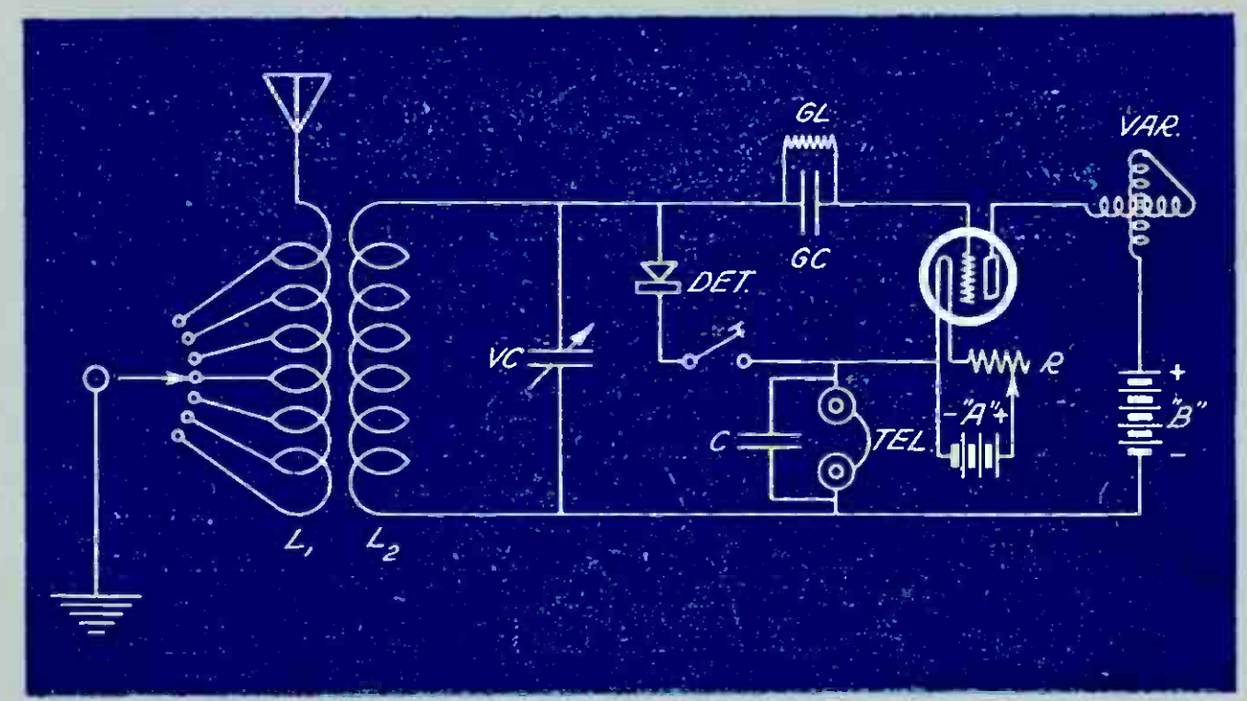
Popular Radio

25¢

Edited by KENDALL BANNING

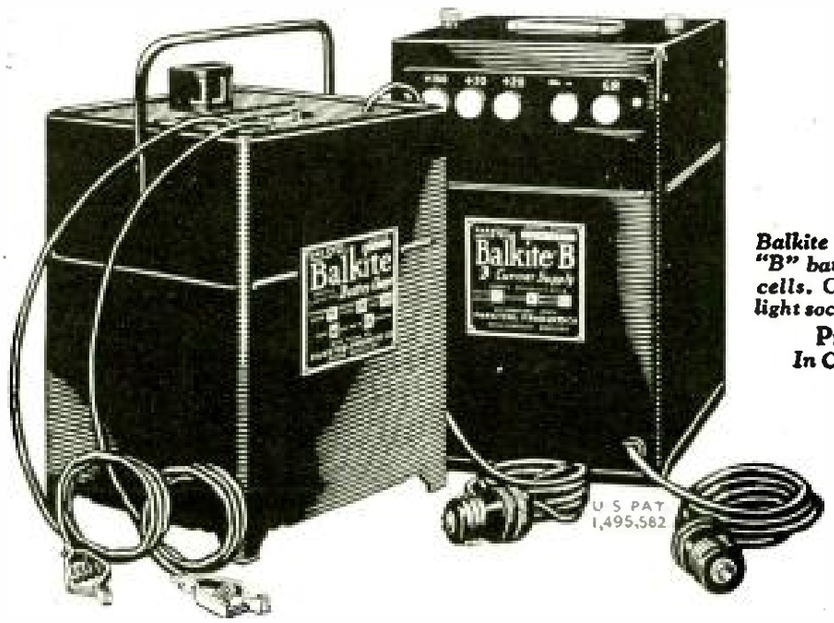
★ JULY 1925



Annual HOOK-UP NUMBER

Containing 101 of the Best Radio Circuits, Revised and Brought Up-to-date

Balkite Battery Charger. Charges 6 volt "A" storage batteries.
Price $19.50
West of Rockies $20
In Canada $27.50



Balkite "B"—replaces "B" batteries and dry cells. Operates from light socket.
Price $55
In Canada $75

A uniform, constant power supply for both "A" and "B" circuits

Here at last is a convenient and unfailing power supply for your radio set. Balkite Radio Power Units furnish constant uniform voltage to both circuits, and will give your radio set greater clarity, power and range. The Balkite Battery Charger keeps your "A" storage battery charged. Balkite "B" replaces "B" batteries entirely and supplies plate current from the light socket.

Based on the same principle, both the Balkite Battery Charger and Balkite "B" are entirely noiseless. They have no bulbs or moving parts, and nothing to break, adjust or get out of order. They have a very low current consumption, are simple and efficient in operation, and can be put in use at any time by merely connecting to a light socket. Both are guaranteed to give satisfaction.

Sold by leading radio dealers everywhere

FANSTEEL
Balkite *Radio Power Units*

BALKITE BATTERY CHARGER — BALKITE "B" PLATE CURRENT SUPPLY

Manufactured by FANSTEEL PRODUCTS COMPANY, Inc., *North Chicago, Illinois*

The adjustable Table-Talker much improved—but still $10.00

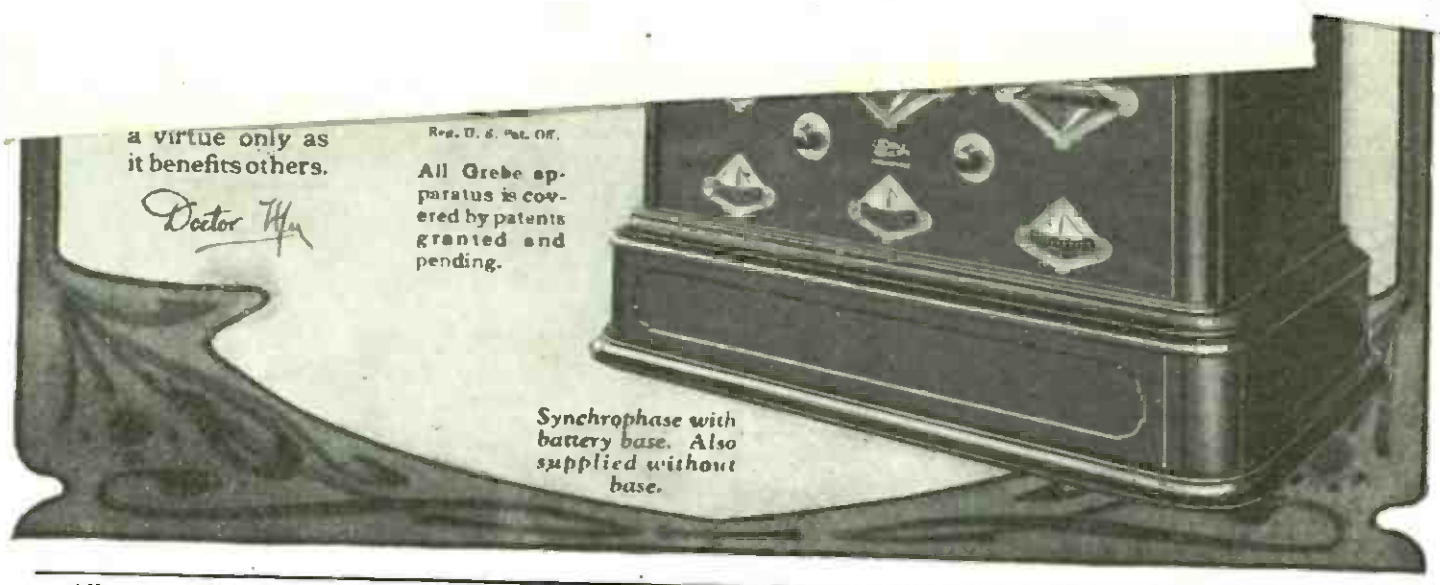
Two big improvements—but no boost in price! Now the *Table-Talker* is adjustable. It has a convenient little lever that does a big job—increases the volume, snaps up the sensitivity. And a goose-neck horn that makes each sound clearer, fuller, more real!

Ten dollars is still the price. But uncountable are the hours of fun and interest and gaiety it will give.

50c additional West of the Rockies

Brandes

All apparatus advertised in this magazine has been tested and approved by POPULAR RADIO LABORATORY



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POPULAR RADIO

EDITED *by* KENDALL BANNING

PAGES WITH THE EDITOR

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CONTENTS *for* JULY, 1925

(Cover design by Frank B. Masters)

VOLUME VIII NUMBER 1

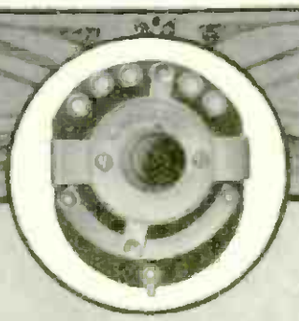
DEPARTMENTS

VOLUME VIII JULY, 1925 NUMBER 1

Published monthly by Popular Radio, Inc., 627 West 43rd St., New York, N. Y., telephone number, Chickering 1906; Douglas H. Cooke, President and Treasurer; Kendall Banning, Vice-President; Laurence M. Cockaday, Secretary; Joseph T. Cooney, Asst. Treasurer. Price 25 cents a copy; subscription $3.00 a year in the U. S., Canada and all countries within the domestic postal zone; elsewhere $3.50 a year, payable in advance. The International News Company, Ltd., No. 5 Bream's Bldg., London, E. C. 4, sole distributors in England. Entered as second class matter April 7, 1922, at the Post Office at New York, N. Y., under the act of March 3, 1879.

Printed in U. S. A.

LAURENCE M. COCKADAY, *Technical Editor*
E. E. FREE, Ph. D., *Contributing Editor* JOHN V. L. HOGAN, *Contributing Editor*



Grebe Volume Control

Controlling Audio Amplification in a New Way

WITH the Synchrophase, volume is controlled by an exclusive feature which makes possible six graduations of volume without changing the character of the sound. This is done gradually and not by the abrupt and distorting stage-to-stage method common to most receivers.

Sound can thus be modulated at will to please the ear.

Ask your dealer to demonstrate this and other Grebe features

A. H. GREBE & CO., Inc.
Van Wyck Blvd., Richmond Hill, N. Y.
Western Branch: 443 So. San Pedro Street, Los Angeles, Cal.

The GREBE SYNCHROPHASE

TRADE MARK

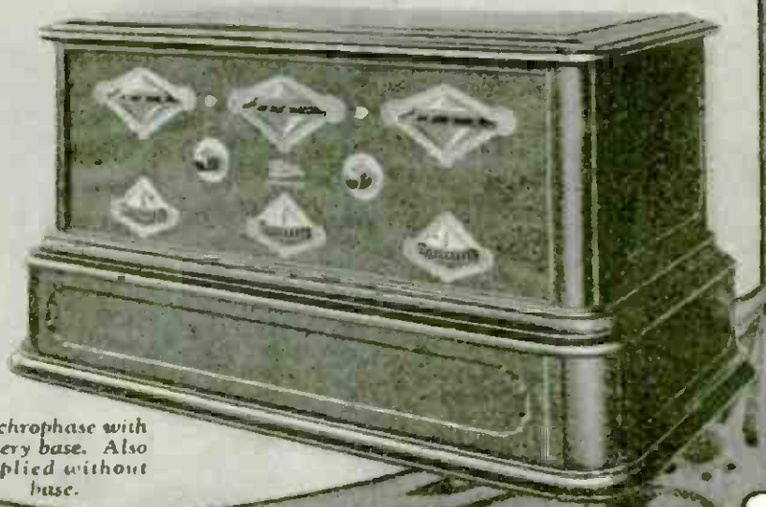
This company owns and operates station WAHG

Exclusiveness is a virtue only as it benefits others.

Doctor Mu

GREBE RADIO
TRADE MARK
Reg. U. S. Pat. Off.

All Grebe apparatus is covered by patents granted and pending.



Synchrophase with battery base. Also supplied without base.

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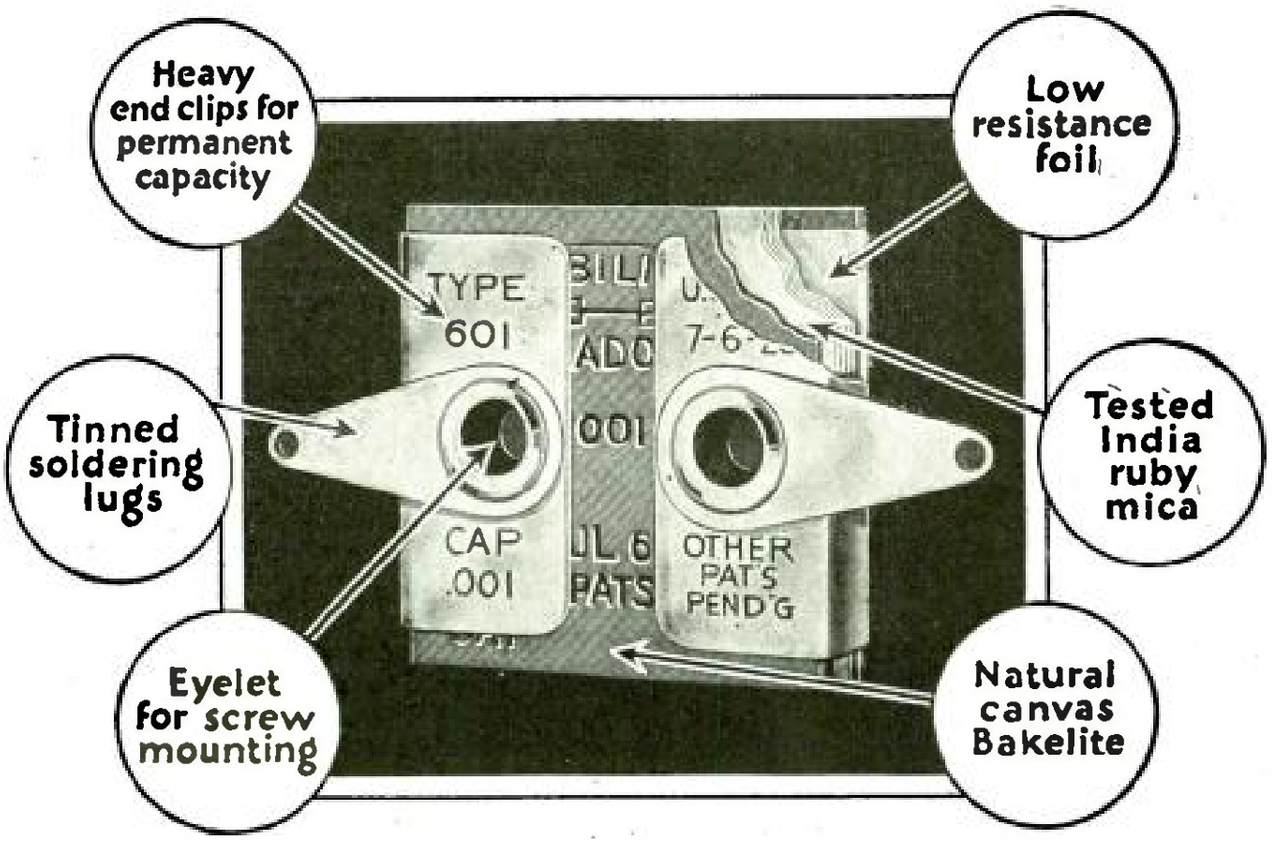


What makes for efficiency in fixed condensers?

This diagram indicates the efficient details of construction that have made Micadons the standard* fixed condensers of radio.

Dubilier engineers have developed these standard condensers of accurate and permanent capacity. Micadons are known the world over —and are used in 90% of all radio sets.

**Standard—anything recognized as correct by common consent . . . of a high degree of excellence.—Webster*

Dubilier

CONDENSER AND RADIO CORPORATION

(*Continued from page 4*)

From a photograph made for POPULAR RADIO

OLD DR. POPULAR RADIO IN THE BOYS' WARD

"This boy," writes Mr. Preston T. Slayback, the Business Executive of the Los Angeles Orthopaedic Hospital-School for Crippled Children, "is a most enthusiastic and well-informed radio fan—and is, of course, a constant reader of POPULAR RADIO. *He was made very proud and happy when he was told that this photograph, showing your magazine on his bed, was to be sent to you, with an expression of thanks to you for the pleasure your magazine gives him and the other boys who are in the same ward with him in our hospital."*

* * *

THE eminent British statesman Gladstone used to subscribe to American magazines not only for the purpose of looking over the articles contained in them, but also to read the advertising pages. For in them, he said, he found reflected the activities and the industries and the needs of the American people.

* * *

IN similar spirit American radio fans are reading the advertising pages of POPULAR RADIO —because they find in them what is, in effect, the best and most carefully tested and consequently the most dependable of all radio apparatus.

* * *

ONE of our advertisers, for example (A. Hall Berry of New York), writes: "For more years than I like to admit I have been engaged in selling and advertising things, electrical and kindred lines. I have been accumulating experience in practically every department of the broad field of advertising and selling, but never, as advertising and sales manager for one of the largest electrical manufacturers in the world, as sales manager for two prominent advertising agencies in this country and as selling and advertising manager for a smaller but prominent manufacturer of electrical products, have I seen a quicker or more consistent response to advertising than has resulted from my small advertisement in POPULAR RADIO."

* * *

POPULAR RADIO, which created the idea of the silver cover which has distinguished the magazine from its earliest issues, has been tendered a subtle form of flattery—if imitation is flattery, as the poet tells us. "Radiofoma," a radio journal published in Rome, Italy, appears with its April 20 number enclosed in a silver cover!

* * *

"THE material in POPULAR RADIO is splendid. I have seen so much of thin and unauthoritative radio magazine stuff in current newspapers that it is a real adventure to see well written articles by the men who are advancing radio."

—COMMANDER FITZHUGH GREEN, U.S.N.

* * *

ANOTHER scientist of world-wide renown has joined the small but distinguished list of contributors to POPULAR RADIO—Sir William Bragg, K.B.E., D.Sc., F.R.S., M.R.I., Fullerian Professor of Chemistry at the Royal Institution of England and Director of the Davy-Faraday Research Laboratory.

* * *

SIR WILLIAM will contribute a series of articles on the atom—a phase of electrical science that is becoming of increasing import to radio. The first article of this series will appear in a near issue.

* * *

"I would not trade my subscription to POPULAR RADIO for a two weeks' vacation, nor trade my four-circuit receiver for any other that I have ever heard."

—DR. H. C. FOYLER, *Portsmouth, O.*

* * *

IN the next number will appear the latest contributions to the radio art by the POPULAR RADIO LABORATORIES—"How to Build a 5-Tube Receiver with Simplified Control."

Kendall Banning

Editor, POPULAR RADIO

Get a good set— and Evereadys

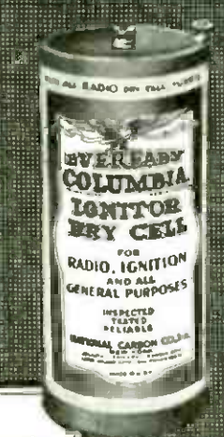
EVEREADY HOUR EVERY TUESDAY AT 8 P. M.
(Eastern Standard Time)
For real radio enjoyment tune in the "Eveready Group." Broadcast through stations

WEAF	New York
WJAR	Providence
WEEI	Boston
WFI	Philadelphia
WGR	Buffalo
WCAE	Pittsburgh
WEAR	Cleveland
WSAI	Cincinnati
WWJ	Detroit
WCCO	Minneapolis, St. Paul
WOC	Davenport

To ENJOY radio for the rest of your life, get the best set you can afford. There are receivers at all prices, made by reputable manufacturers; it isn't necessary for anyone to get 'round-the-corner, unproved, unreliable merchandise at any price. That applies to batteries too. Eveready Radio Batteries are made in so many sizes and prices that there is a correct, long-lasting Eveready for every receiver and for every radio home, ship or commercial station. Specify Evereadys for your new radio set. It is false economy to buy nondescript batteries at any time. In the long run you'll find it most economical to buy either the large or extra large Evereadys. Always buy Evereadys and enjoy the knowledge that no one can get any more in batteries for the money than you. There is an Eveready dealer nearby.

Manufactured and guaranteed by
NATIONAL CARBON CO., INC.
New York San Francisco
Canadian National Carbon Co., Limited, Toronto, Ontario

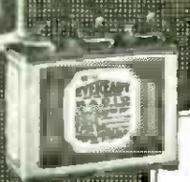
EVEREADY
Radio Batteries
—they last longer



Eveready Columbia Ignitor the proven Dry Cell for all Radio Dry Cell Tubes 1½ volts

No. 772 45-volt Large Vertical Price $3.75

No. 766 22½-volt Large Horizontal Price $2.00



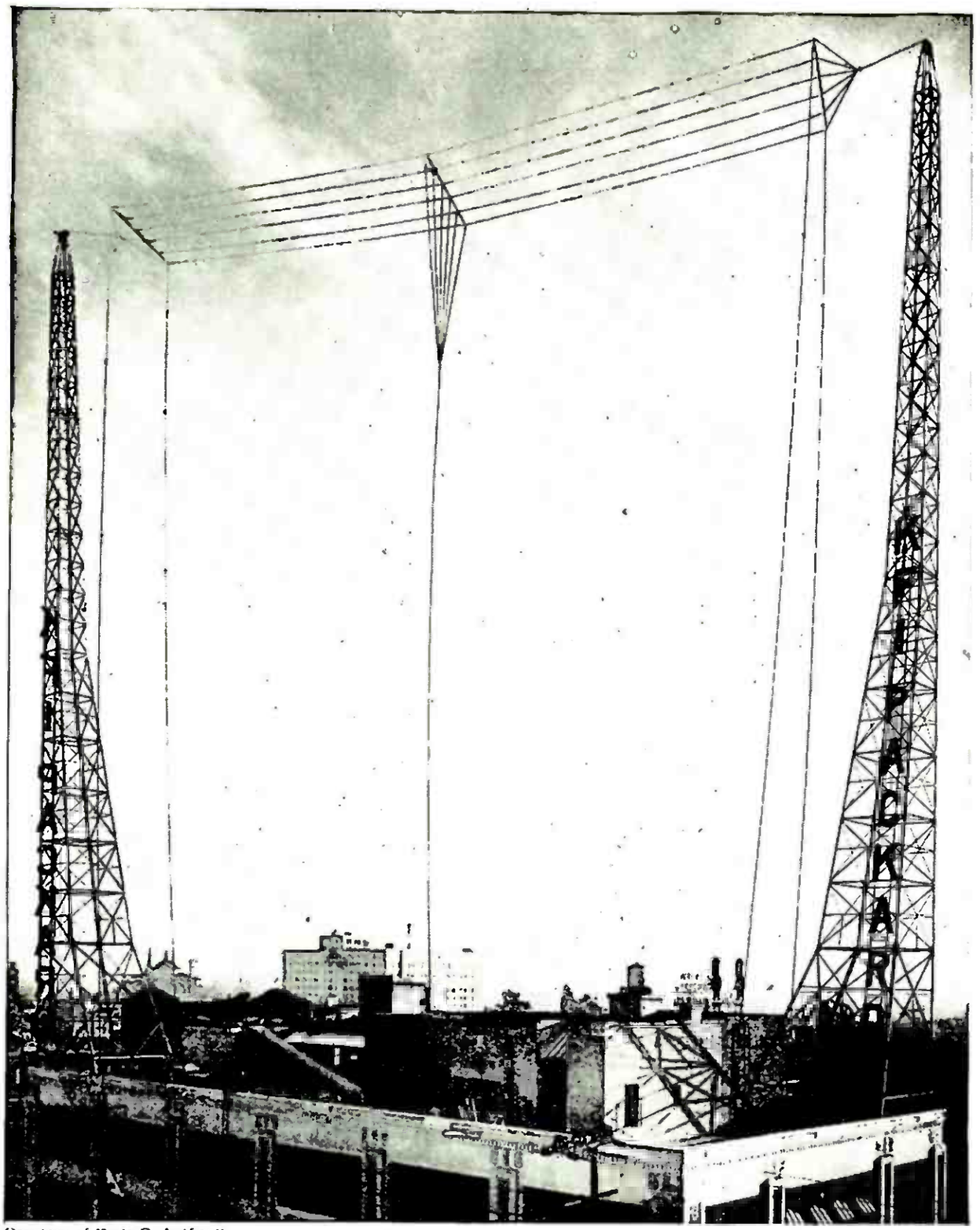
No. 771 4½-volt "C" Battery improves quality, saves "B" Batteries Price 60c

Kadel & Herbert

"Radio's Finest Interpreter"

A MAGAZINE *dedicated to the presentation of an art or science in terms and language that the public can understand and appreciate, is in very truth the House of the Interpreter. The radio art has no finer interpreter than* POPULAR RADIO, *which combines an exact and thorough knowledge of this great science with the happy gift for interesting popular expression.*

—R. A. WEAGANT



Courtesy of Earle C. Anthony

A Forerunner of Tomorrow's Broadcasting

It is from such great antenna systems as this one (the powerful station KFI in Los Angeles), that programs of national importance may be broadcast throughout the entire country. And it is this type of power station that is destined to become a part of the plan for attaining "super-broadcasting" and to be an important factor in solving the broadcasting problem.

Popular Radio

VOLUME VIII JULY, 1925 NUMBER 1

A PROBABLE SOLUTION OF THE BROADCASTING PROBLEM—

"SUPER-BROADCASTING"

Questions That the Radio Interests Must Eventually Answer—

WHAT constitutes program features of superlative merit?
FROM what stations shall these "super features" be broadcast?
HOW can these programs reach the maximum number of listeners?
WHO will pay the costs of maintenance of the stations?
HOW will the broadcast artists receive remuneration?
WHO will pay authors' and composers' royalties on copyright features?

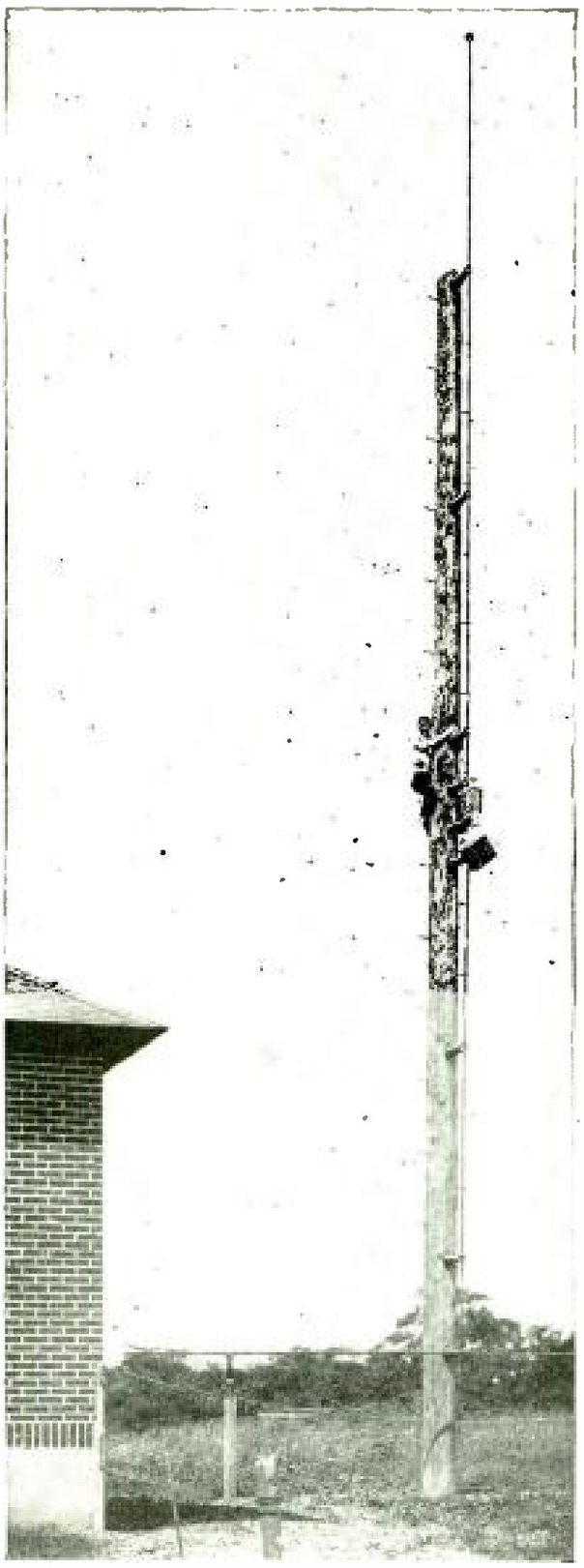
By LAURENCE M. COCKADAY

BROADCASTING has grown in the past three years from the experimental work of a few scientifically-minded amateurs to the greatest medium of disseminating news, entertainment and education that the world has ever known.

Today there are 475 class A broadcasting stations in this country and 90 class B stations. The former broadcast on wavelengths ranging between 280 and 545 meters, and are required to have a minimum of 500 watts of power in the antenna. The latter operate on wavelengths between 200 and 280 meters, and are limited to a maximum of 500 watts in the antenna. These two classes of stations total 565. Between them they cover the entire country.

The quality of the broadcast programs that are sent out from these stations varies to a marked degree. In those areas that are served by stations which are noted for the general excellence of their programs, the interest in radio has been developed to the benefit of the radio fan and to the profit of the radio dealer and manufacturer. As a consequence, the growth of radio has been in reality the direct reaction of the development of individual broadcasting stations. Those stations have been most successful that have given the best programs to the largest number of listeners.

In other words, the public interest in radio and the radio industry itself is dependent upon the maintenance of a higher standard of broadcast program, and the future of radio will be deter-



Westinghouse

A RADIO "RELAY STATION"

This is the type of short-wave antenna that is used at station KDKA for relaying radio programs to other stations. It is a vertical rod mounted rigidly on evenly spaced insulators. This prevents swinging and changes in the transmitted wave on a pole.

mined by the character of programs that will be furnished.

On the maintenance of broadcast programs the whole structure of the radio interests rests.

How shall this be accomplished?

In the answer to this question lies the problem of super-program building—the selection of those features of the broadest possible interest, of the best possible quality and of the greatest national import.

And here is where "superbroadcasting" enters the situation as a probable solution.

"Superbroadcasting" is the term that may be applied to what is, in effect, universal broadcasting; *i. e.*, the broadcasting of those program features of outstanding excellence that may be received over the entire country or over the entire continent or, conceivably, over the entire world at the same moment. This may be attained in three ways, any one of which may be used separately or in combination.

These three ways may be summarized thus:

1. A small number of strategically located broadcasting stations that operate on "super-power" ranging from 5,000 to 20,000 watts;
2. The linking together of broadcasting stations by wire, so that the same program may be sent out from them simultaneously;
3. The linking together of broadcasting stations by means of "relay stations," which pick up programs broadcast from other stations simultaneously on a short wavelength (say 90 meters), and re-broadcast them on a regular wavelength.

Let us consider for a moment the first of these methods—the super-power stations.

It has been estimated that fifteen or twenty super-power stations of 5.000 watts or more could cover the whole of

Kadel & Herbert

HOW BROADCAST STATIONS ARE LINKED TOGETHER BY WIRE

Here is a long-distance control board for the telephone lines that are used to connect a number of widely separated broadcasting stations, so that they may all transmit the same broadcast program.

the United States with as many different programs (see Figure 1). This could be done in such a way that a listener in any part of the country, with a receiver of only medium sensitivity, could pick up that particular type of program or feature in which he was interested, and he could receive it with good volume and in pleasing quality.

This system of broadcasting would undoubtedly help to popularize a simple receiver (of not more than three or four tubes) which would be easy to tune (probably a single-control unit) and that would be a profitable instrument to sell at a price well within the reach of everybody's pocket. In fact, a receiver capable of receiving signals from a super-power station at a distance of 2,000 or 3,000 miles can be manufactured at a considerably lower cost to the ultimate consumer than the ordinary receivers sold today. At the same time, the manufacturers could incorporate in these simplified receivers an audio-frequency amplifier of much better quality than is used today, so that the reproduction of the program in the homes would be much more enjoyable than in even the most expensive of the receivers now in use.

A super-power station, however, if it is located in the midst of a large city, causes an undue amount of interference. This is especially true if the receivers now in general use are employed. To avoid this interference it may become necessary to install and operate super-power stations outside of the crowded areas. No super-power station (in the writer's opinion) should be located in the center of a city or town. It should be built at a distance of fifteen or twenty miles from a congested district. It should be located at some place where

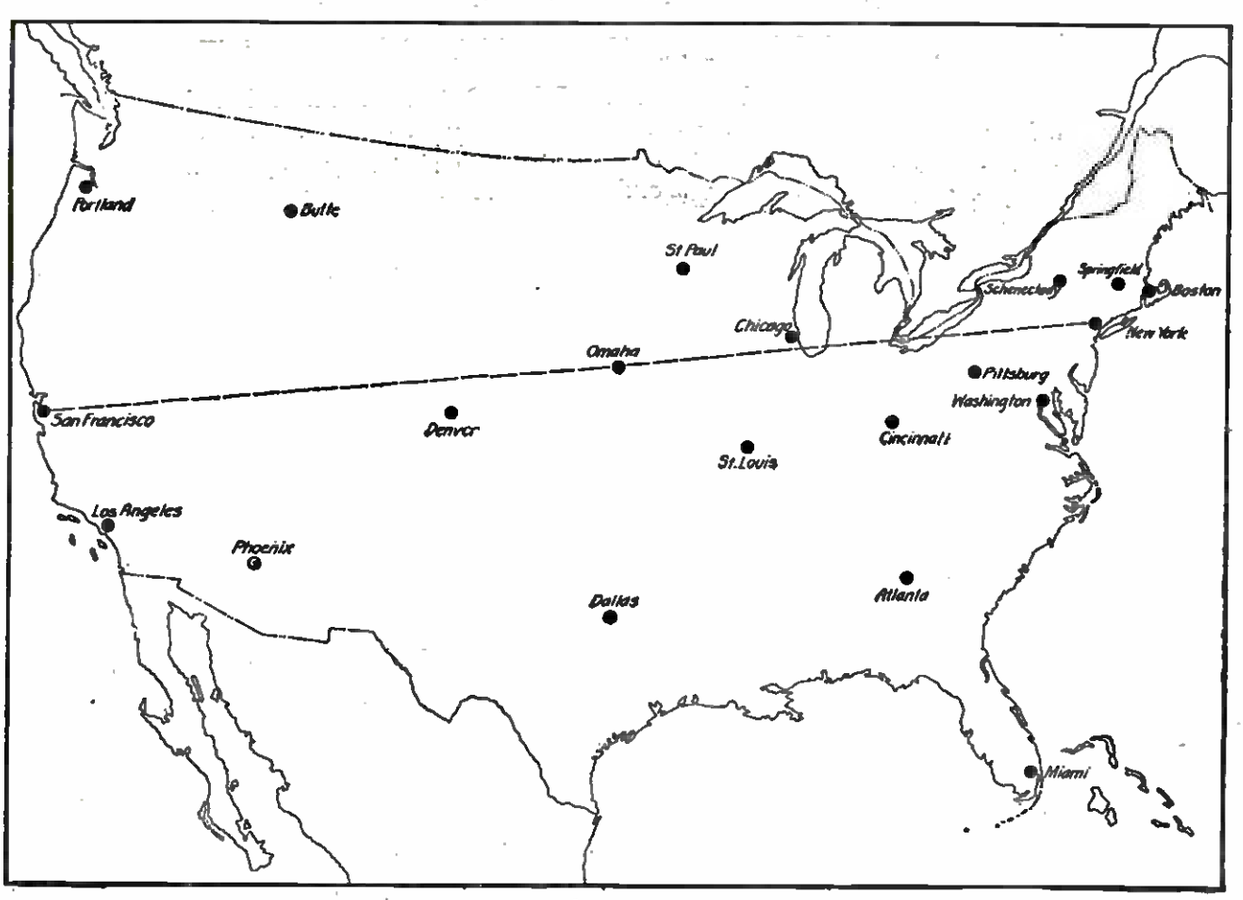
there are few residents—as, for example, in low, flat marshes or up in the mountains on some high peak.

The studios for these stations would not, of course, be at such a distance from town, as it would be difficult to induce performers or lecturers to travel to them. The studio itself would be located in the most accessible district of the city or town, and would be connected to the transmitting station by telephone lines. In this way, the multitudes in the city would not have a broadcasting station of tremendous power "in their back yards," so to speak, and they would be able to tune it out with a receiver of only fair selectivity. But other broadcast listeners at great distances would be able to pick up these programs from this station although the nearer super-power stations might be transmitting at the same time.

There are a number of super-power stations now in operation in the United States, including stations KDKA at East Pittsburgh, Pa.; WBZ at Springfield, Mass.; WOC at Davenport, Ia.; KFI at Los Angeles, Cal.; WLW at Cincinnati, O.; WEAF at New York City; KGO at Oakland, Cal.; WGY at Schenectady, N. Y., and WSB at Atlanta, Ga. These stations have an average power of 5,000 watts with minimum and maximum powers ranging from 2,500 watts to 50,000 watts in one or two cases.

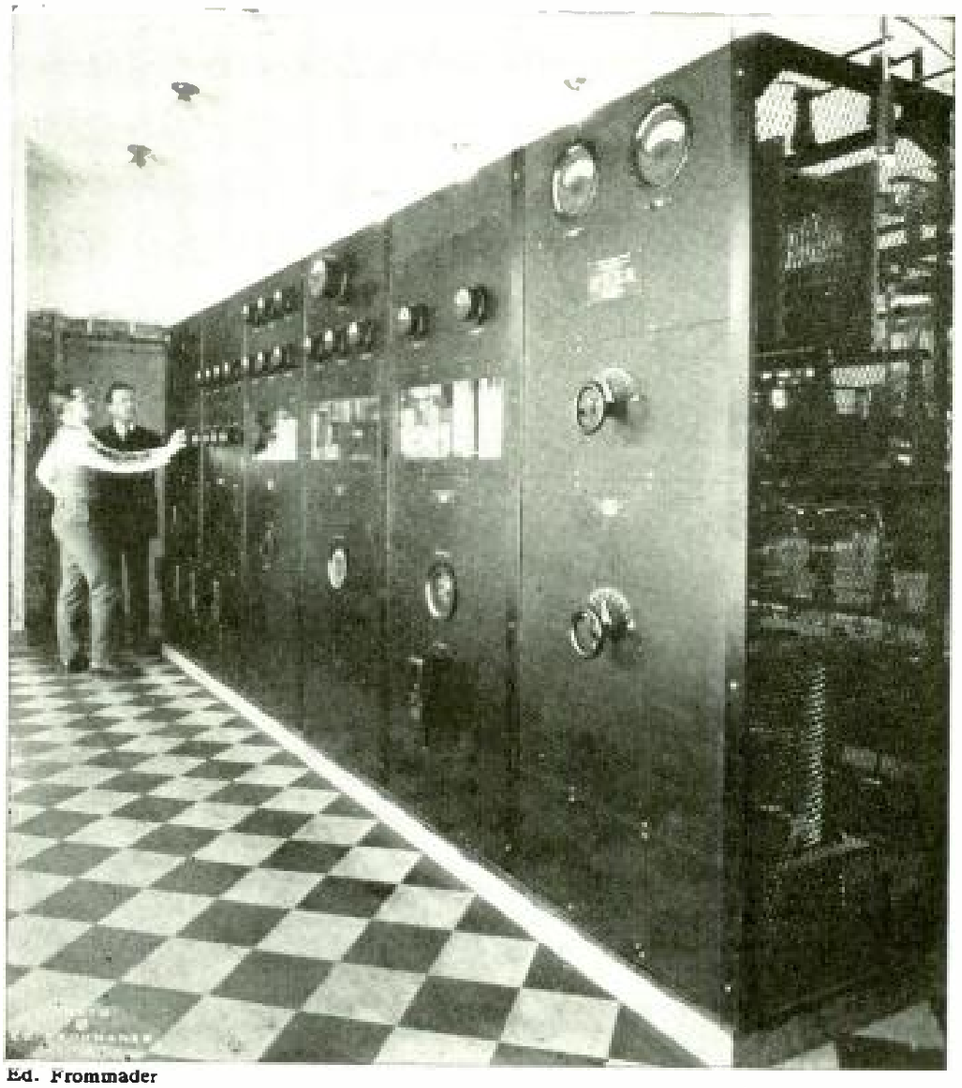
By the second method of super-broadcasting, a number of local stations of low, medium or high power would all be connected to each other by means of special land wires—and all connected to a single broadcasting studio.

These separate stations, properly distributed around the whole country (see



HOW SUPER-POWER STATIONS SHOULD BE DISTRIBUTED

FIGURE 1: *A number of high-powered radio stations may supply the country with the same number of national programs, if the wavelengths of the stations are far enough apart to avoid interference. A station at Omaha would need but half the power required if it were located at New York or San Francisco.*



Ed. Frommader

A FAMOUS SUPER-POWER TRANSMITTER

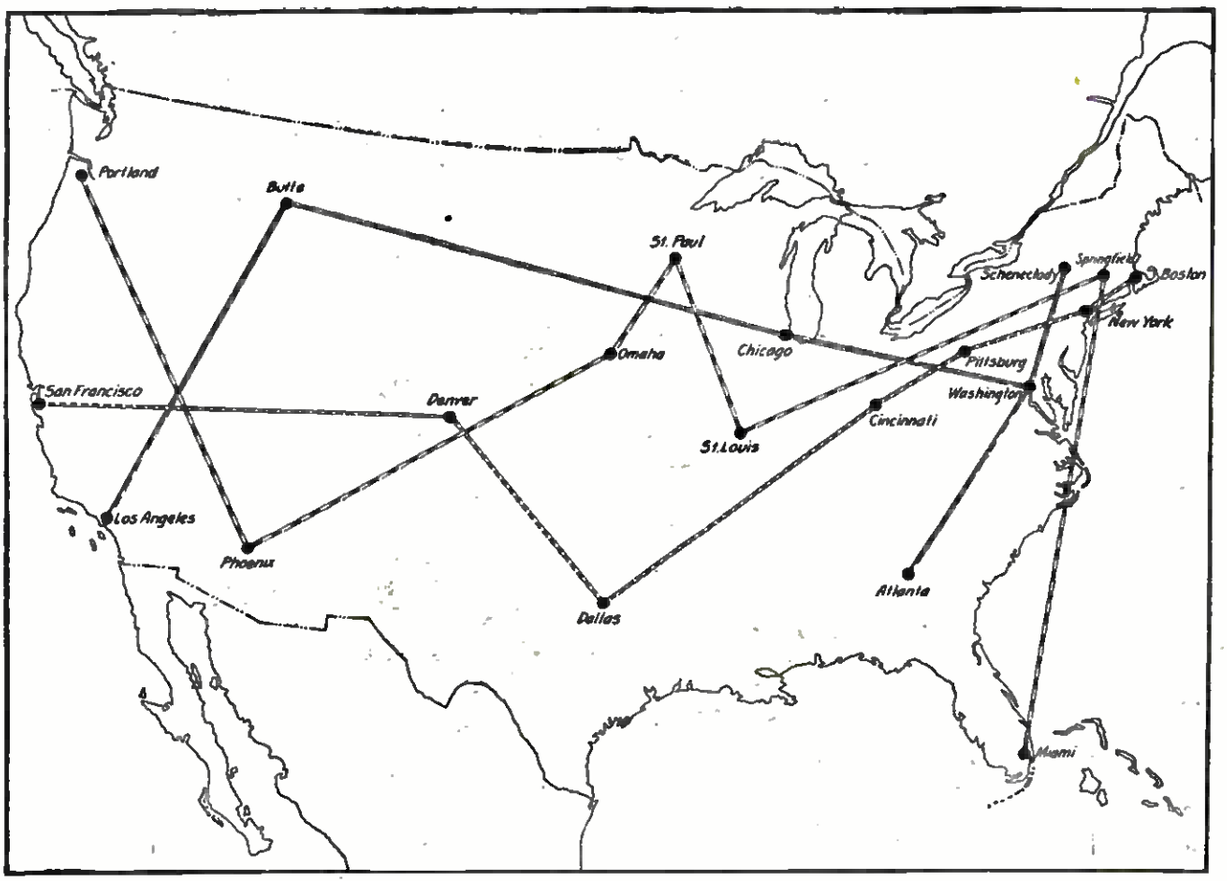
This is the recently erected panel transmitter of station WOC, at Davenport, Ia. It is one of the greatest super-power stations in the world and is heard throughout the year from coast to coast on a loudspeaker with simple three or four-tube receivers.

Figure 2) and each broadcasting the same program, could be received throughout the entire nation with the same type of simplified receiver as would be required to tune in the super-power stations. In other words, this second method of broadcasting would make it possible for any person in any part of the country to pick up a program originating at a distant point with a receiver that would not strain even the most modest pocketbook.

This method, however, has a disadvantage, in that it would make available at one particular time only a single program. This objection, however, could be overcome by using a series of interconnected low-power stations, with (say) one program from the east on one chain, another program from the western part of the country on another chain of stations, and so on.

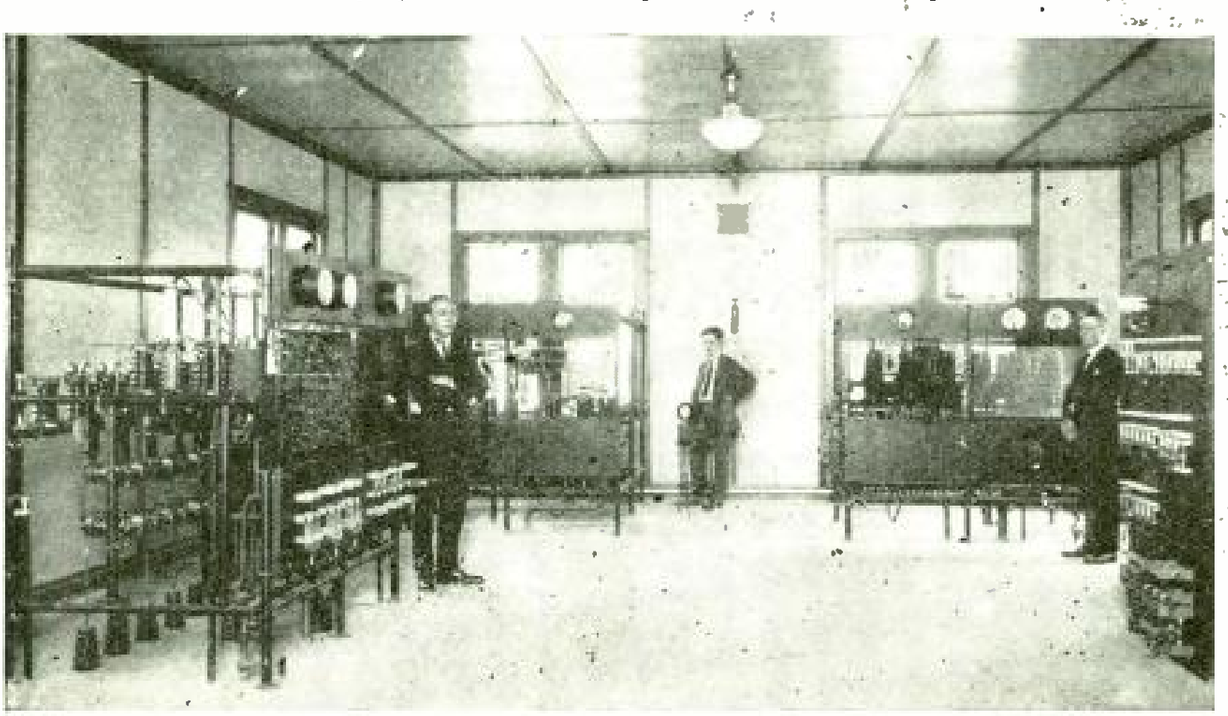
But this method has one outstanding advantage; it would reduce local interference considerably over that obtained by the first method.

Of course, this second method is only applicable on one continent. It cannot be used for linking stations over large bodies of water, as it is necessary to run a high quality telephone line between every one of the stations to be connected in the chain.



THE TELEPHONE LINK FOR BROADCASTING STATIONS

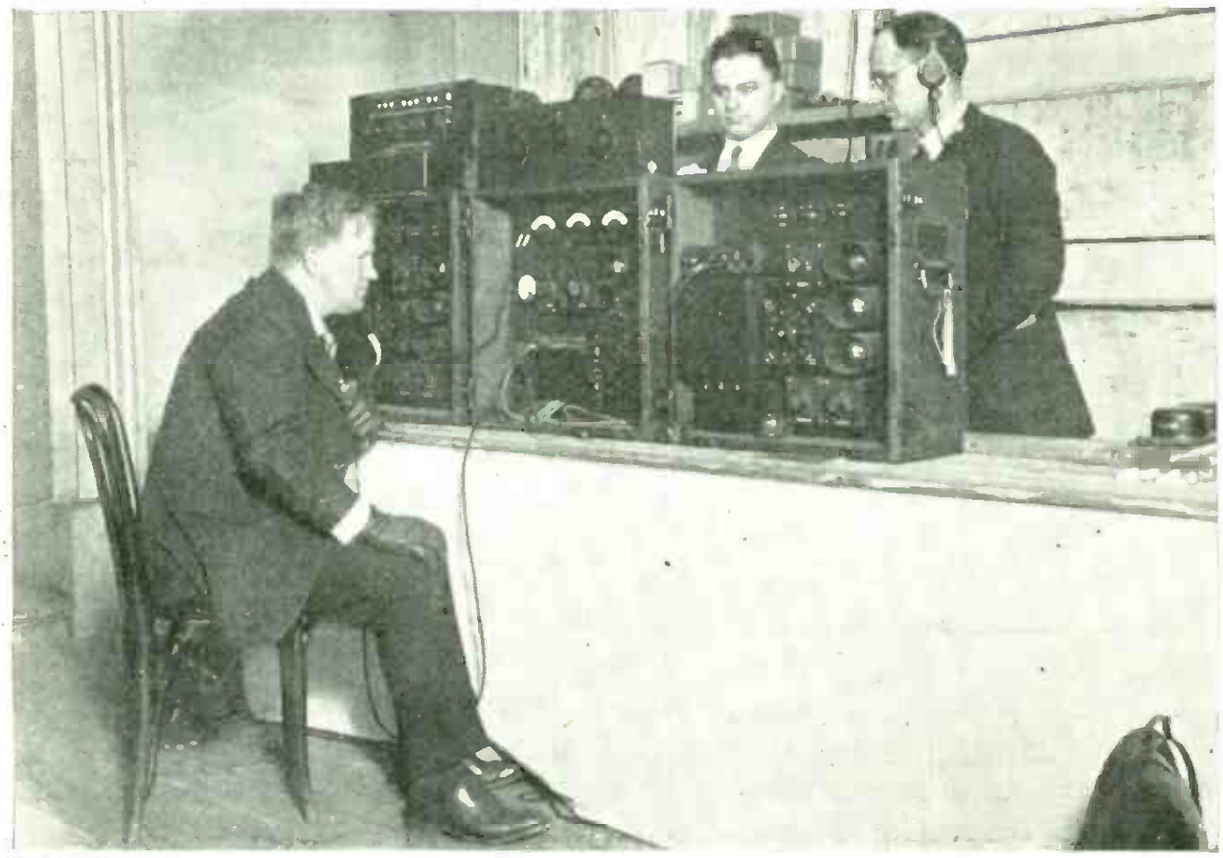
FIGURE 2: *Seven stations with a 1,000-mile range and located at proper points throughout the country would be able, if connected by telephone wires, to broadcast a program simultaneously to the whole country.*



Westinghouse

A PIONEER IN SHORT-WAVE TRANSMISSION

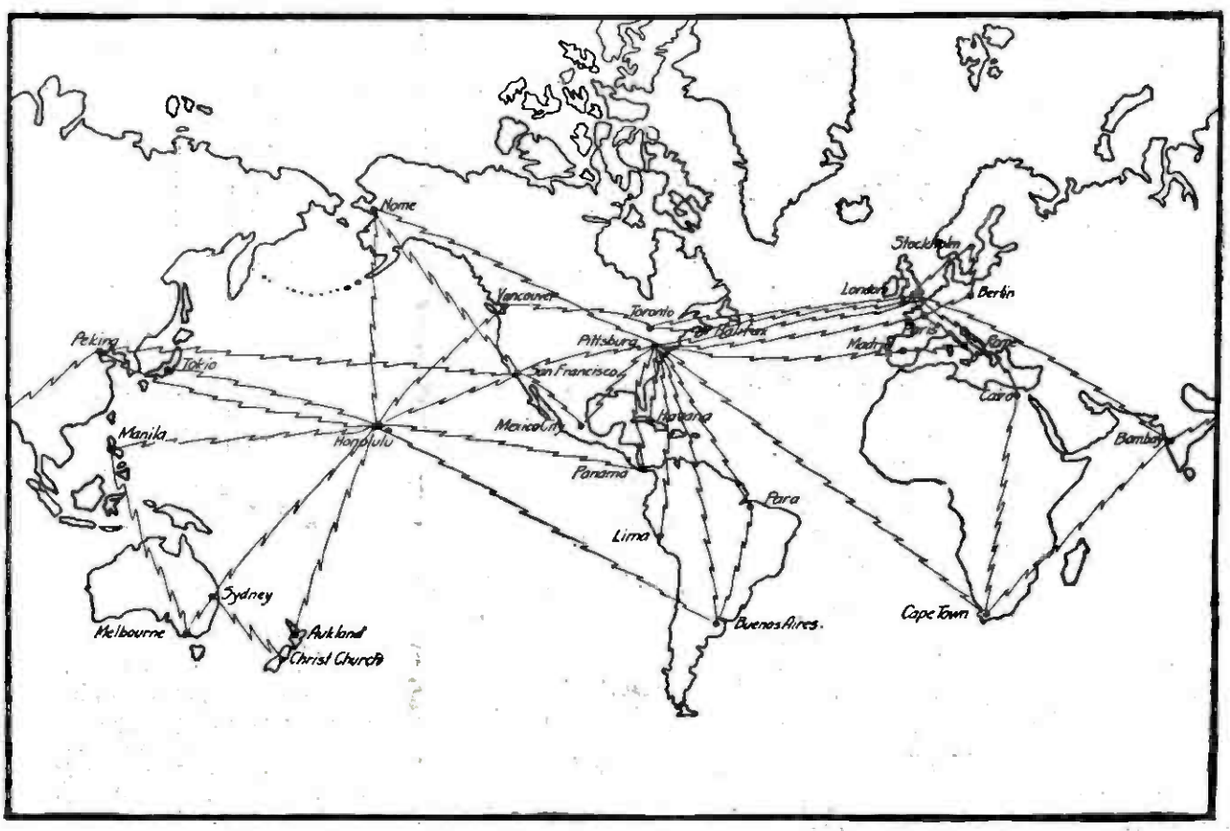
Here is the apparatus used at the new experimental radio station at KDKA of the Westinghouse company. By means of this high-powered short-wave system, radio programs have been transmitted across the continent and even across the ocean.



Kadel & Herbert

THE START OF A NATIONAL RADIO EVENT

The pick-up apparatus used at the Capitol when the inaugural ceremonies were broadcast so that the entire country could listen in.



THE INVISIBLE RADIO NET AROUND THE GLOBE

FIGURE 3: *The diagram shows how short-wave radio stations could be tied together.*

The third method of super-broadcasting provides for the use of a short wave radio link between a number of well distributed transmitting stations of low, medium or high power, so that they all could re-broadcast on a higher wavelength the programs transmitted to them by the "mother" station on a short wave. Programs broadcast from these separate radio-linked stations, properly distributed throughout the whole country, or in fact, throughout the whole world (see Figure 3), each broadcasting the same program, could be received anywhere within the range of any one of the separate stations —and with the same type of simplified receiver already mentioned in connection with the other two methods of super-broadcasting. This latter method, however, has the added advantage that its service is available to any transmitting station at any place within the range of the short wave mother transmitter. It does not rely on expensive land lines for its operation and its apparatus and maintenance would not include these or their

Tomorrow's Broadcasting May See—

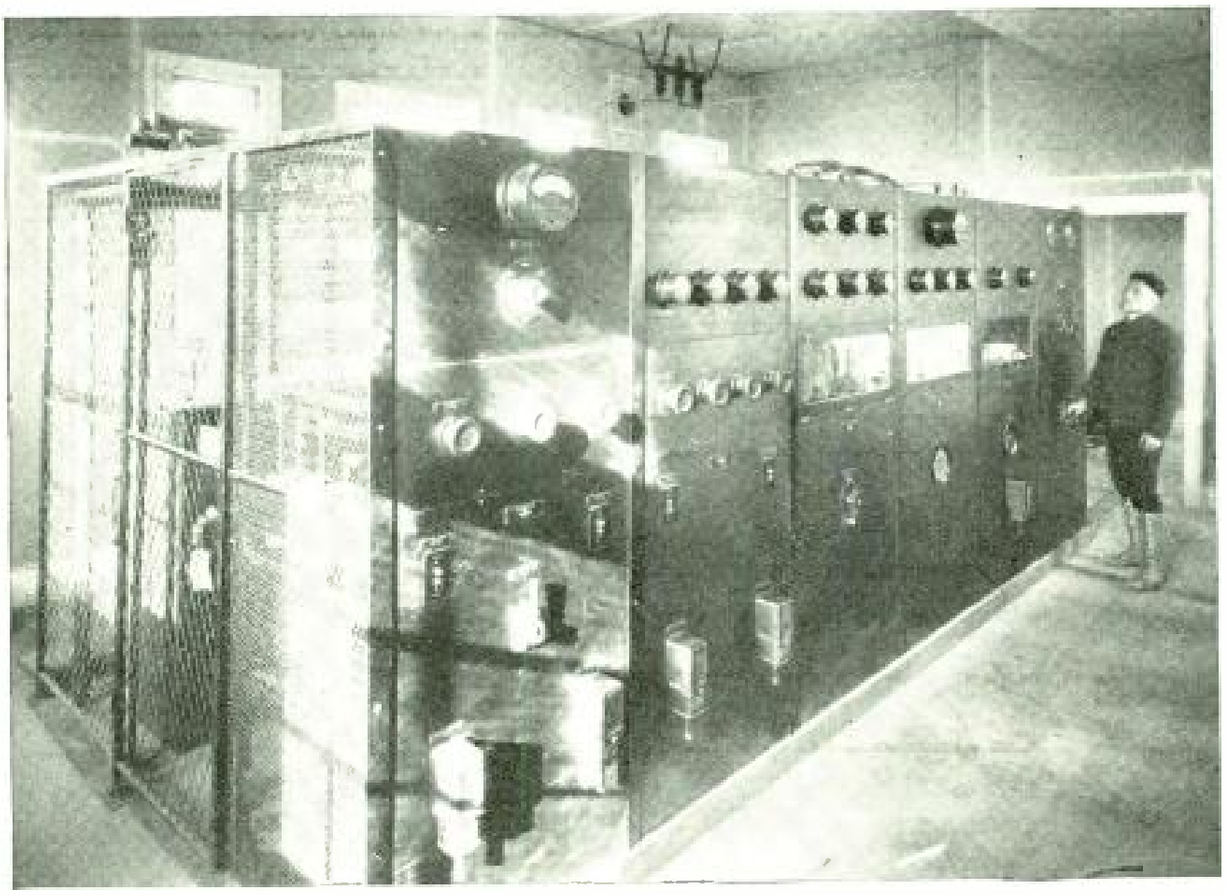
1: A small number of super-power broadcasting stations, located throughout the country and connected by telephone wires so that programs of national importance and of superlative quality may be broadcast simultaneously for the benefit of all;

2: These broadcasting stations authorized to collect toll charges for the rental of these stations for educational, publicity or other purposes, so that funds may be thus secured for their maintenance;

3: Manufacturers of radio sets, and manufacturers of parts that are required for radio sets, assessed on some fair and equitable basis so that those who profit from the sales of radio equipment may contribute toward the maintenance of the stations; (on this point there is much controversy);

4: These broadcasting stations operating under the direction of a representative group of public-spirited citizens of practical experience, acting under the supervision of the Secretary of Commerce;

5: The entire revenue derived by these broadcasting stations—which might conceivably amount to several million dollars a year—devoted exclusively to the maintenance of the stations and to the payment of the broadcasting artists and to the payment of proper royalties to the composers and authors whose work is thus published for the entertainment or for the instruction of all our people.



Crosley Radio Corp.

A 5,000-WATT STATION

This is the high-powered transmitter which is now working day and night at station WLW in Cincinnati. This station may be heard at any time in the evening throughout the United States and in many foreign countries.

accompanying repair work. It would rely wholly upon short wave ether vibrations for the inter-connecting link between the local broadcaster and the mother station transmitting the original program. On the other hand, it might prove to be difficult to transmit to the whole world by this method on account of static conditions in any one vicinity. This condition, however, is ameliorated by the fact that static disturbances are very slight or almost totally absent on certain short wavelengths. It would probably assure the greatest range for super-broadcasting.

Any one of these three methods of broadcasting points a way to a practical solution of the national broadcasting problem. No one of these three systems would interfere in the least with the operation of our regular broadcasting as it is carried on today. There would be ample field for medium-powered local stations, of, say, 250 watts for the transmission of purely local news and items of local interest. These stations should be equipped with the best modulating apparatus obtainable, so that their programs will be reproduced in the receiving sets with as good quality as from the super-broadcasting stations. These local stations would fit in with either of the latter two plans, so that they too could broadcast national programs, when they are of sufficient importance to assure interest on the part of the local listeners.

It is quite possible that certain elements of all three of these schemes may be incorporated in the ultimate plan for world broadcasting. Such a plan might include the following:

(1) A number of super-power stations well distributed throughout every country in the world, and arranged so

that no two adjacent super-power stations would be transmitting on approximate wavelengths;

(2) A number of local medium-powered stations in every large city (not more than four to a large city and, possibly, only one in small towns) all equipped so that they could be tied in with some national program by means of telephone wires;

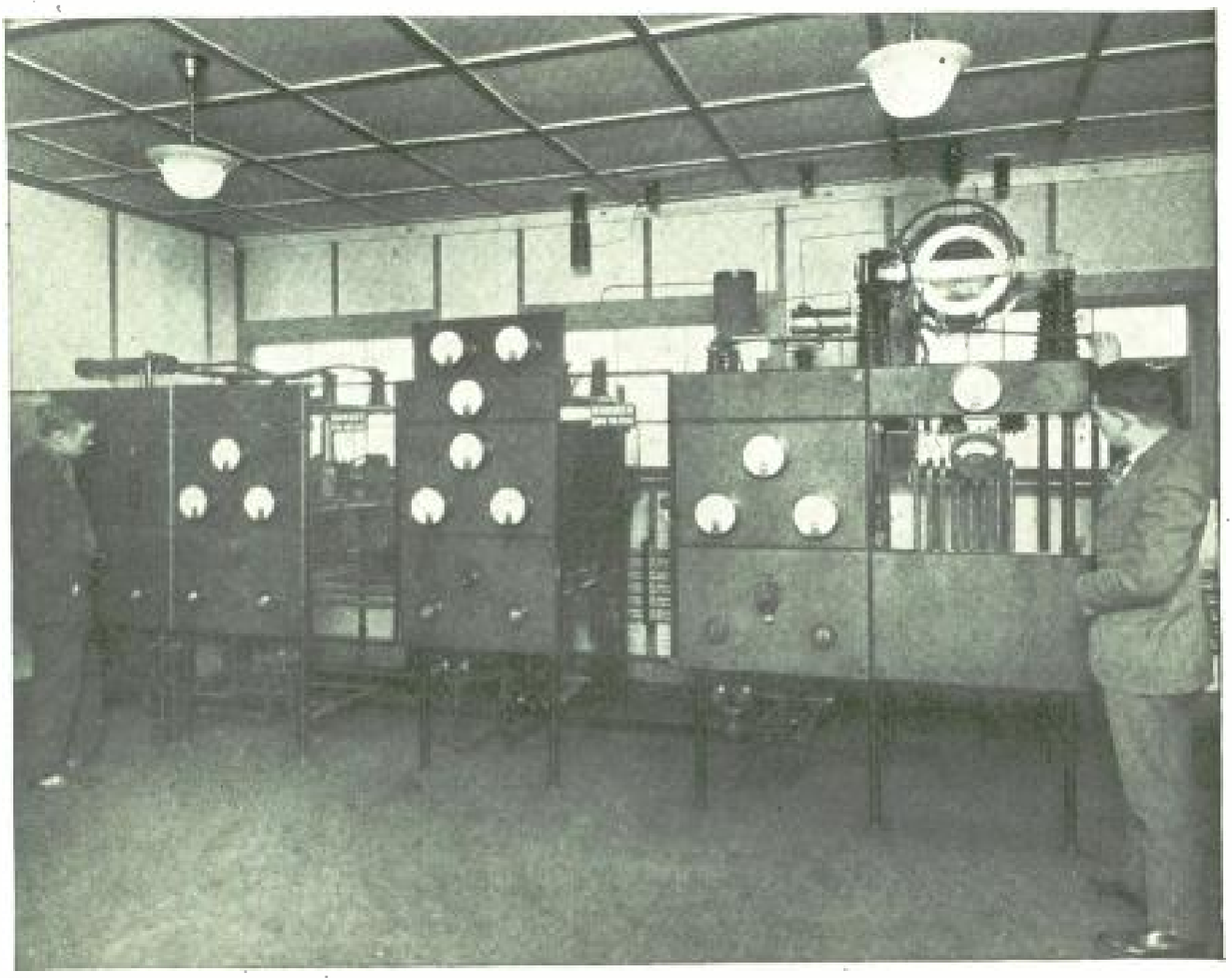
(3) A small number of high-powered short-wave broadcasting stations (two or three to each nation) that might be used as relay stations across large bodies of water (such as the Atlantic and Pacific Oceans), to be used as an interconnecting link between the various national broadcasting chains;

(4) A comprehensive telephone land-wire link for every nation, which would be used for no other purpose than to supply national broadcasting programs to any client broadcasting station that would pay for the service.

When some such plan as this is put into effect and all of the broadcasting facilities of the nation, or of the whole world, are pooled, so to speak, the success of radio broadcasting will be reasonably assured.

And such a comprehensive broadcasting plan would tend not only to reduce the price of receiving apparatus but also to increase the quality of reception throughout any area at the same time cutting down the trouble from interference.

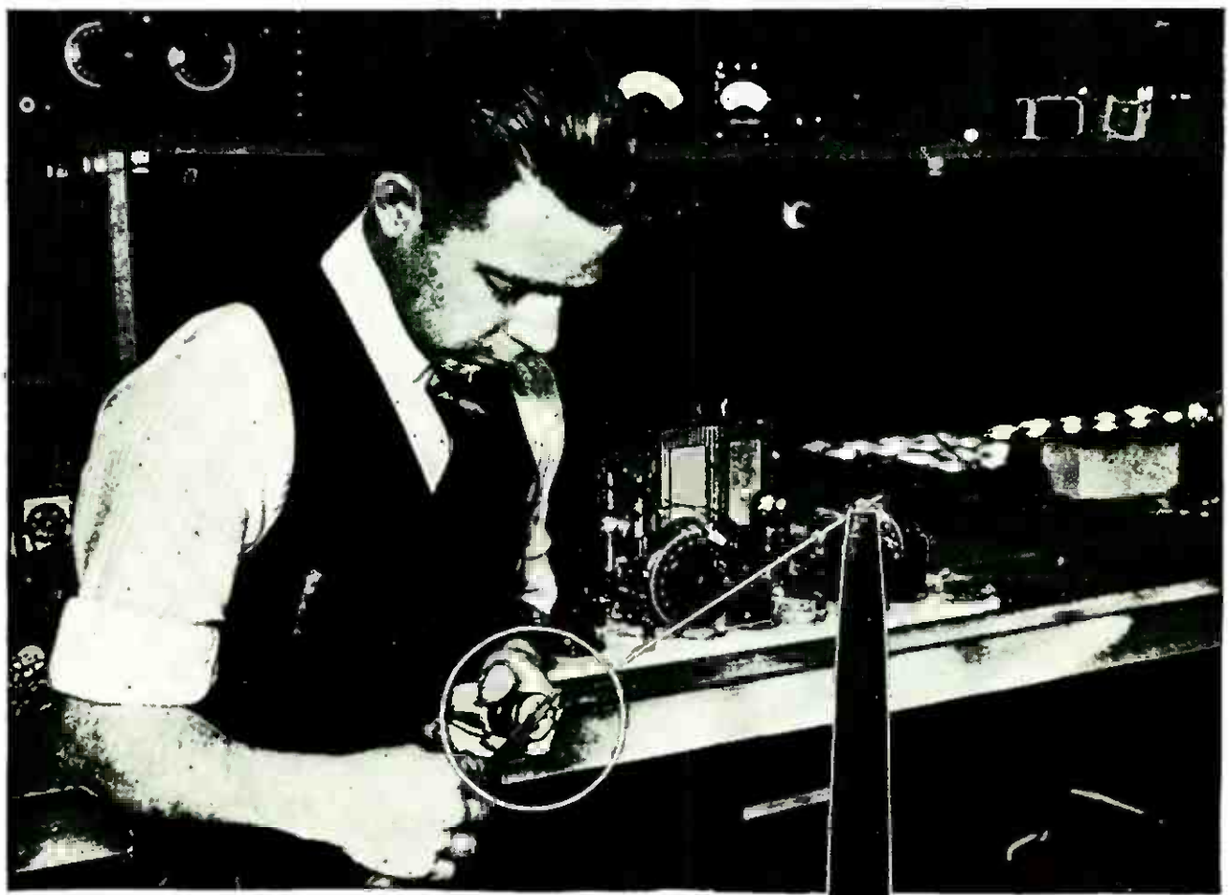
When these steps have been taken radio broadcasting will be available to practically every family in the world.



Westinghouse

ANOTHER "SUPER" STATION

The transmitting apparatus at station WBZ in Springfield, Mass. Almost all radio listeners in the United States have at some time received programs from this powerful transmitter.



From a photograph made for POPULAR RADIO

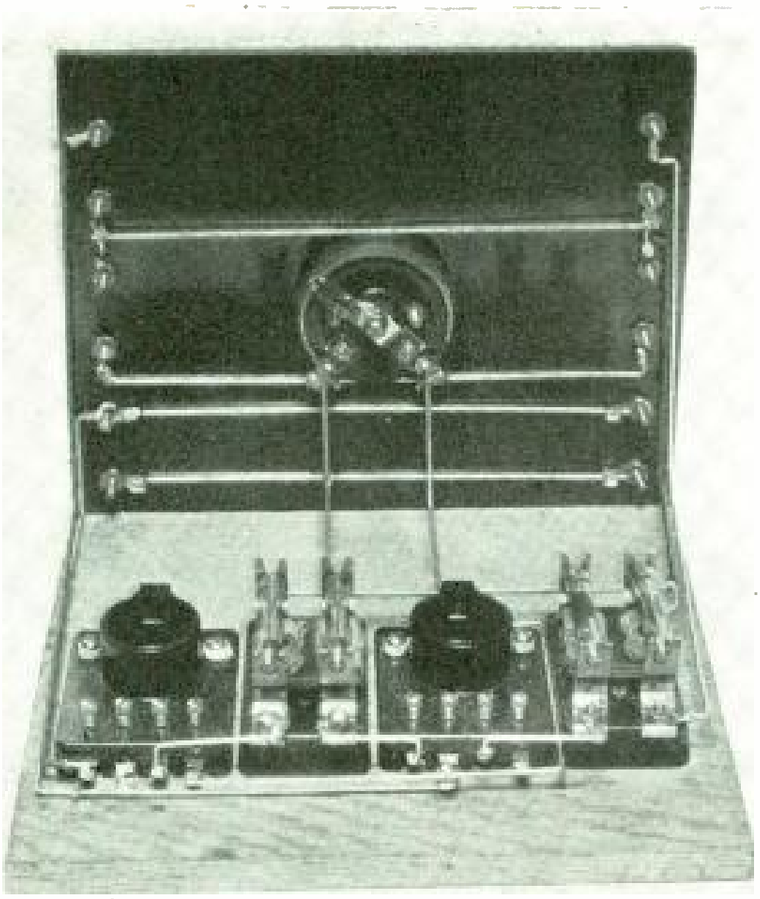
THE FILE

A tool of many uses

THE kit of tools for the set owner should include a file or a number of files of various coarseness and fineness. Files are indispensable for brightening up the contacts of vacuum tubes, for cleaning metal connections before soldering them and for trimming any metal brackets, or other hard materials that enter into set construction.

Many times the trouble in a receiver is due to corroded terminals of the tubes. This condition results in noisiness, loss of signal strength, or in some cases, no signals at all. A fine file applied to the prongs of the tube lightly, will assure good clean contact.

The preceding suggestions in this series were SIDE-CUTTING PLIERS, SCREW-DRIVERS, THE HYDROMETER *and* THE BATTERY-TESTING VOLTMETER.



THE REAR VIEW OF THE AMPLIFIER

Study this view in connection with the picture diagram of the hook-up on page 15. The location and connecting points of each wire appear clearly and you can determine just how to bend the wires to get the shortest connection with the proper clearance.

Simple "How-to-Build" Articles for Beginners No. 10

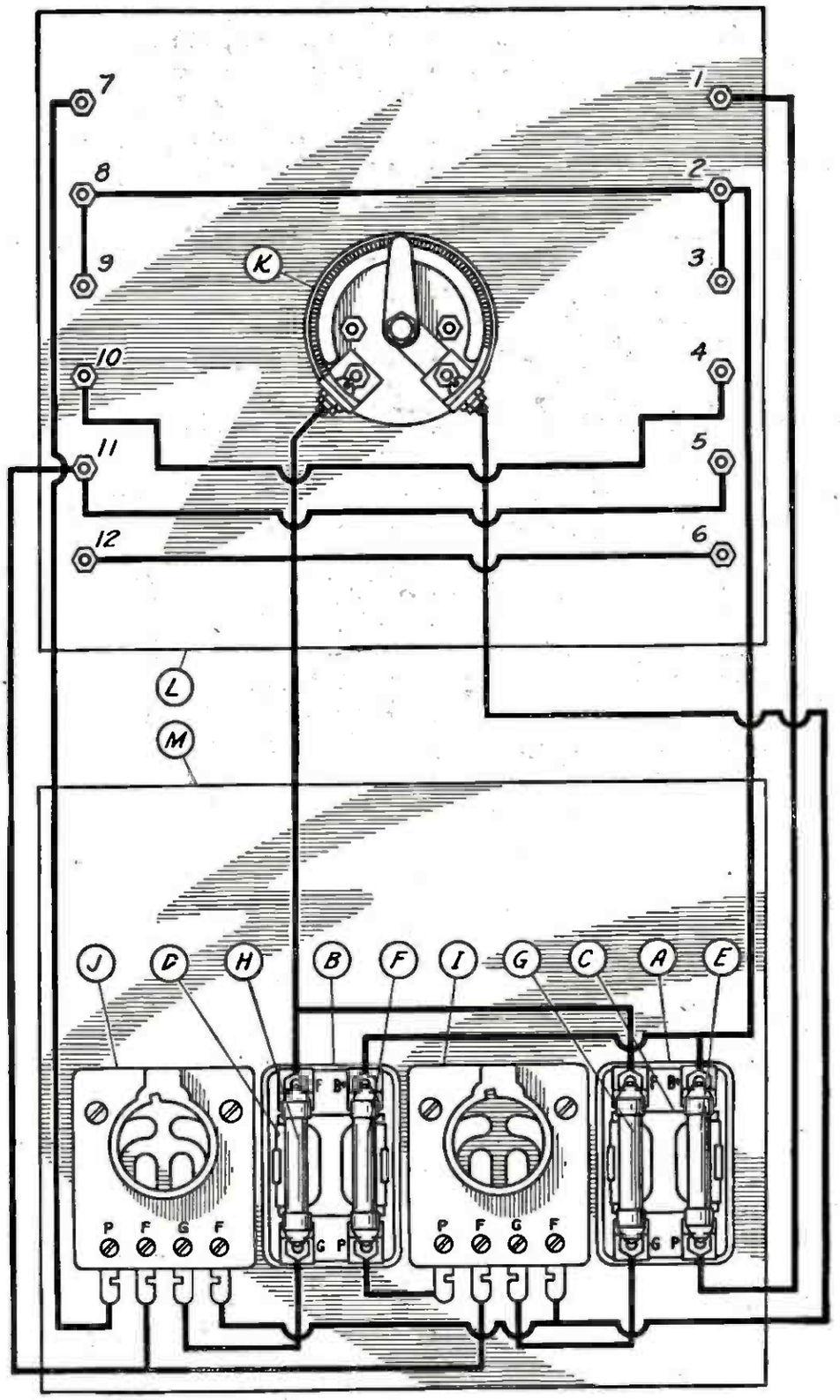
How to build a two-stage resistance-coupled amplifier for use with dry-cell tubes

By ALBERT C. CRAIG

COST OF PARTS: *Not more than* $11.00

HERE ARE THE ITEMS YOU WILL NEED—

A and B—Daven resisto-couplers;
C and D—Dubilier mica fixed condenser, .006 mfd.;
E, F and H—Durham metallized grid-leaks, ¼-megohm;
G—Durham metallized grid-leak, ½-megohm;
I and J—Remler sockets, Type 399;
K—"E-Z" Stat;
L—composition panel, 7 inches by 8 inches;
M—hardwood sub-base, 6½ inches by 8 inches; twelve binding posts.



THE "PICTURE DIAGRAM" OF THE HOOK-UP

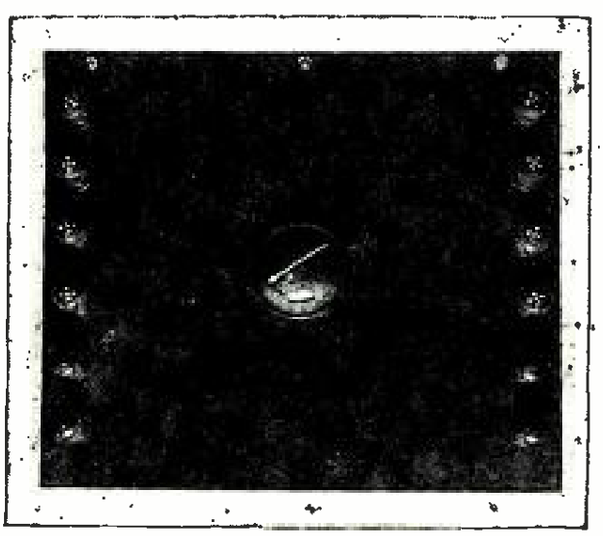
FIGURE 1: *This illustration shows the exact manner in which the instruments are placed on the panel and baseboard and how the wires run in relation to them. The upper rectangle shows the back of the panel, and the lower one shows the baseboard. All the parts are lettered to correspond with the designations in the text and in the list of parts.*

THIS tenth unit to be described in this series is a vacuum-tube audio-frequency amplifier that comprises two stages of resistance-coupled amplification for use with the small type dry-cell tubes. This unit will be found efficient and useful for connecting to the preceding units and tuners described in this series.

This unit was built in the POPULAR RADIO LABORATORY for the express purpose of submitting to the beginner a resistance-coupled amplifier that will give him the best reception possible, and at the same time teach him something about the problems involved in resistance-coupled circuits.

After you have decided to make this simple amplifier, take these pages to a radio dealer and ask him to supply you with the parts listed at the head of the article. When you have your parts ready for mounting, you may spread them out on a kitchen worktable and begin the construction of the set. Mount them on the panel and baseboard as shown in the picture diagram and the two photographs that accompany this article. These three illustrations show you exactly how to mount the instruments and also how to wire up.

Next, connect up the instruments in the electrical circuit as indicated specifically in the picture diagram.



THE PANEL ARRANGEMENT

This photograph shows the front view of the panel with the rheostat mounting in the center and the binding posts in two rows, one at each end.

If you follow the directions shown there you cannot make a mistake, as the instruments are all marked with designating letters that re-appear in the list of parts.

When you have finished wiring up, all you have to do is connect the telephones or loudspeaker, the batteries and the tuning unit and you are ready to "go."

To connect this unit, be sure to do the following:

Connect the binding posts 10 and 11 to your dry-cell "A" battery consisting of three dry-cells in series, with the positive terminal connected to binding post 11:

Then, connect the 67½-volt "B" battery to the binding posts 9 and 10 with the positive terminal connected to binding post 9. The loudspeaker should be connected to binding posts 7 and 8. Binding posts 1 and 2 go to the binding posts on the preceding unit, where you usually connect the telephones. Binding posts 3 and 4 may be used to apply the "B" battery directly from this unit to the "B" battery terminals of the preceding unit. Binding posts 5 and 6 may also be used to supply the "A" battery current to the two binding posts for that purpose on the preceding unit:

Place two tubes of the UV-199 or C-299 type in the two sockets, I and J, and turn on the rheostat K and the set is ready to work.

You will find that you will obtain wonderful reproduction if a good loudspeaker is used with this type of amplifier. For best results with a loudspeaker, it is recommended that the single-stage dry-cell amplifier described in a previous article be used in between this amplifier and the tuning unit. This will give exceptionally loud and clear results.

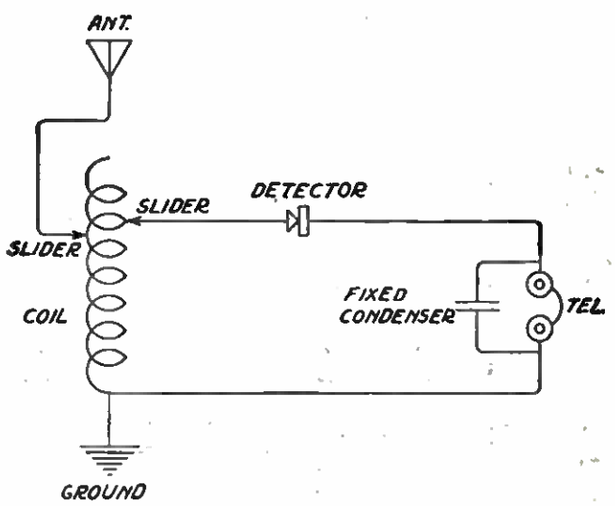
Do not turn the rheostat which controls the filament current to the two tubes any higher than is necessary to produce sufficient volume. This will conserve the batteries and lengthen the useful life of the tubes.

THE BEST

101 HOOK-UPS

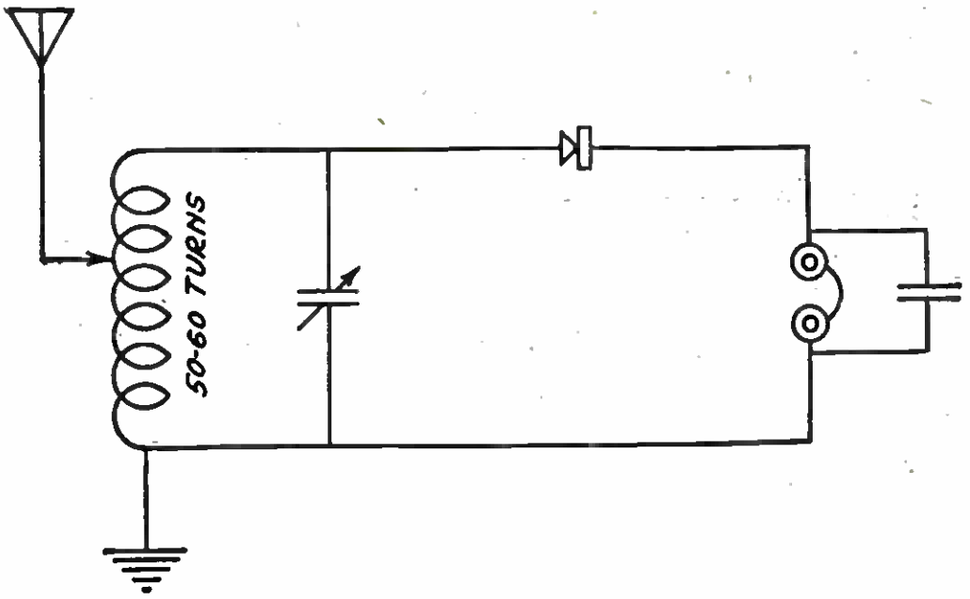
HERE are listed—for the guidance of broadcast listeners and radio experimenters, and as a ready reference record—what POPULAR RADIO believes to be the most efficient of the radio circuits that have been developed to date. Accompanying each diagram is information concerning costs of parts, selectivity, operation, construction and other practical features that will guide the builder or purchaser of a set that will meet his own particular needs. The approximate ranges as here given, are *yearly averages on actual records*. During the summer the actual ranges may fall to 50 percent of the value given, while in the winter, under the best of conditions, the actual ranges have been known to exceed the values given by as much as 500 percent.

Crystal Circuits



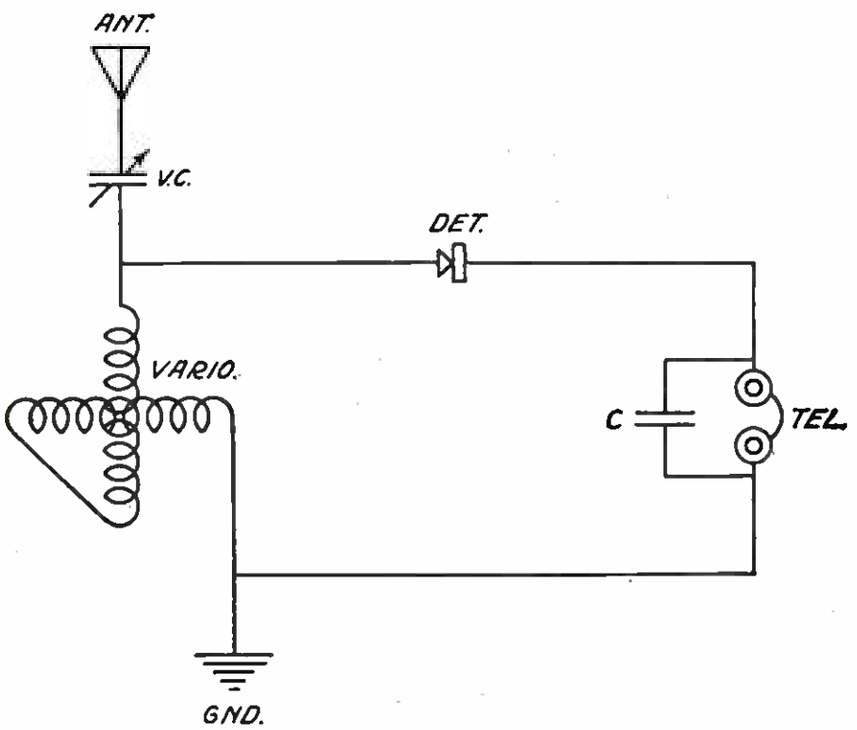
THE CONDUCTIVELY-COUPLED CRYSTAL CIRCUIT

Cost of parts: Not more than $10.00.
Selectivity: Fairly good.
Operation: Very simple. Only two controls are used; a primary and a secondary slider.
Ease of construction: No technical knowledge necessary.
Approximate range: 15 miles.
Outstanding features: This circuit is especially suitable for the beginner who wants to start out by building the simplest set that will give him clear reception of local signals at the smallest cost.



THE CAPACITY-TUNED CRYSTAL CIRCUIT

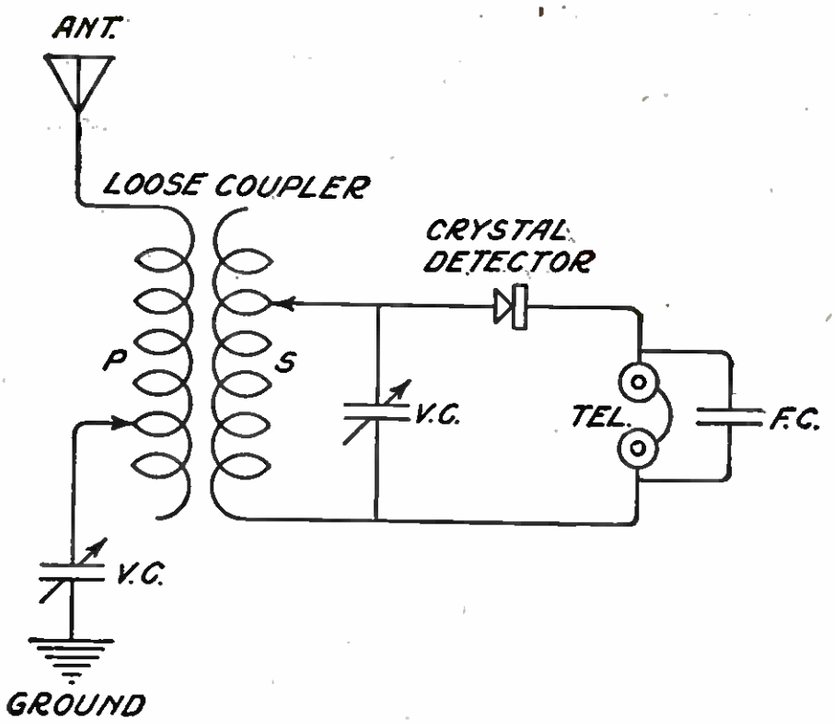
Cost of parts: Not more than $12.00.
Selectivity: Good.
Operation: Simple. Only two controls; a primary slider and a secondary variable condenser.
Ease of construction. Nothing complicated.
Approximate range: 15 miles.
Outstanding features: The circuit is more selective than the ordinary conductively-coupled tuner and the variable condenser gives smoother wavelength control.



SINGLE-CIRCUIT CRYSTAL SET

Cost of parts: Not more than $18.00.
Selectivity: Fair.
Operation: Simple. The antenna circuit is tuned by both the condenser and the variometer. The closed circuit is controlled by the variometer.
Construction: Very simple to make.*
Approximate range: 15 miles.
Outstanding feature: A good, inexpensive set for the city dweller who is content to listen to local programs with the headphones.

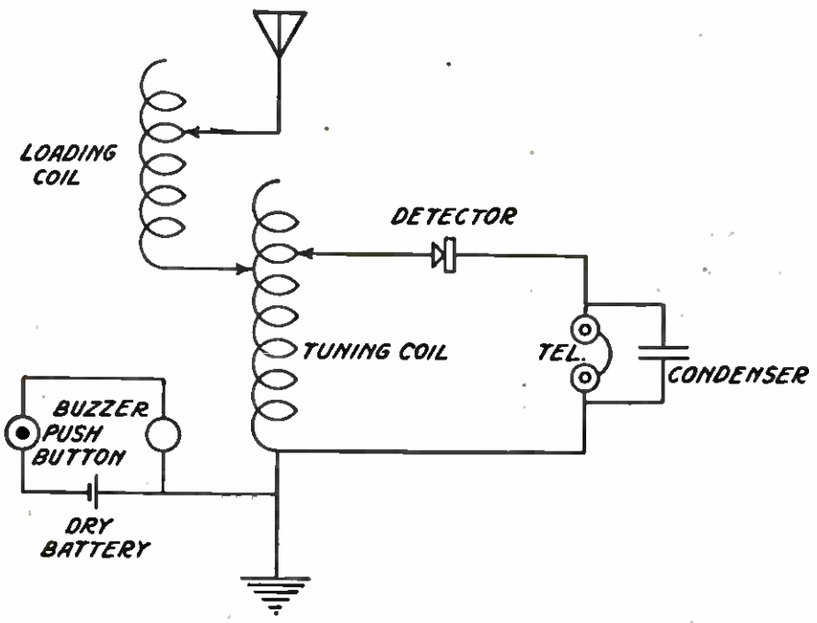
*(*See* POPULAR RADIO, *December, 1922, page 292, for details of operation.)*



INDUCTIVELY-COUPLED CRYSTAL RECEIVER

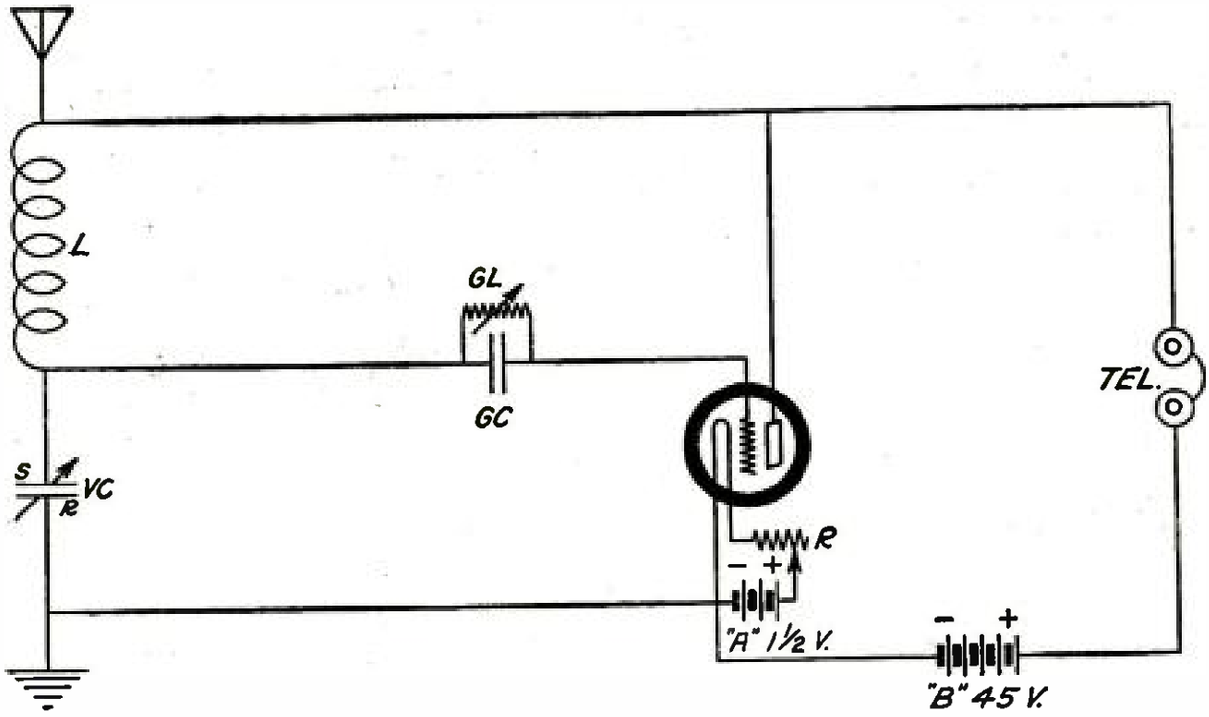
Cost of parts: Not more than $22.00.
Selectivity: Good.
Operation: Fairly simple.
Construction: The whole set can be constructed on a board and wired up in an hour or two.*
Approximate range: 15 miles.
Outstanding feature: The sharpest tuning crystal receiver that it is possible to make.

*(See POPULAR RADIO, *August, 1922, page 293, for constructional details.)*



CONDUCTIVELY-COUPLED CRYSTAL SET WITH LOADING COIL AND BUZZER TEST

Cost of parts: Not more than $14.00.
Selectivity: Fair.
Operation: Simple. The buzzer test simplifies the adjustment of the crystal detector.
Ease of construction: Not difficult. The whole set can be mounted on a board and wired up ready for use in an hour or so.
Approximate range: 15 miles.
Outstanding feature: A simple set for a young beginner to help him obtain his first knowledge of radio.



MODIFIED COLPITTS CIRCUIT FOR RECEIVING

Cost of parts: Not more than $14.00.

Selectivity: Fair.

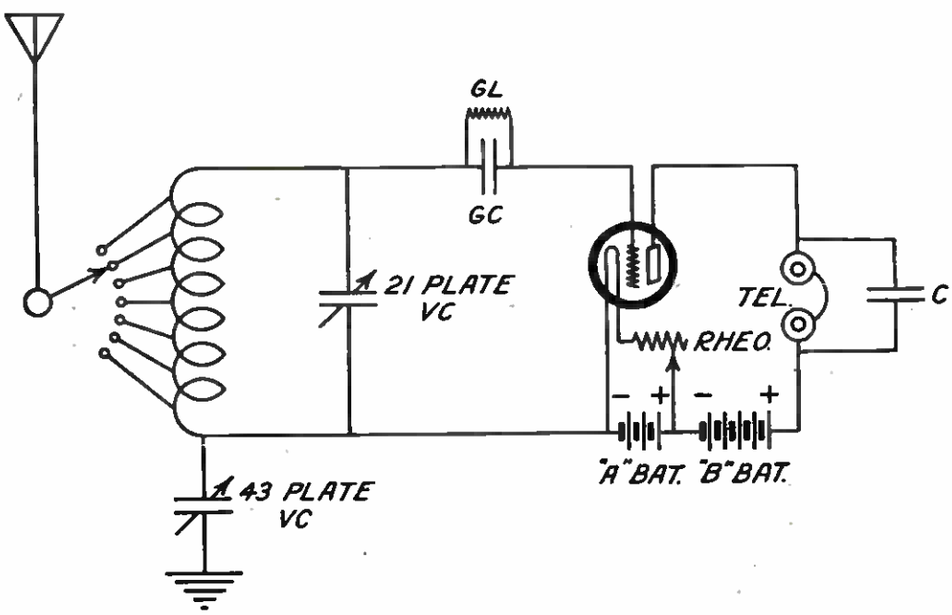
Operation: Simple. The variable condenser changes the wavelength and the filament rheostat controls regeneration.

Construction: Easy to make.*

Approximate range: 500 miles.

Outstanding features: Only a single, simple control for tuning. The filament rheostat should not be turned up too high or the set will radiate badly.

(See POPULAR RADIO, May, 1924, page 439, for constructional details.)



CONDUCTIVELY-COUPLED, CONDENSER-TUNED, VACUUM-TUBE CIRCUIT

Cost of parts: Not more than $20.00 (*Note:* The cost of tubes and batteries is not included in the cost given in these descriptions).

Selectivity: Fair.

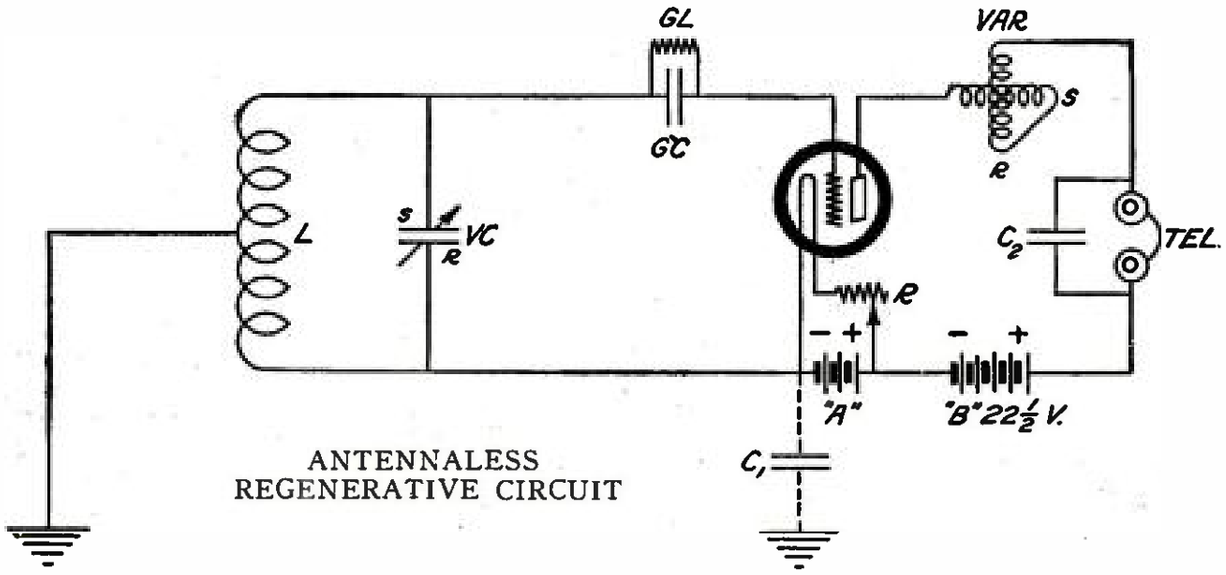
Operation: Simple.

Construction: Easy to build, and a good circuit for the beginner to try.*

Approximate range: 100 miles.

Outstanding feature: The best set for the beginner to learn the operating characteristics of the vacuum tube with.

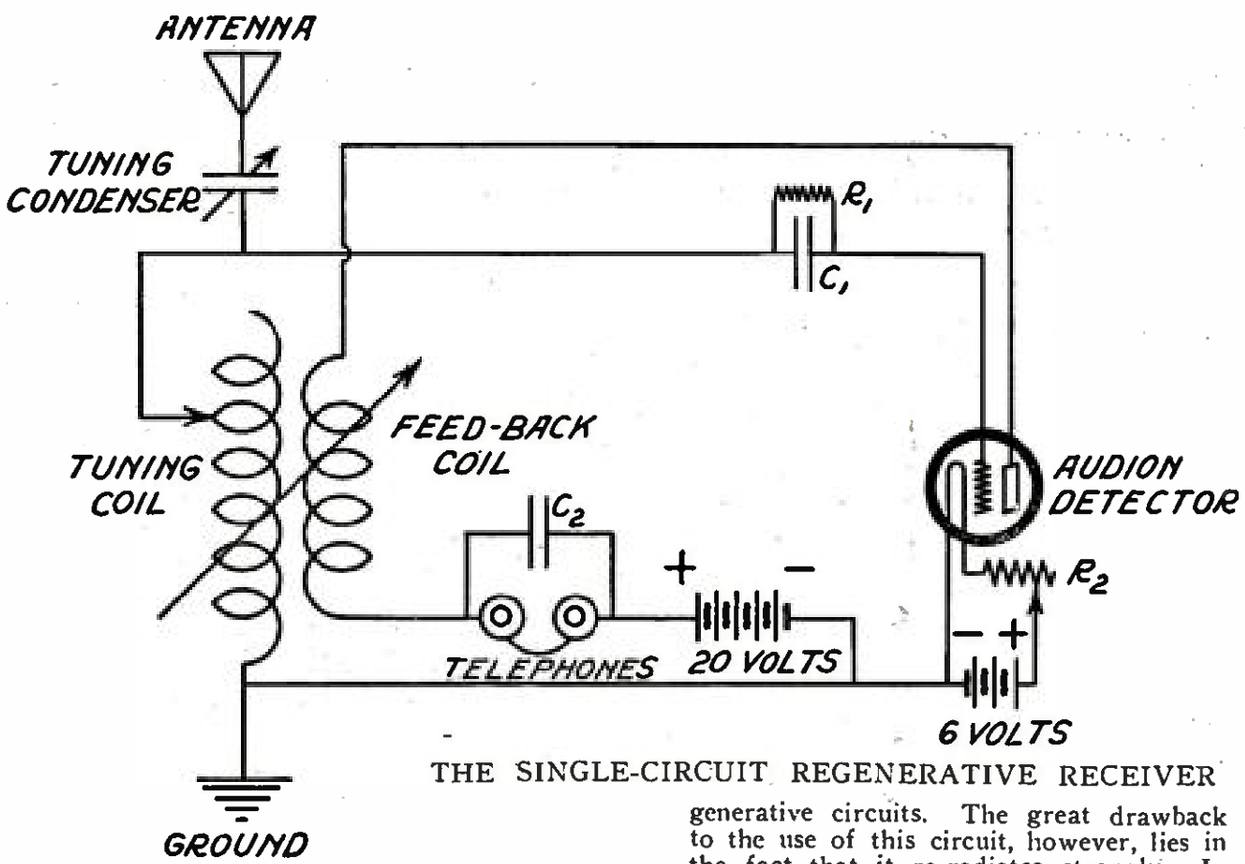
(See POPULAR RADIO, January, 1923, page 61, for constructional details.)



ANTENNALESS REGENERATIVE CIRCUIT

Cost of parts: Not more than $21.00.
Selectivity: Excellent.
Operation: Very simple. One control for wavelength and one for regeneration.
Ease of construction: Not difficult to make.*
Approximate range: 20 miles.
Outstanding features: Works without an antenna. Reduction in static. Fine for local reception.

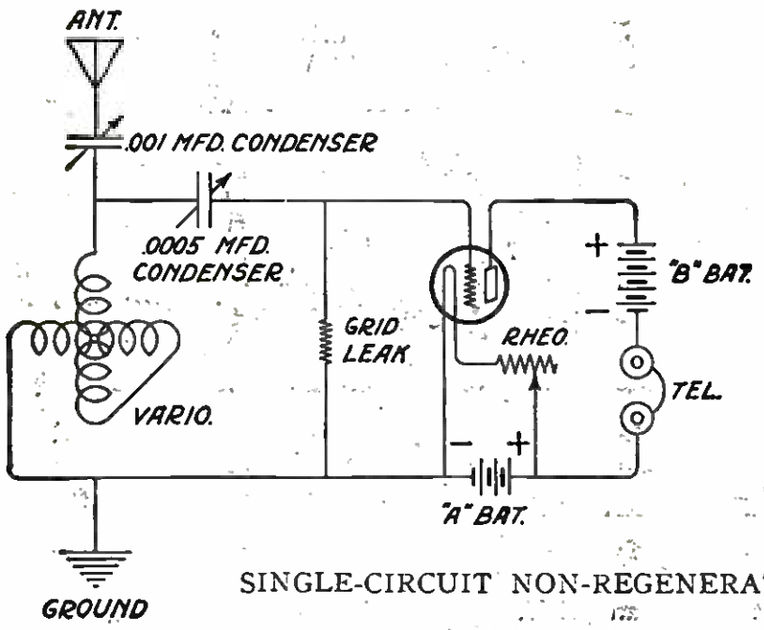
*(See POPULAR RADIO, *November, 1923, page 372, for constructional details.)*



THE SINGLE-CIRCUIT REGENERATIVE RECEIVER

Cost of parts: Not more than $20.00.
Selectivity: Poor.
Operation: Simple.
Ease of construction: Not complicated.*
Approximate range: 500 miles.
Outstanding features: Easy to build and easy to operate; much simpler than most regenerative circuits. The great drawback to the use of this circuit, however, lies in the fact that it re-radiates strongly. In other words, while it is being used for receiving, it generates radio-frequency currents in the antenna system which cause radio waves to be sent out to produce interference in other receiving sets in the neighborhood. In the hands of an expert operator this might not happen.

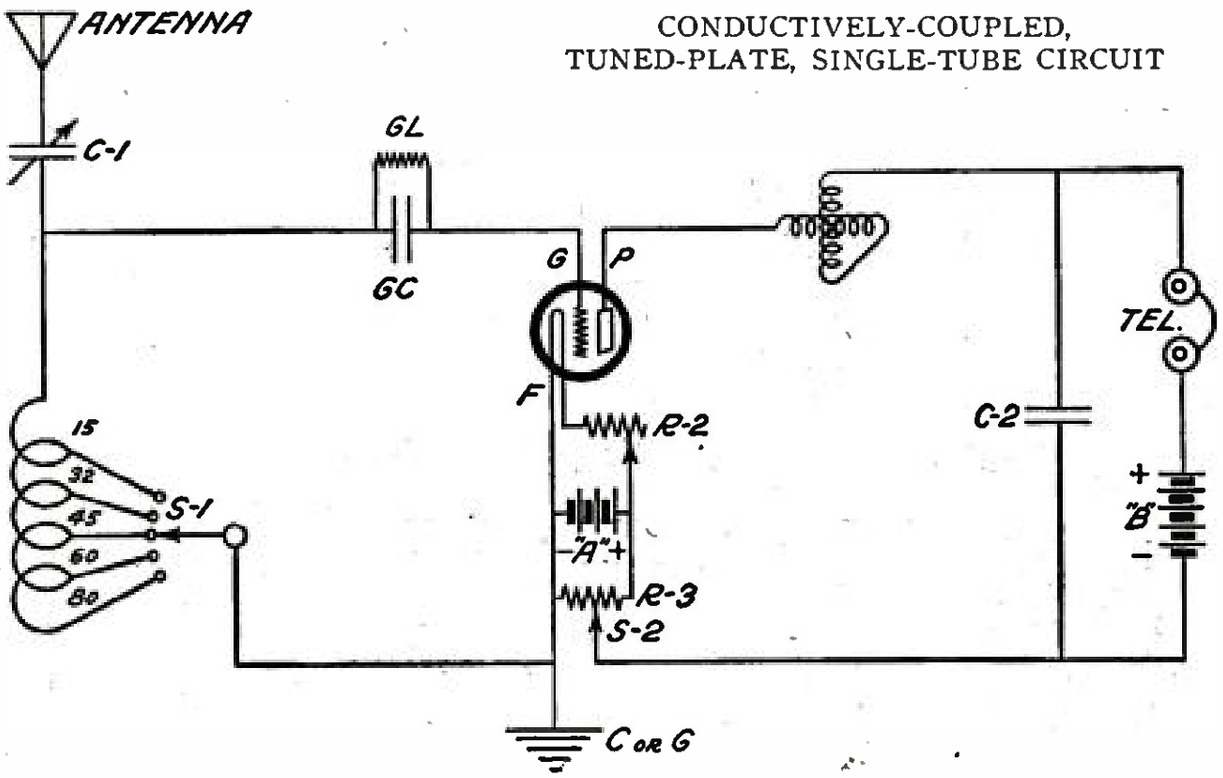
*(See POPULAR RADIO, *November, 1922, page 192, for constructional details.)*



SINGLE-CIRCUIT NON-REGENERATIVE SET

Cost of parts: Not more than $22.00.
Selectivity: Only fair. (This modification is a little more selective than the one shown on page 50 of the January, 1923, issue.)
Operation: Simple. The variometer and one of the variable condensers tune the antenna, and the variometer and the other variable condenser control the grid-circuit tuning.
Construction: Not complicated.*
Approximate range: 100 miles.
Outstanding feature: A non-re-radiating, single-circuit receiver for reception of local signals.

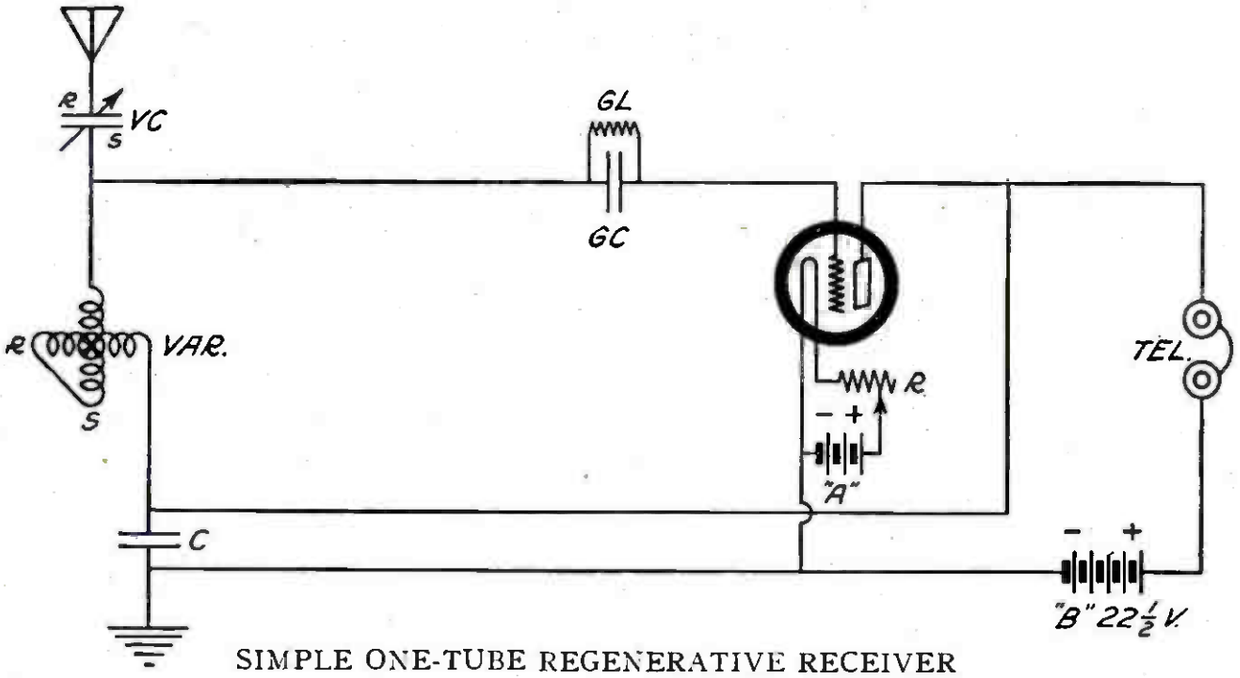
*(See POPULAR RADIO, January, 1923, page 59, for constructional details.)



CONDUCTIVELY-COUPLED, TUNED-PLATE, SINGLE-TUBE CIRCUIT

Cost of parts: Not more than $23.00.
Selectivity: Only fair.
Operation: Simple. A variable condenser is used for wavelength control and a variometer is used in the plate circuit to control regeneration.
Ease of construction: Not complicated.*
Approximate range: 500 miles.
Outstanding features: This modification will tune a little better than the straight single-circuit set, and can be kept in more stable operation by means of the potentiometer. The set is guilty, however, of permitting interfering re-radiation in the hands of the inexperienced operator.

*(See POPULAR RADIO, June, 1923, page 430, for constructional details.)



SIMPLE ONE-TUBE REGENERATIVE RECEIVER

Cost of parts: Not more than $19.00.

Selectivity: Fair.

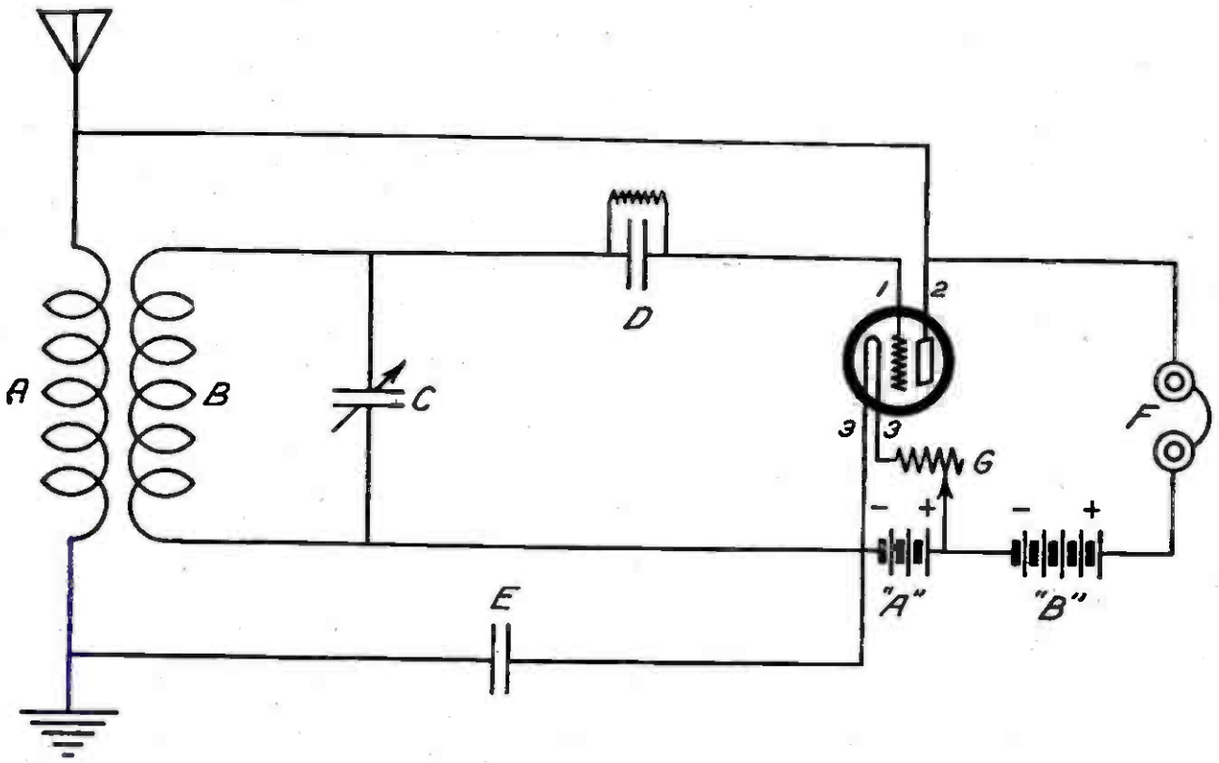
Operation: Simple to tune. Wavelength is controlled by the variable condenser and the variometer. Regeneration is controlled by the filament rheostat.

Construction: Extremely simple.*

Approximate range: 500 miles.

Outstanding features: This is a simple set to build and operate. It will give good results in the hands of beginners. But the filament rheostat should not be turned up too high or the set will radiate badly.

(See POPULAR RADIO, February, 1924, page 197, for constructional details.)



THE MAN-DAY SINGLE-CONTROL REGENERATIVE CIRCUIT

Cost of parts: Not more than $12.00.

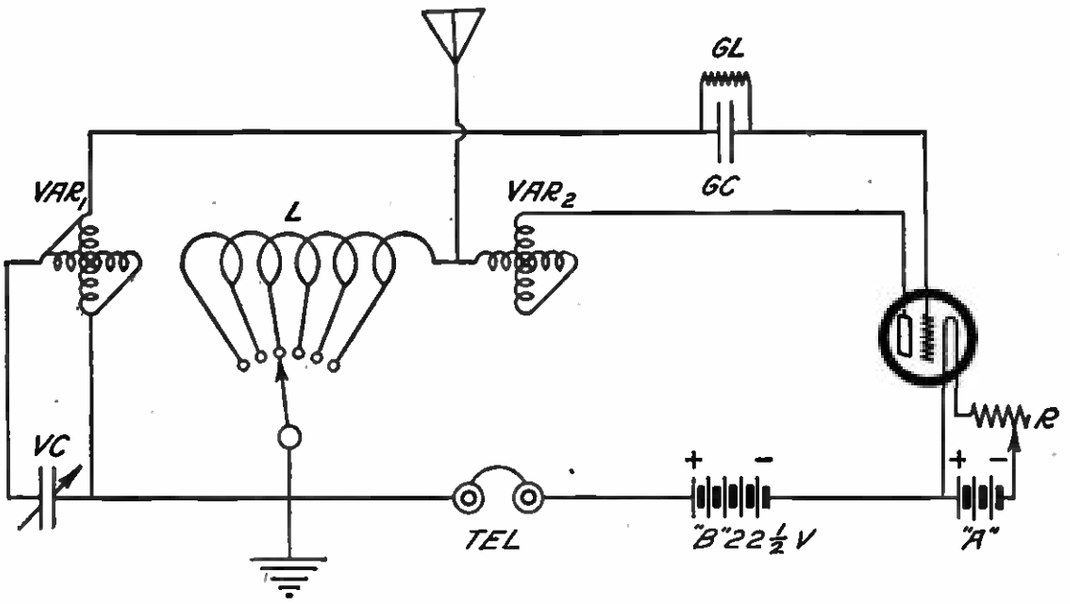
Selectivity: Excellent.

Operation: Very easy. Only one control for wavelength. Regeneration is adjusted with the filament rheostat.

Ease of construction: Simple.

Approximate range: 500 miles.

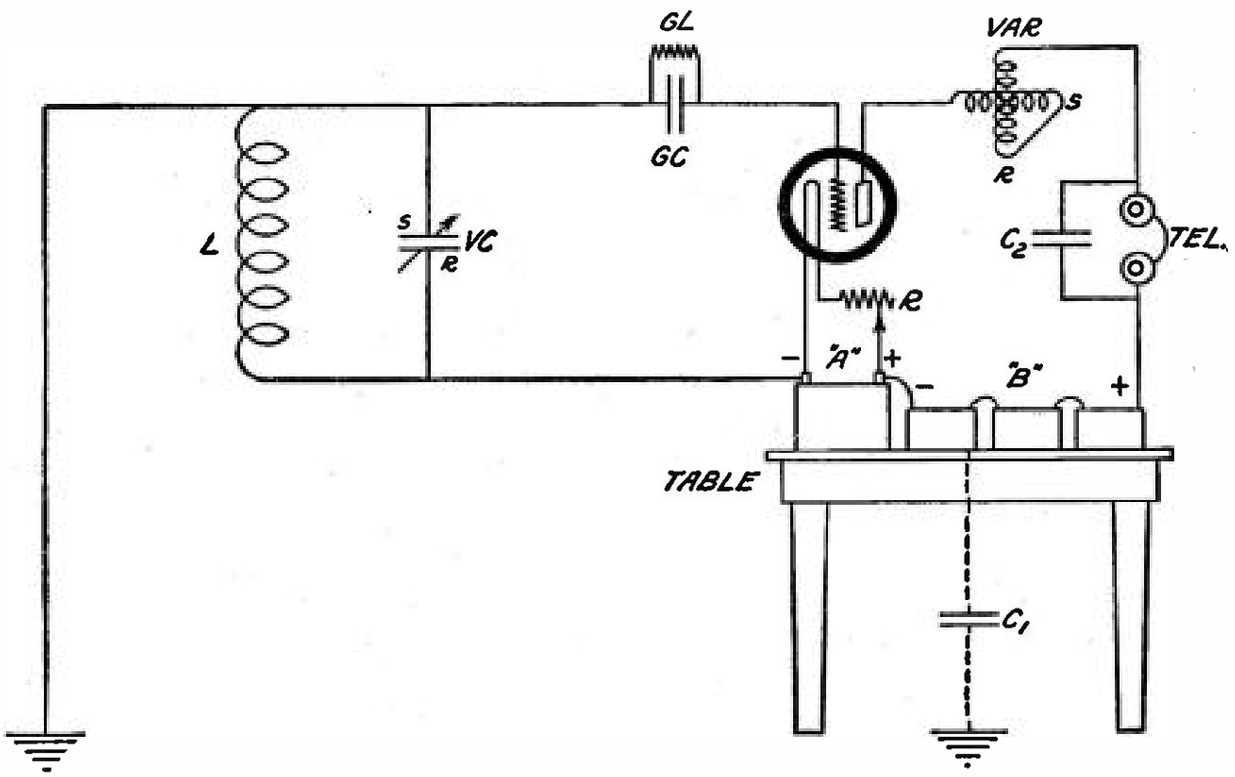
Outstanding features: This is the simplest regenerative circuit to tune. It is very selective and costs but little.



NOVEL VARIOMETER HOOK-UP

Cost of parts: Not more than $24.00.
Selectivity: Fair.
Operation: Rather complicated.
Construction: Just an ordinary acquaintance with tools and some experience in wiring up the circuit is necessary.*
Approximate range: 800 miles.
Outstanding features: Strong signals from one tube. The set will readily radiate, unless carefully handled. For this reason it is a menace to a neighbor's reception, in the hands of a novice.

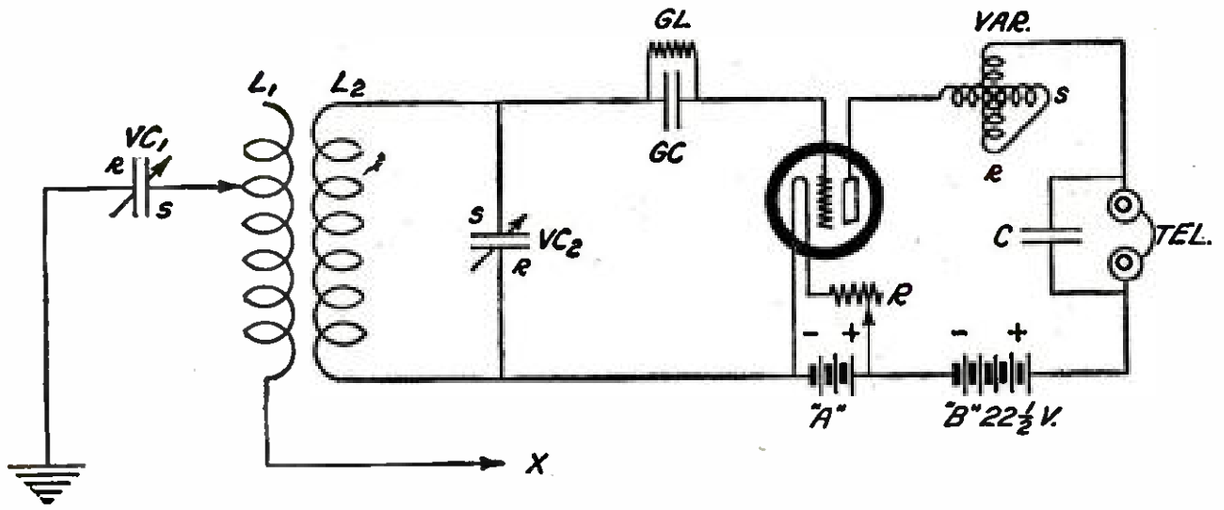
*(See POPULAR RADIO, *August, 1923, page 176, for constructional details.)*



A REGENERATIVE SET FOR RECEPTION WITH A GROUND ONLY

Cost of parts: Not more than $23.00.
Selectivity: Excellent.
Operation: Easy to tune. There are only two controls, the variable condenser for wavelength, and the variometer for regeneration.
Construction: Very simple to make.*
Approximate range: 25 miles.
Outstanding feature: This is a good type of receiver for local reception where the conditions make impossible the erection of an outside antenna.

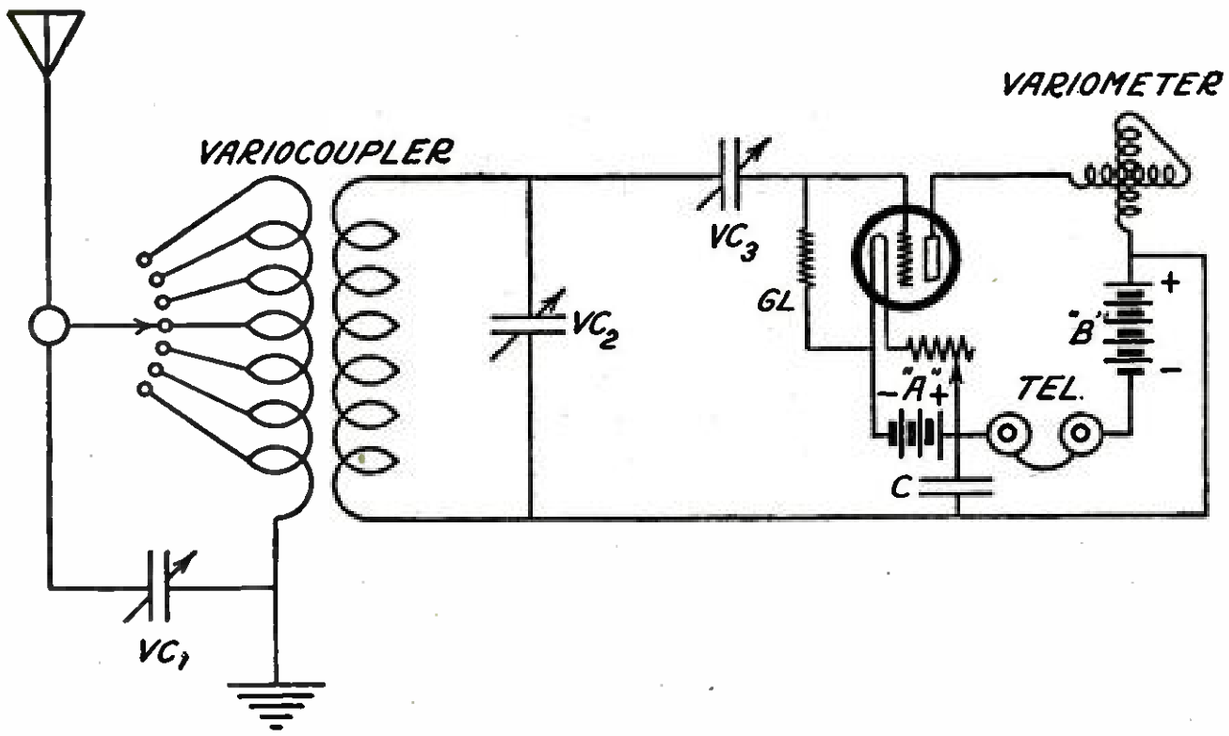
*(See POPULAR RADIO, *November, 1923, page 372, for constructional details.)*



A SIMPLE REGENERATIVE RECEIVER FOR USE WITH TWO GROUNDS

Cost of parts: Not more than $30.00.
Selectivity: Excellent.
Operation: Not especially complicated. The ground circuit is tuned by means of a variable condenser; likewise the secondary circuit. The plate circuit of the detector tube is tuned by means of a variometer and this controls regeneration.
Construction: Not complicated.*
Approximate range: Local.
Outstanding feature: No antenna is necessary. Just use two grounds; one may be the water pipe and the other the radiator system or the gas pipes.

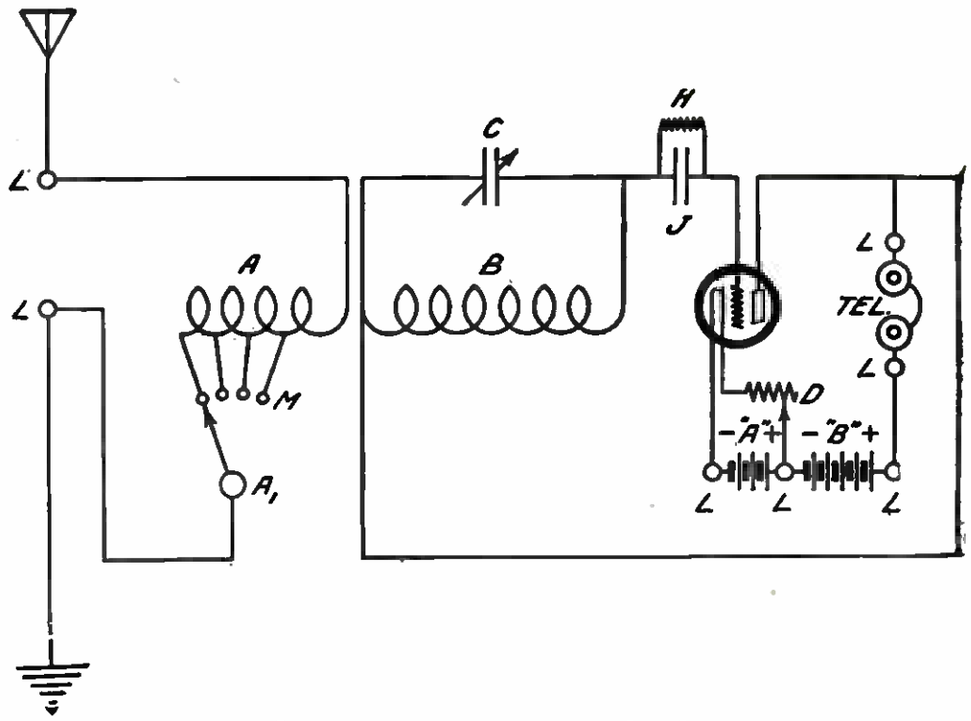
*(See POPULAR RADIO, *November, 1923, page 373, for constructional details.)*



TUNED-PLATE ULTRA-AUDION CIRCUIT WITH FINER CONTROLS

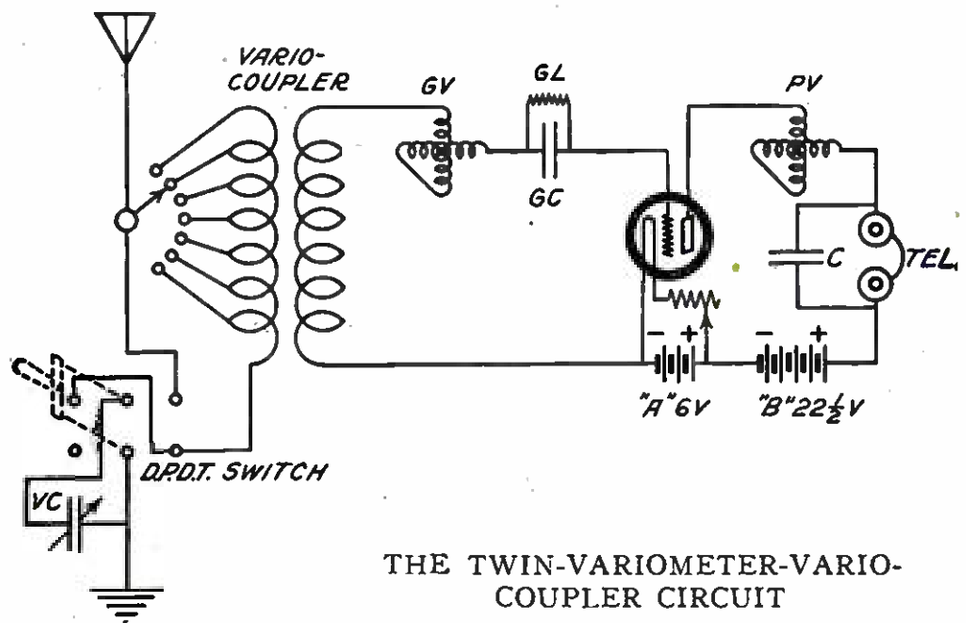
Cost of parts: Not more than $34.00.
Selectivity: Excellent.
Operation: Fairly simple. This adaptation of this circuit contains variable tuning elements such as a variable grid-condenser, variable grid-leak, and a variable condenser in the antenna circuit which will enable the more experienced operator to get maximum results out of the receiver.
Ease of construction: Just an ordinary acquaintance with tools and some ability in wiring up the circuit are necessary.*
Approximate range: 1,000 miles.
Outstanding features: A real set for the advanced man who wants selectivity and sensitivity at reasonable cost.

*(See POPULAR RADIO, *February, 1923, page 142, for constructional details.)*



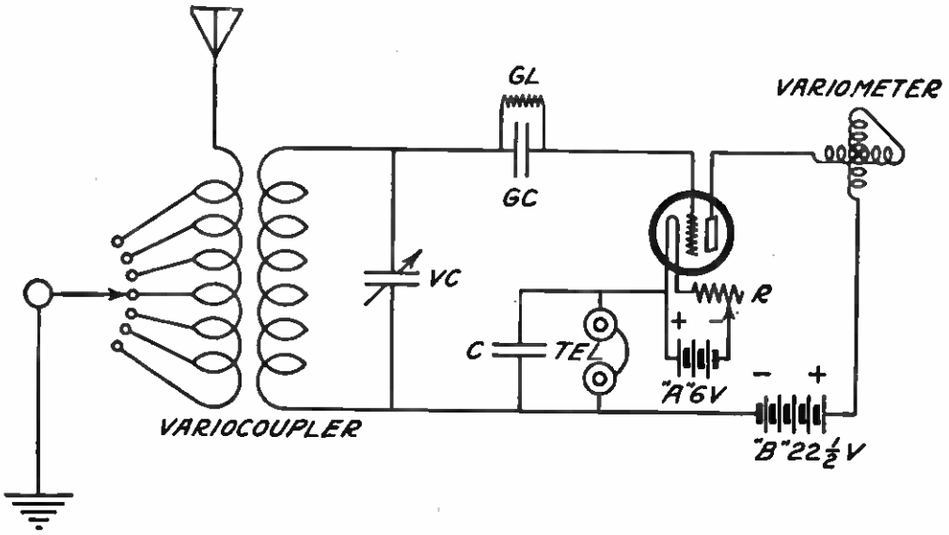
SPECIAL ULTRA-AUDION CIRCUIT

Cost of parts: Not more than $12.00 (*Note:* The costs of tubes and batteries are considered "extras" and are not included in the costs given in these descriptions).
Selectivity: Excellent.
Operation: Very easy. When the switchpoint A1 is adjusted for the antenna, there is only one control for wavelength. The regeneration is controlled by the filament rheostat.
Ease of construction: Simple.
Approximate range: 500 miles.
Outstanding features: This circuit shares first place with the Man-Day circuit in simplicity of operation. It is very selective, and costs but little.



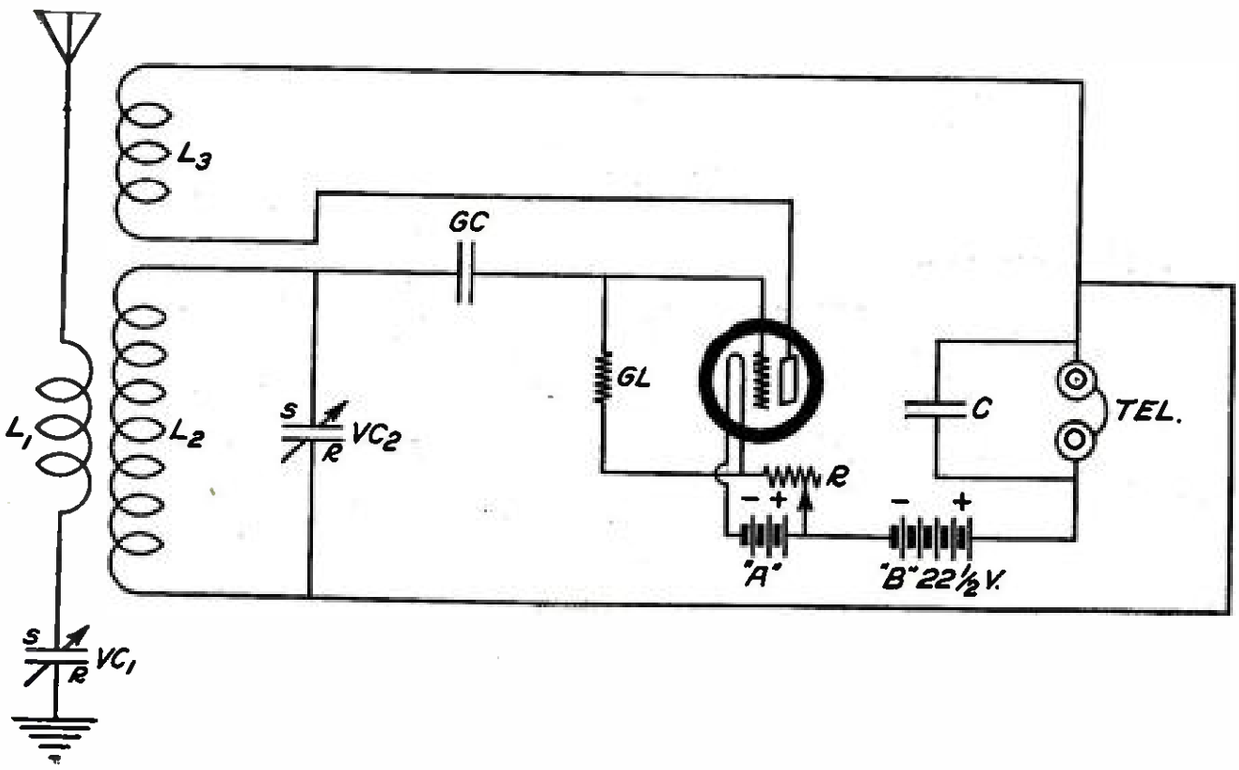
THE TWIN-VARIOMETER-VARIO-COUPLER CIRCUIT

Cost of parts: Not more than $30.00.
Selectivity: Good.
Operation: Requires considerable skill which can be acquired in a couple of months of experimenting with the tuning.
Ease of construction: Just an ordinary acquaintance with tools but some electrical ability in wiring up the circuit is necessary.
Approximate range: 500 miles.
Outstanding features: This was the first well-known short-wave regenerative receiver and it has been found reliable and probably has been more used than any other type of receiver in the past.



THE COMBINATION TUNED-PLATE, ULTRA-AUDION CIRCUIT

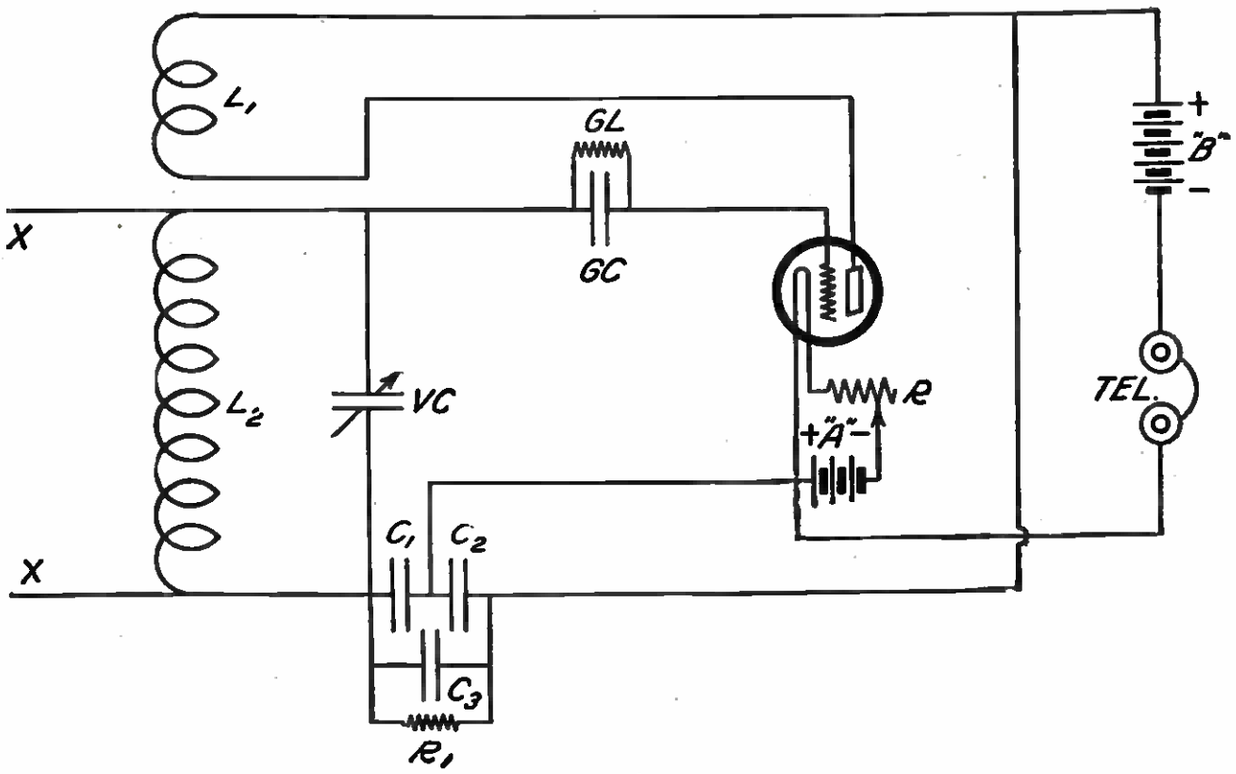
Cost of parts: Not more than $25.00 (*Note:* The cost of tubes, and batteries is considered "extra," and is not included in the cost given in these descriptions).
Selectivity: Excellent.
Operation: Requires considerable skill which can be acquired in a couple of months of experimenting with the tuning.
Ease of construction: Just an ordinary acquaintance with tools, but some electrical ability in wiring up the circuit is necessary.
Approximate range: 500 miles.
Outstanding features: Exceptionally suitable for DX amateur work on CW. Tuning is very sharp and easy when it is learned correctly.



THREE-CIRCUIT TUNER FOR SHORT-WAVE RECEPTION

Cost of parts: Not more than $27.00.
Selectivity: Very good.
Operation: Not very hard to tune when the operator has worked with the set for a week or so.
Construction: Not difficult to make.*
Approximate range: 500 miles for telephony; 1,000 miles for CW reception.
Outstanding features: For work below 200 meters. For short-wave broadcast reception and amateur CW reception.

*(See POPULAR RADIO, *August, 1924, page 183, for constructional details.)*



FLEWELLING MODIFIED SUPER-REGENERATIVE CIRCUIT

Cost of parts: Not more than $22.00.

Selectivity: Fair (on outdoor antenna). Good (on loop).

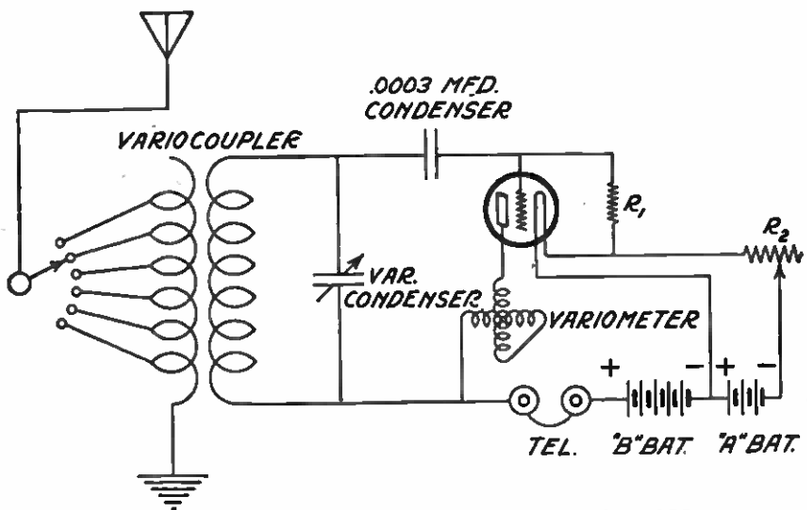
Operation: Not hard to operate when the circuit has once been adjusted properly. When used on an outdoor antenna, however, it is liable to produce bad interference to neighbors, due to re-radiation.

Ease of construction: Easy to make but not easy to get adjusted right.*

Approximate range: Local (on loop). 500 miles (on an outdoor antenna).

Outstanding features: Simplest super-regenerative circuit. Can be made to operate a loudspeaker on one tube. This is only true when all conditions are satisfied. Actually, many experimenters do not get very good results on account of some mistakes they have made and have failed to locate. Reception is accompanied with a high-pitched whistle.

**(See* POPULAR RADIO, *May, 1922, page 393, for constructional details.)*



TUNED-PLATE ULTRA-AUDION CIRCUIT

Cost of parts: Not more than $23.00 (*Note:* The cost of tubes and batteries is considered "extra" and is not included in the cost given in these descriptions).

Selectivity: Excellent.

Operation: Fairly simple.

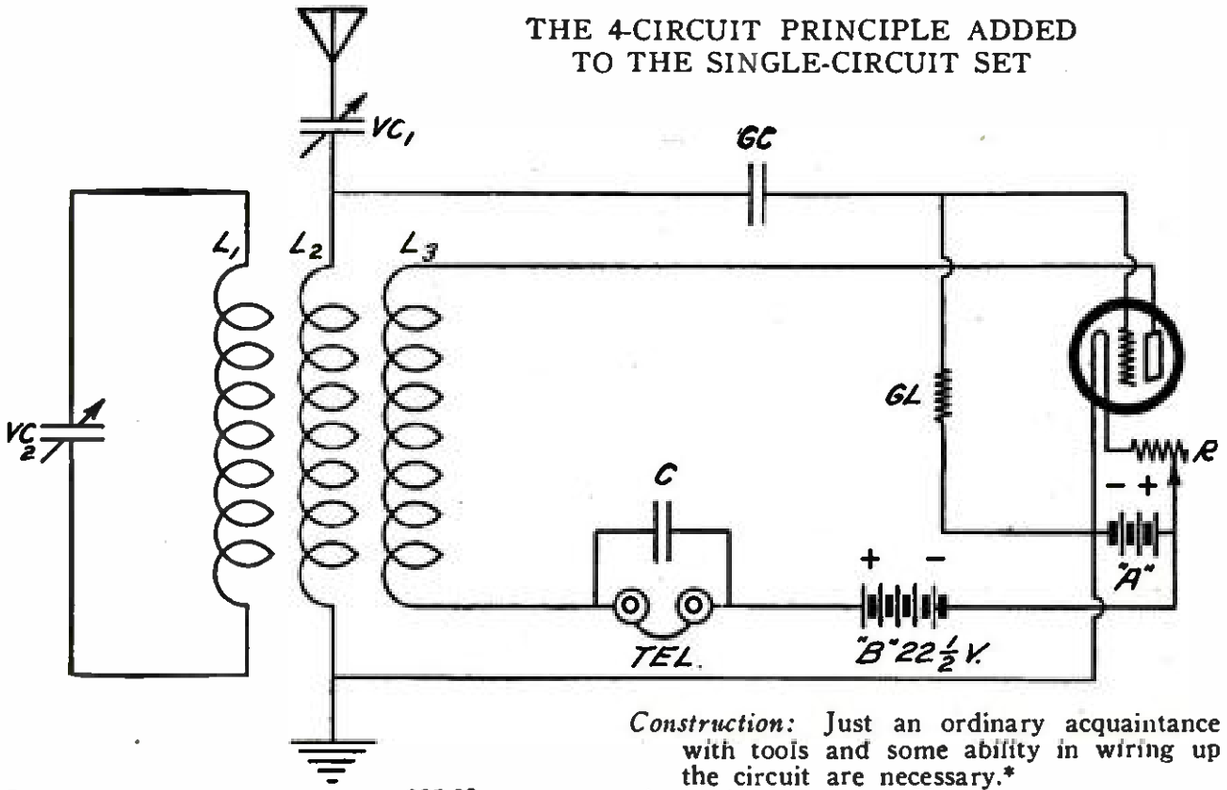
Ease of construction: Not complicated.*

Approximate range: 1,000 miles.

Outstanding features: Noted for DX, amateur and broadcast reception and for its exceptionally sharp tuning.

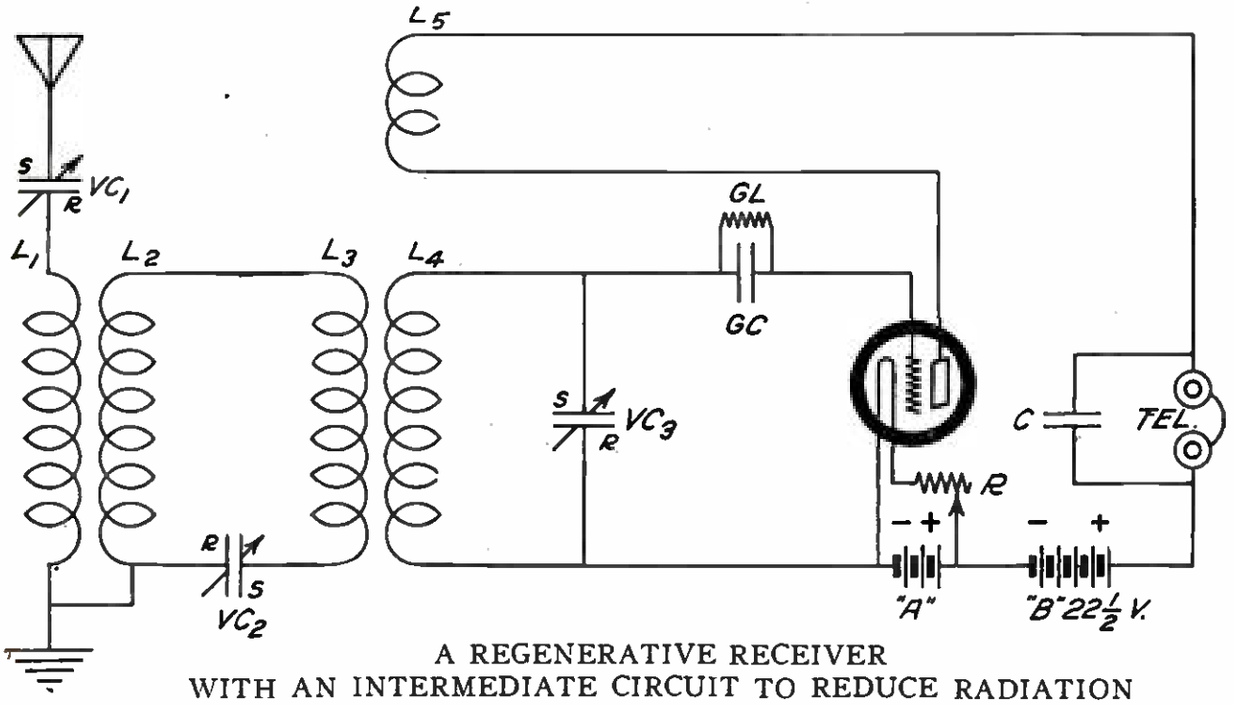
**(See* POPULAR RADIO, *September, 1922, page 62, for constructional details.)*

THE 4-CIRCUIT PRINCIPLE ADDED TO THE SINGLE-CIRCUIT SET



Cost of parts: Not more than $25.00.
Selectivity: Fair.
Operation: The extra circuit, comprising the condenser VC2 and the coil L1, gives a much better control of regeneration than in the conventional circuit.
Construction: Just an ordinary acquaintance with tools and some ability in wiring up the circuit are necessary.*
Approximate range: 500 miles.
Outstanding feature: The added circuit will give stability to the control of regeneration so that the circuit will not burst into oscillation and cause a violent disturbance in neighbors' receivers.

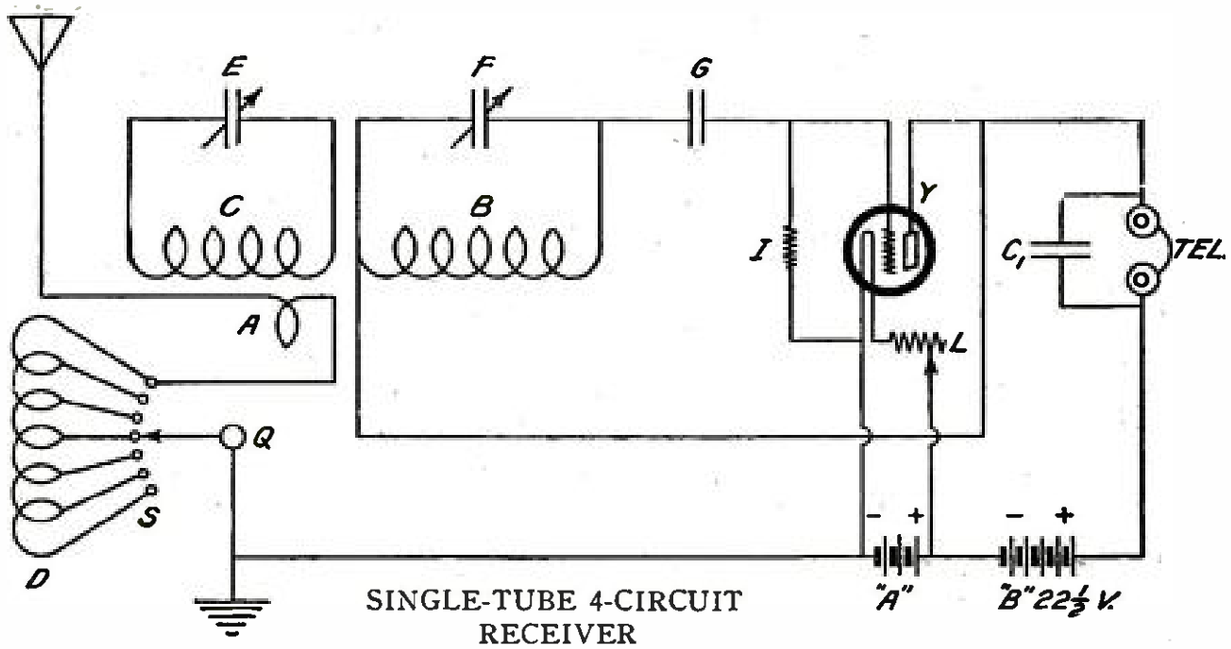
(See POPULAR RADIO, October, 1923, page 325, for constructional details.)



A REGENERATIVE RECEIVER WITH AN INTERMEDIATE CIRCUIT TO REDUCE RADIATION

Cost of parts: Not more than $30.00.
Selectivity: Very good.
Operation: Rather complicated.
Construction: Just an ordinary acquaintance with tools and some ability in wiring up the electrical circuit are necessary.*
Approximate range: 500 to 1,000 miles.
Outstanding features: The receiving system used here makes use of an intermediate, resonant circuit for loosening the coupling between the antenna circuit and the grid circuit so that radiation will be prevented.

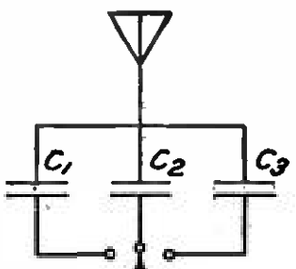
(See POPULAR RADIO, March, 1924, page 292, for constructional details.)



SINGLE-TUBE 4-CIRCUIT RECEIVER

Cost of parts: Not more than $24.00.
Selectivity: Excellent.
Operation: Simple. The condenser C1 should be of the correct value to put the set into stable condition and then the condenser E is adjusted so that the circuit is just on the highly regenerative point. All tuning is then accomplished with the condenser F and the antenna switch Q.
Ease of construction: Not complicated. Be sure that the best parts are obtained and the results will exceed expectations. Poor parts render the circuit useless.
Approximate range: 1,000 miles.
Outstanding features: The regeneration is independent of wavelength. The selectivity and sensitivity of this type of receiver are noteworthy.

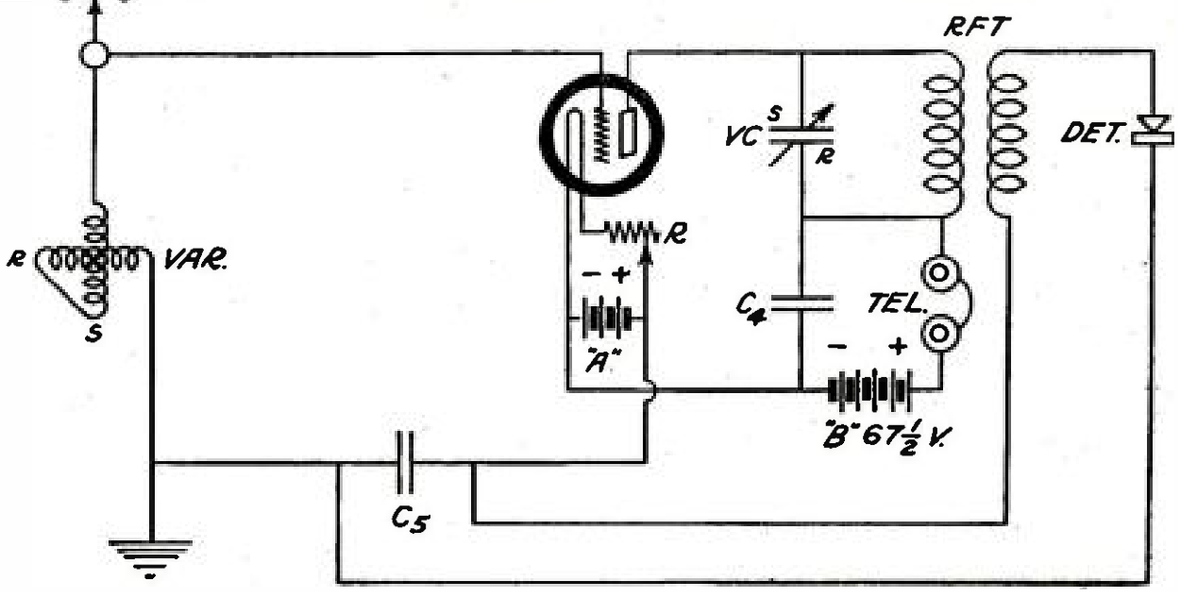
One-tube and Crystal Circuits

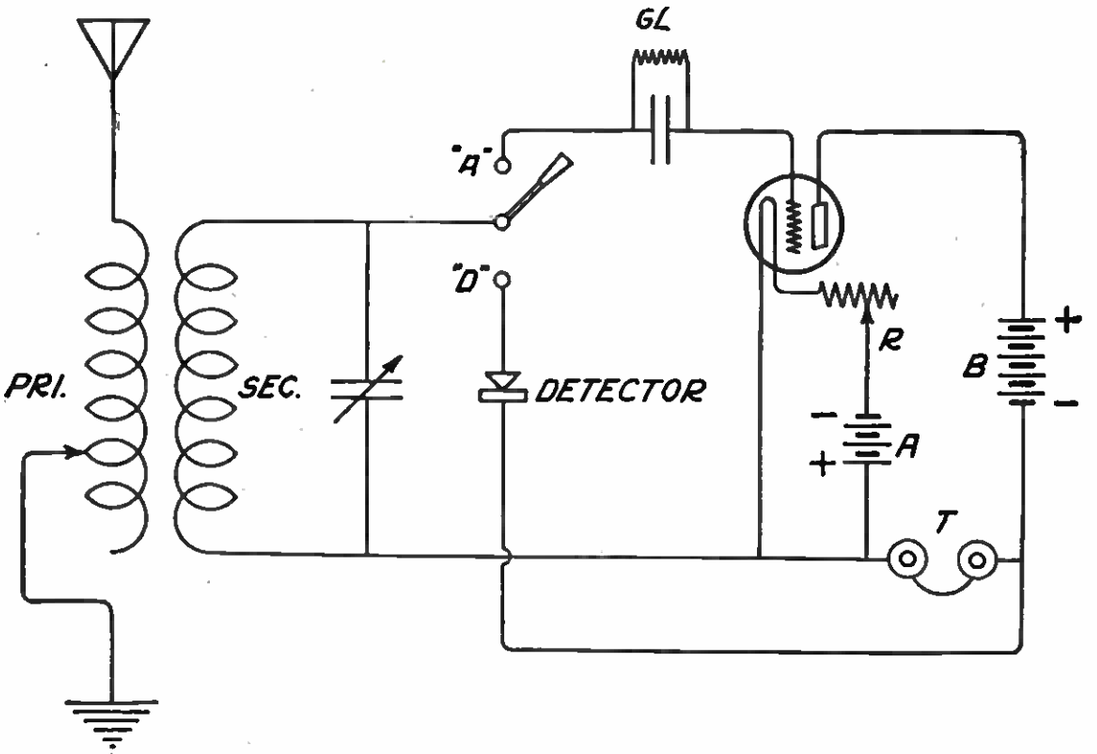


A SIMPLIFIED REFLEX

Cost of parts: Not more than $24.00.
Selectivity: Only fair.
Operation: Extremely simple.
Construction: Easy.*
Approximate range: 800 miles.
Outstanding feature: No audio-frequency amplifying transformer is used.

*(See POPULAR RADIO, January, 1924, page 81, for constructional details.)



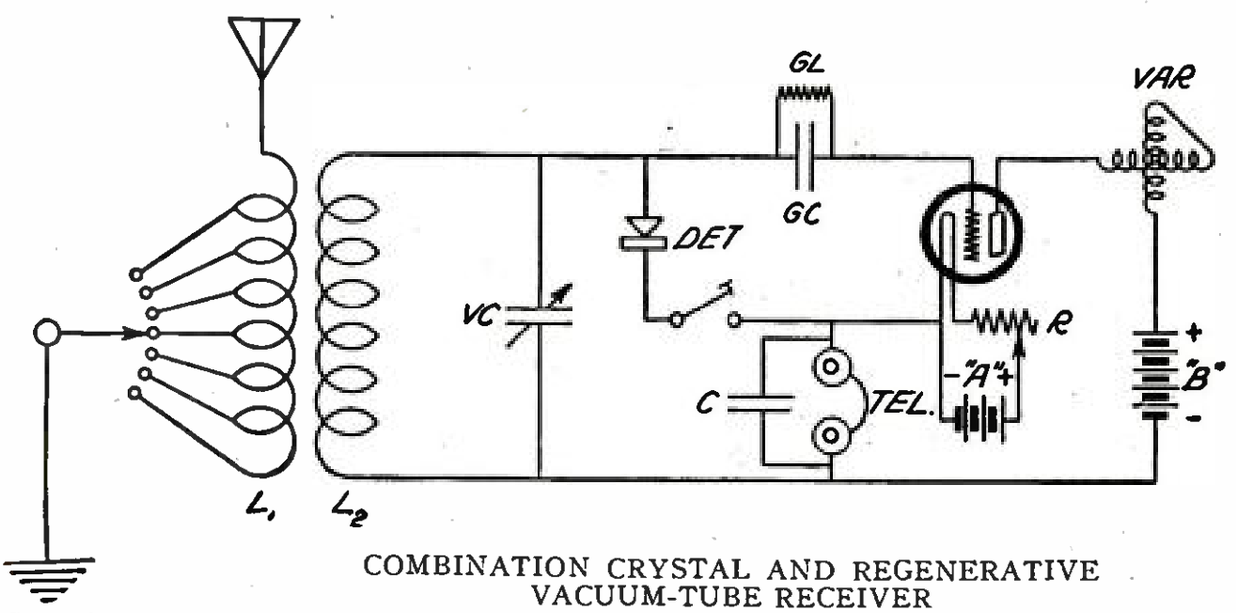


COMBINATION CRYSTAL AND VACUUM-TUBE SET

Cost of parts: Not more than $21.00.
Selectivity: Fairly good.
Operation: Very simple.
Ease of construction: Simple to make.*
Approximate range: 15 miles on the crystal detector. 100 miles on the vacuum-tube detector.

Outstanding features: Here is the circuit for the man who already has a crystal receiver and wishes to find out what the vacuum-tube detector will do for him in the way of increased signals. The crystal may be used for strong local stations and the vacuum tube may be used for the more distant and weaker ones.

(See POPULAR RADIO, July, 1922, page 222, for information about use.)

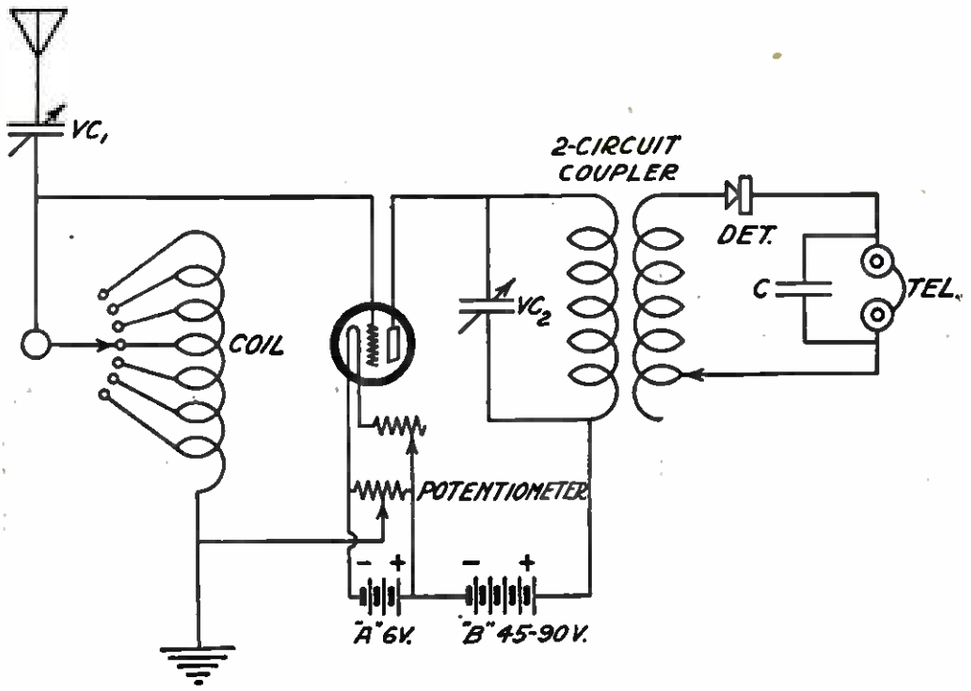


COMBINATION CRYSTAL AND REGENERATIVE VACUUM-TUBE RECEIVER

Cost of parts: Not more than $27.00.
Selectivity: Good (with crystal). Excellent (with vacuum tube).
Operation: Simple.
Construction: Not complicated.*
Approximate range: 15 miles (with crystal); 500 miles (with vacuum tube).

Outstanding feature: By simply throwing a switch, the operator can listen in with a crystal detector for local reception, or can use the vacuum tube for distant stations.

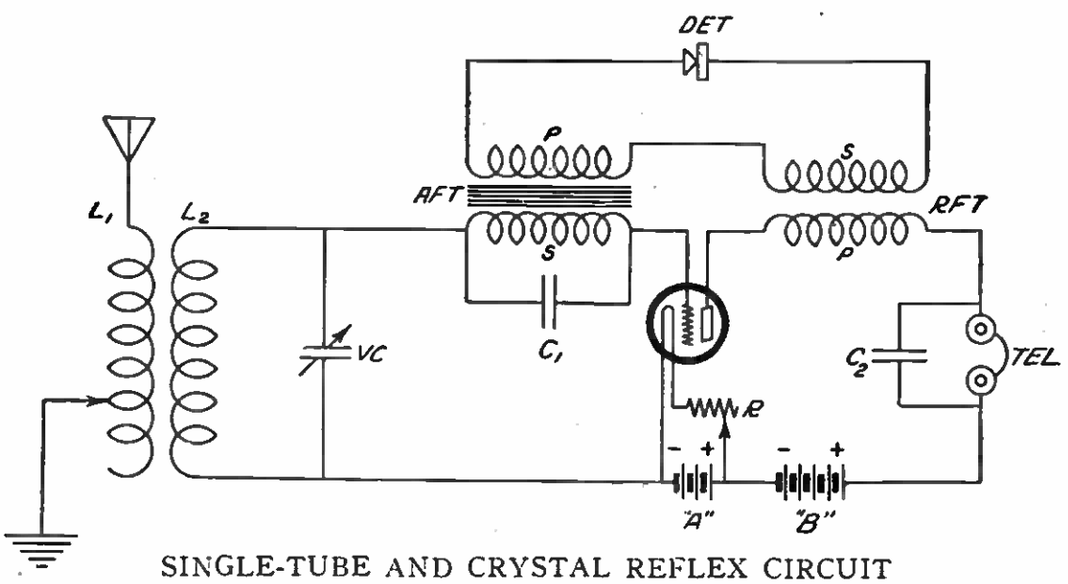
(See POPULAR RADIO, May, 1923, page 397, for constructional details.)



SINGLE-STAGE RADIO-FREQUENCY AMPLIFIER WITH CRYSTAL DETECTOR

Cost of parts: Not more than $26.00.
Selectivity: Fairly good.
Operation: Not complicated. There are two controls for antenna wavelength, a variable condenser and a tapped coil. The plate circuit is tuned by a second variable condenser, and the inductance tap on the secondary of the 2-circuit coupler controls the wavelength of the crystal circuit.
Ease of construction: Just an ordinary acquaintance with tools and some ability in wiring up the set are necessary.*
Approximate range: 500 miles.
Outstanding features: Clear, crisp reception. A short antenna may be used (such as an indoor antenna strung behind the picture molding).

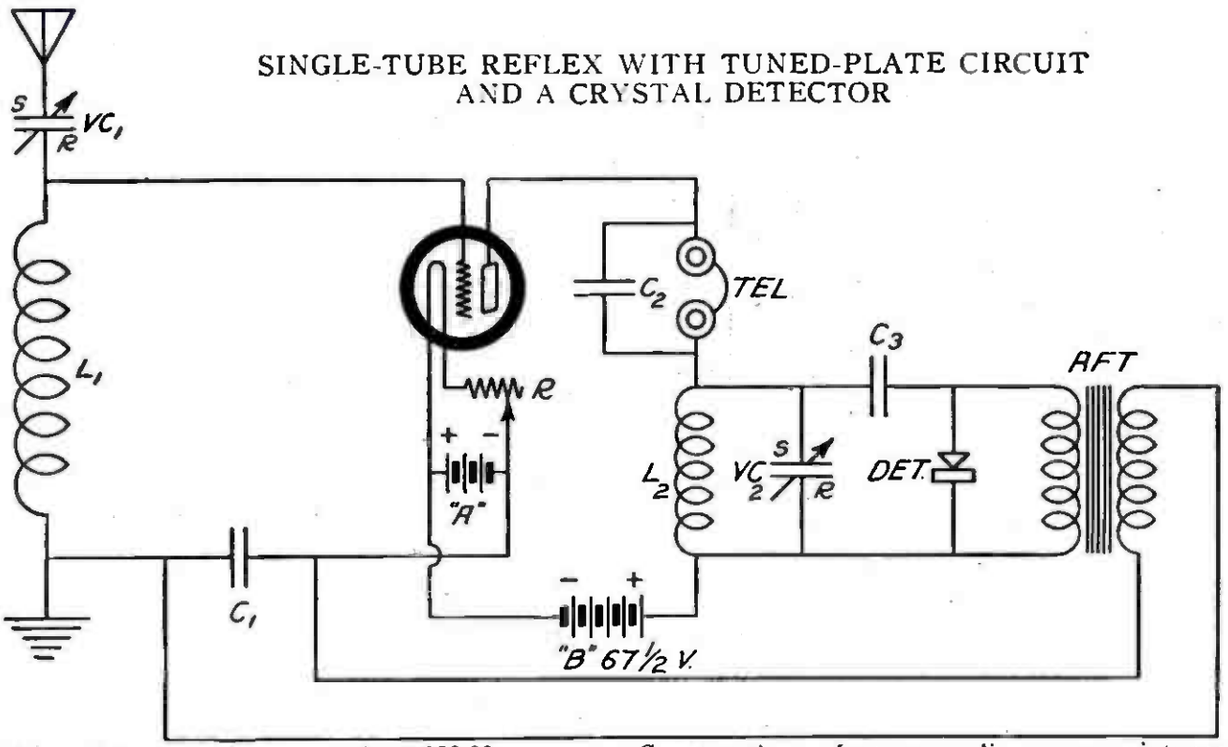
(See POPULAR RADIO, February, 1923, page 142, for constructional details.)



SINGLE-TUBE AND CRYSTAL REFLEX CIRCUIT

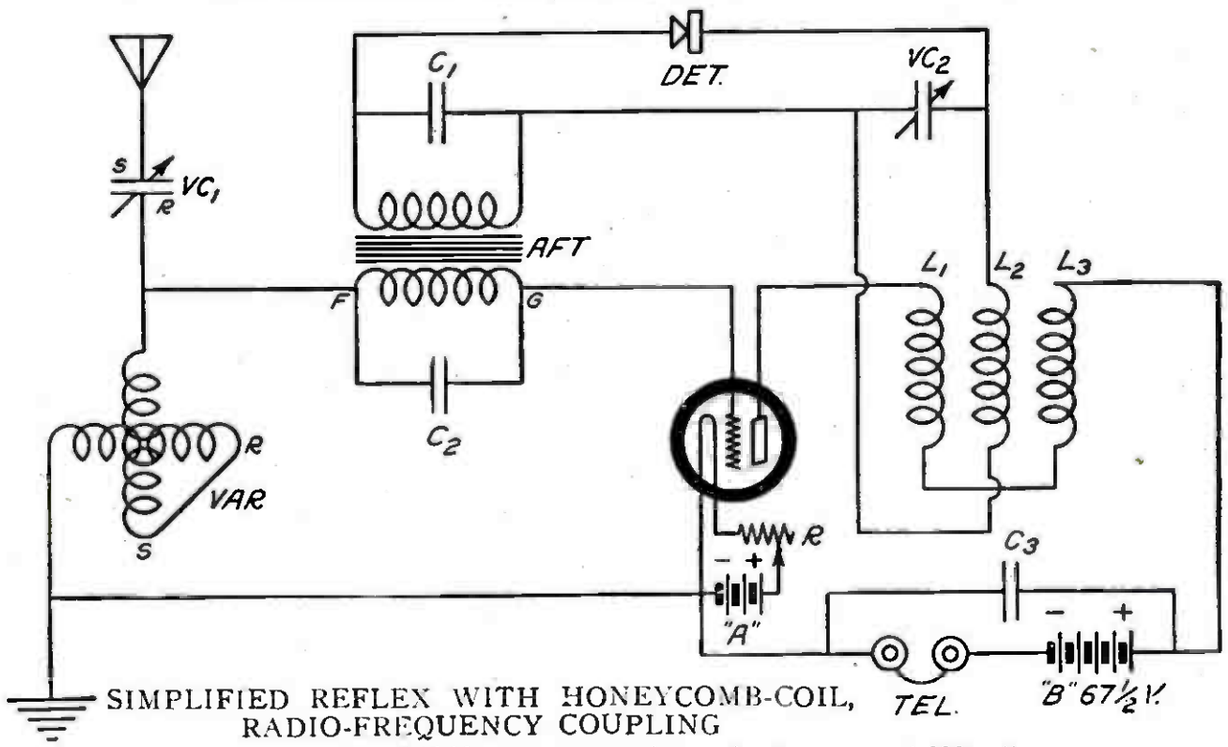
Cost of parts: Not more than $28.00.
Selectivity: Very good.
Operation: Fairly simple. Two controls for wavelength and one coupling control are used. The crystal adjustment must be changed for any considerable change in wavelength in order to prevent the circuit from oscillating and still have it retain its maximum signal strength.
Ease of construction: More complicated than the straight regenerative circuits but not beyond the ordinary radio fan's ability.
Approximate range: 1,000 miles.
Outstanding feature: Circuit combines radio-frequency, and audio-frequency amplification and regeneration in one tube.

SINGLE-TUBE REFLEX WITH TUNED-PLATE CIRCUIT AND A CRYSTAL DETECTOR



Cost of parts: Not more than $30.00.
Selectivity: Good.
Operation: Easy to tune. The variable condenser in the antenna circuit tunes the input circuit to the tube and the variable condenser in the plate circuit tunes that circuit.
Construction: Just an ordinary acquaintance with tools and some ability in wiring.*
Approximate range: 500 miles.
Outstanding features: A good set for the experimenter who wishes to learn the principles of radio-frequency amplification and of the reflex.

*(See POPULAR RADIO, *May, 1924, page 498, for constructional details.)*

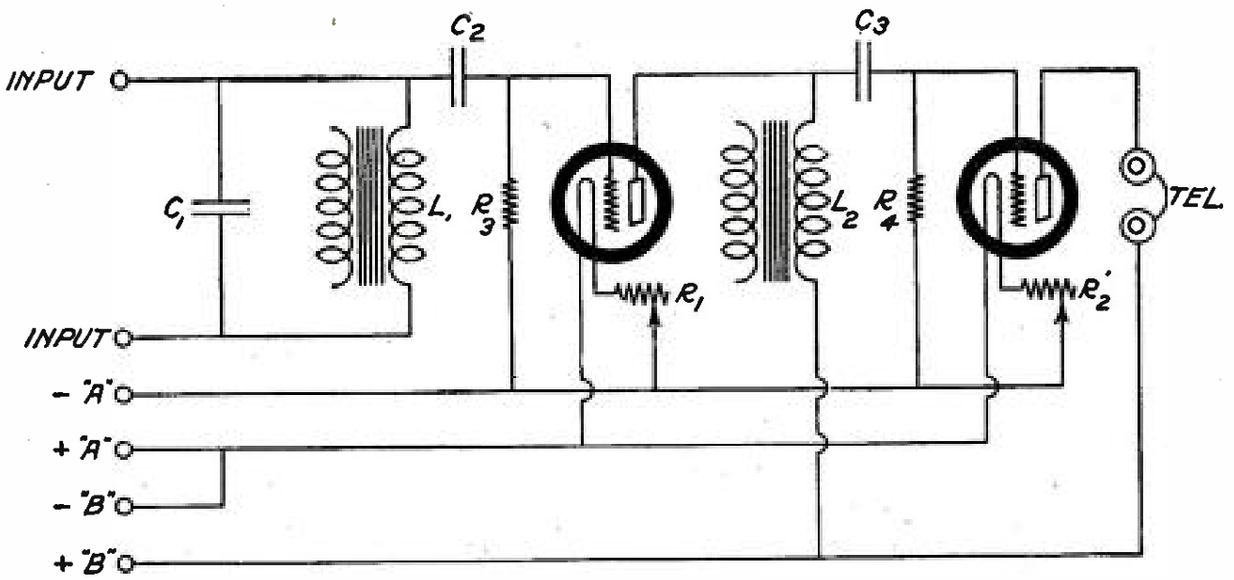


SIMPLIFIED REFLEX WITH HONEYCOMB-COIL, RADIO-FREQUENCY COUPLING

Cost of parts: Not more than $45.00.
Selectivity: Fair.
Operation: Rather difficult.
Construction: Some experience in making sets should be had before trying this one.*
Approximate range: 1,000 miles.
Outstanding features: Will operate a loudspeaker on local stations. Incorporates one stage of radio-frequency amplification and one of audio with only one tube.

(See POPULAR RADIO, July, 1924, page 105, for constructional details.)

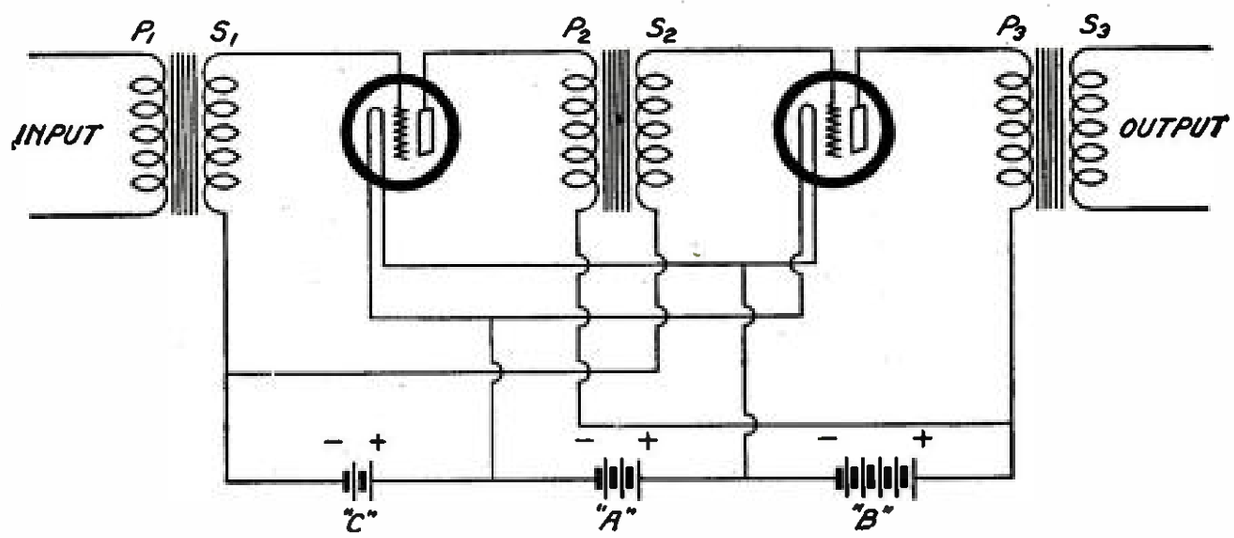
Amplifying Circuits



TWO-STAGE, IMPEDANCE-COUPLED AMPLIFIER MADE FROM FORD SPARK COILS

Cost of parts: Not more than $15.00.
Usage: With headphones or loudspeaker.
Signal strength: Fairly good.
Quality of reproduction: Fairly good.
Construction: Simple.*
Outstanding features: Simple to make and operate, and of low cost, especially if you have same old Ford coils on hand.

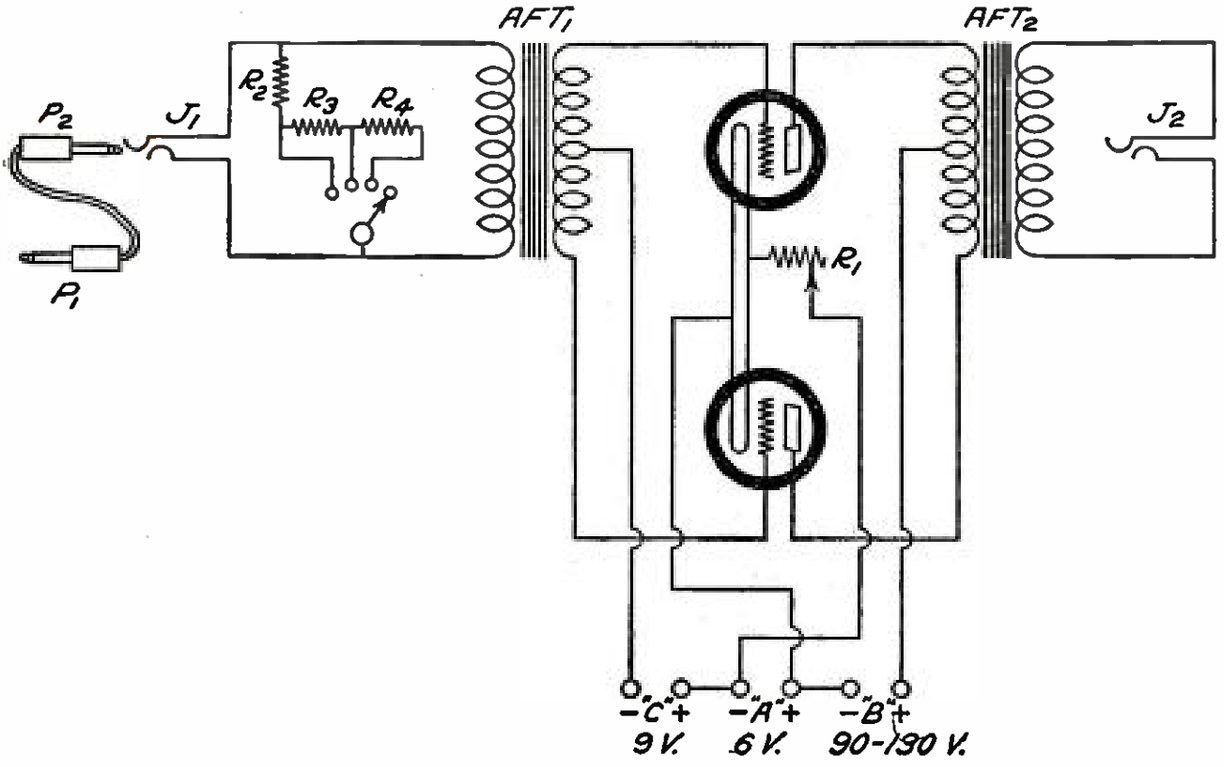
(See POPULAR RADIO, April, 1924, page 417, for constructional details.)



TWO-STAGE, TRANSFORMER-COUPLED, POWER AMPLIFIER FOR USE WITH 5-WATT TUBES

Cost of parts: Not more than $25.00 (*Note:* The costs of tubes and batteries are considered as "extras" and are not included in the costs given in these descriptions).
Usage: With loudspeaker.
Signal strength: Excellent, when added to a two-tube receiver.
Quality of reproduction: Good, if good transformers are used.
Construction: Not complicated.*
Outstanding features: No rheostats need be used with these tubes (Western Electric 216-a) on 6 volts. The plate circuit of the last tube includes a step-down transformer across the secondary of which is connected the loudspeaker.

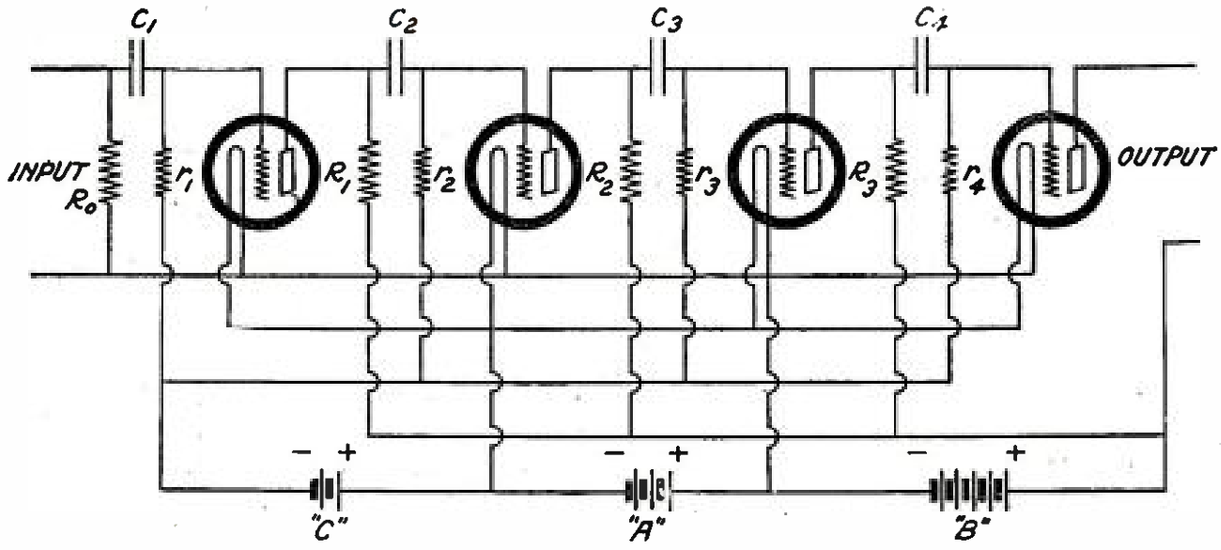
(See POPULAR RADIO, January, 1924, page 69, for constructional details.)



ONE STAGE OF PUSH-AND-PULL POWER AMPLIFICATION

Cost of parts: Not more than $22.00.
Usage: With loudspeaker.
Signal strength: Very good when used with a single-stage of transformer-coupled amplification.
Quality of reproduction: Very good, if good transformers are used.
Construction: Just an ordinary acquaintance with tools and some ability in wiring up a circuit are necessary.*
Outstanding feature: This form of amplification takes advantage of both sides of the amplified alternating current that makes up audible voice signals.

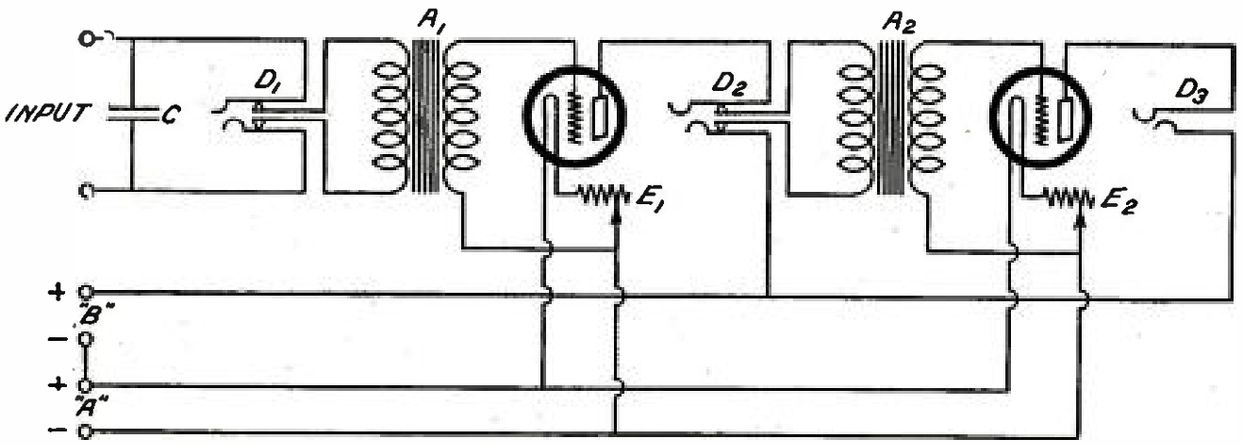
*(See POPULAR RADIO, *February, 1924, page 165, for constructional details.)*



RESISTANCE AND CONDENSER-COUPLED AMPLIFIER

Cost of parts: Not more than $20.00.
Usage: With phones or with loudspeaker.
Signal strength: Good.
Quality of reproduction: Excellent.
Construction: Fairly simple.*
Outstanding features: Truthfulness of reproduction and simplicity and low cost.

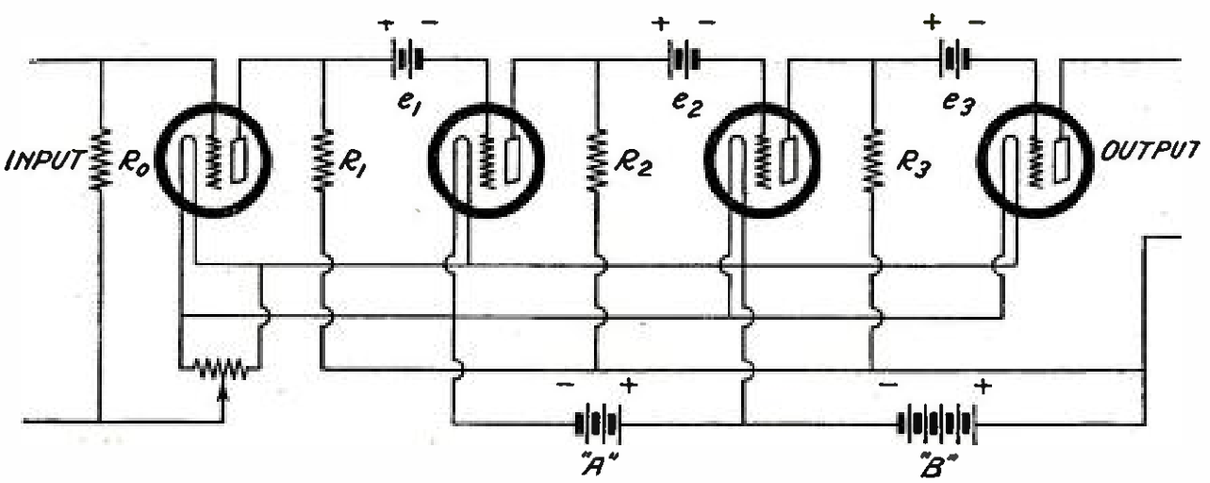
*(See POPULAR RADIO, *January, 1924, page 71, for constructional details.)*



TWO STAGES OF TRANSFORMER-COUPLED AMPLIFICATION

Cost of parts: Not more than $19.00.
Usage: With headphones or with loudspeaker.
Signal strength: Good.
Quality of reproduction: Good, if good transformers are used.
Construction: There is nothing really difficult in putting together and wiring up such an amplifier.*
Outstanding feature: A simple circuit for getting consistent loudspeaker reception with a small number of tubes.

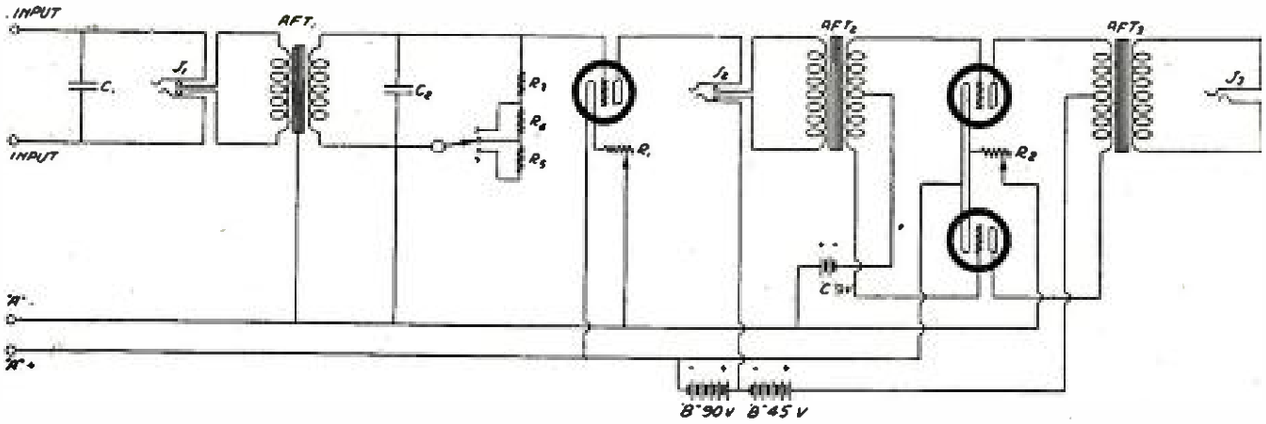
*(See POPULAR RADIO, *October, 1923, page 289, for constructional details.)*



APERIODIC RESISTANCE-COUPLED AMPLIFIER

Cost of parts: Not more than $15.00.
Usage: With headphones or with loudspeaker.
Signal strength: Good.
Quality of reproduction: Excellent.
Construction: Simple.*
Outstanding features: Perfect reproduction, if properly adjusted. Simplicity of construction. Low cost.

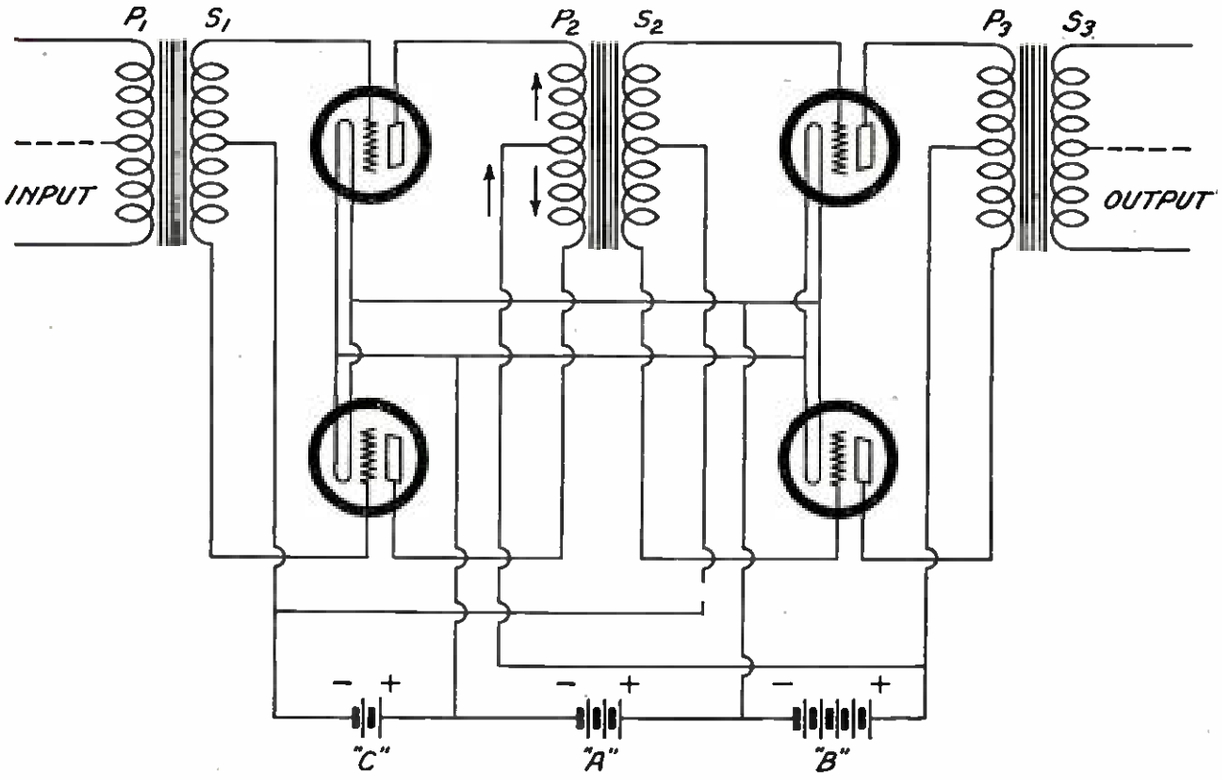
*(See POPULAR RADIO, *January, 1924, page 74, for constructional details.)*



ONE STAGE OF TRANSFORMER-COUPLED, AND ONE STAGE OF PUSH-AND-PULL AMPLIFICATION

Cost of parts: Not more than $30.00.
Usage: With headphones or with loudspeaker.
Signal strength: Excellent.
Quality of reproduction: Very good, if good transformers are used.
Construction: Not very difficult to make.*
Outstanding feature: Large volume and good reproduction through a loudspeaker.

*(See POPULAR RADIO, *February, 1924, pages 198-199, for constructional details.)*

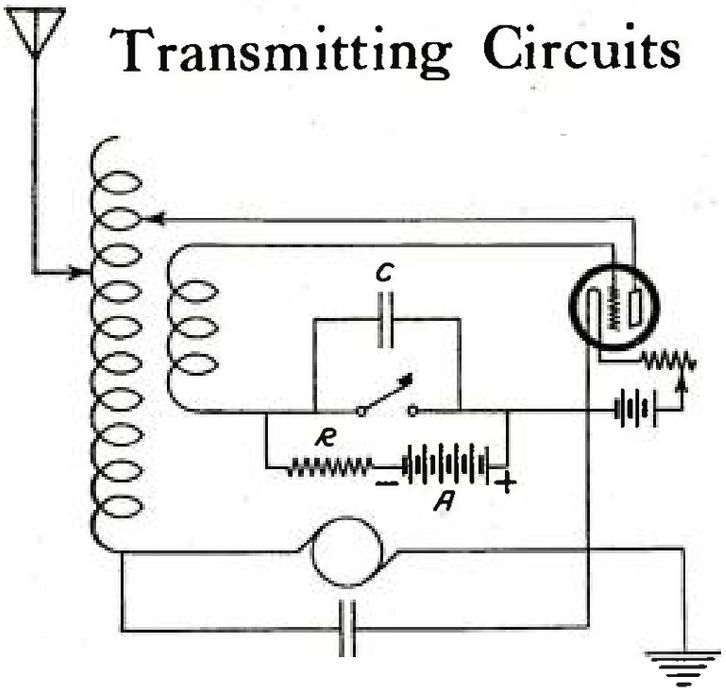


TWO STAGES OF PUSH-AND-PULL AMPLIFICATION

Cost of parts: Not more than $30.00.
Usage: With loudspeaker.
Signal strength: Excellent, when used as a power amplifier.
Quality of reproduction: Very good—if the transformers are good.
Construction: Rather complicated.*
Outstanding feature: Excellent for use as a power amplifier where great volume and good clarity is required.

*(See POPULAR RADIO, *January, 1924, page 70, for constructional details.)*

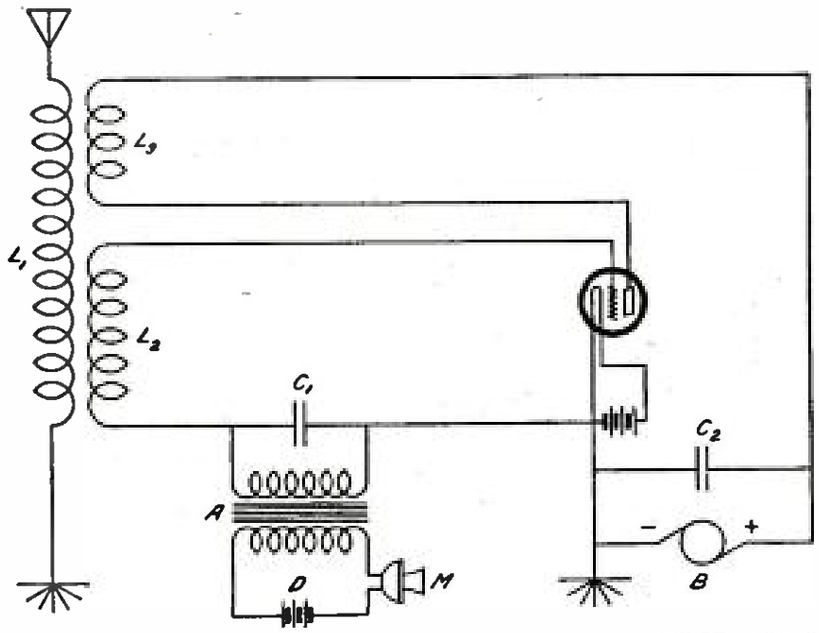
Transmitting Circuits



GRID-TICKLER CIRCUIT FOR PURE CW TELEPHONY

Cost of parts: Not more than $125.00.
Emitted wave: Extremely sharp.
Operation: Not difficult.
Construction: Nothing especially complicated in the arrangement of this set, but the builder should have had some experience in putting together receiving sets, wiring, soldering and the like before he attempts to make a transmitter.*
Approximate range: 1,000 miles.
Outstanding features: A sharp wave, and a pure "whistle" note for telephony.

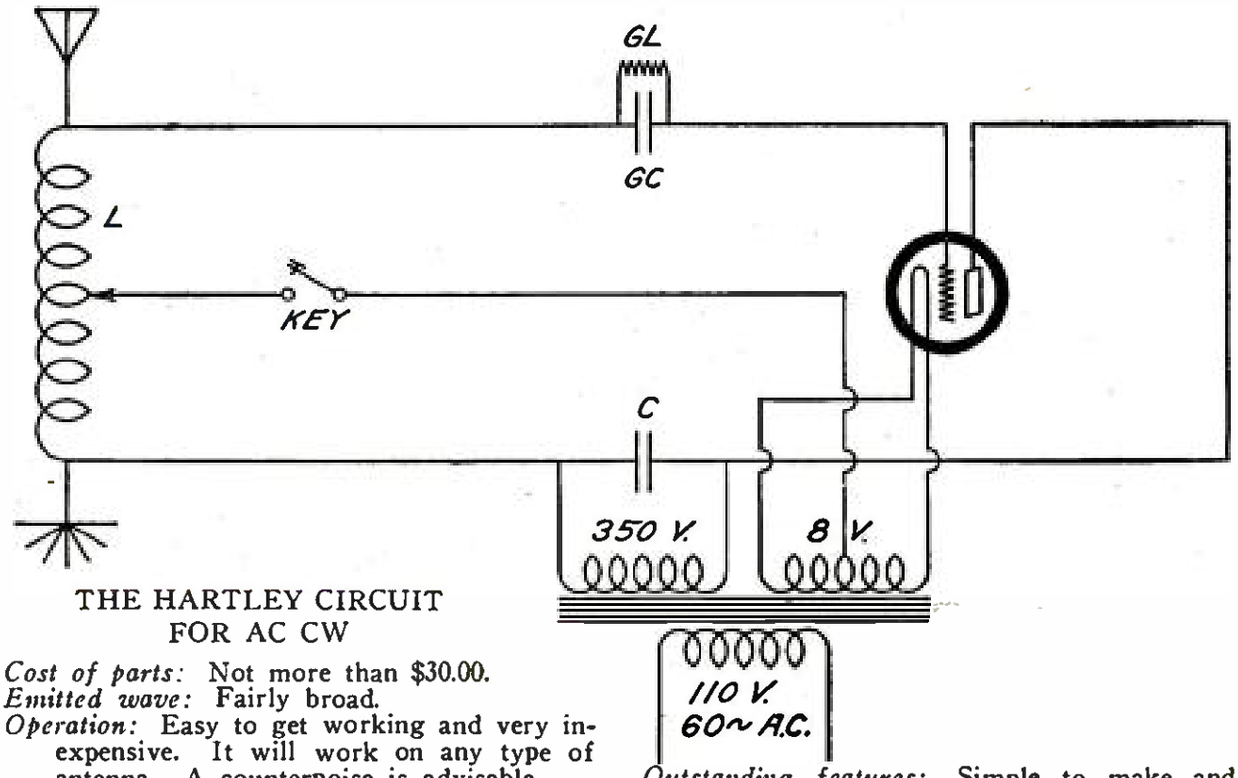
*(See POPULAR RADIO, *September, 1922, page 39, for constructional details.)*



THE MEISSNER CIRCUIT FOR TELEPHONY, WITH GRID MODULATION

Cost of parts: Not more than $120.00.
Emitted wave: Fairly sharp.
Operation: It is quite difficult to get a large percentage of modulation and still keep the transmitted speech clear.
Construction: The most important parts in this circuit are the coils; they should be wound on high-grade composition tubing with no shellac on the windings. A regular modulation transformer should be used at A.*
Approximate range: 50 to 100 miles (on telephony.)
Outstanding features: This is a good single-tube telephone outfit for the amateur. It will give him a lot of information and allow him to try a lot of experimenting to get better modulation.

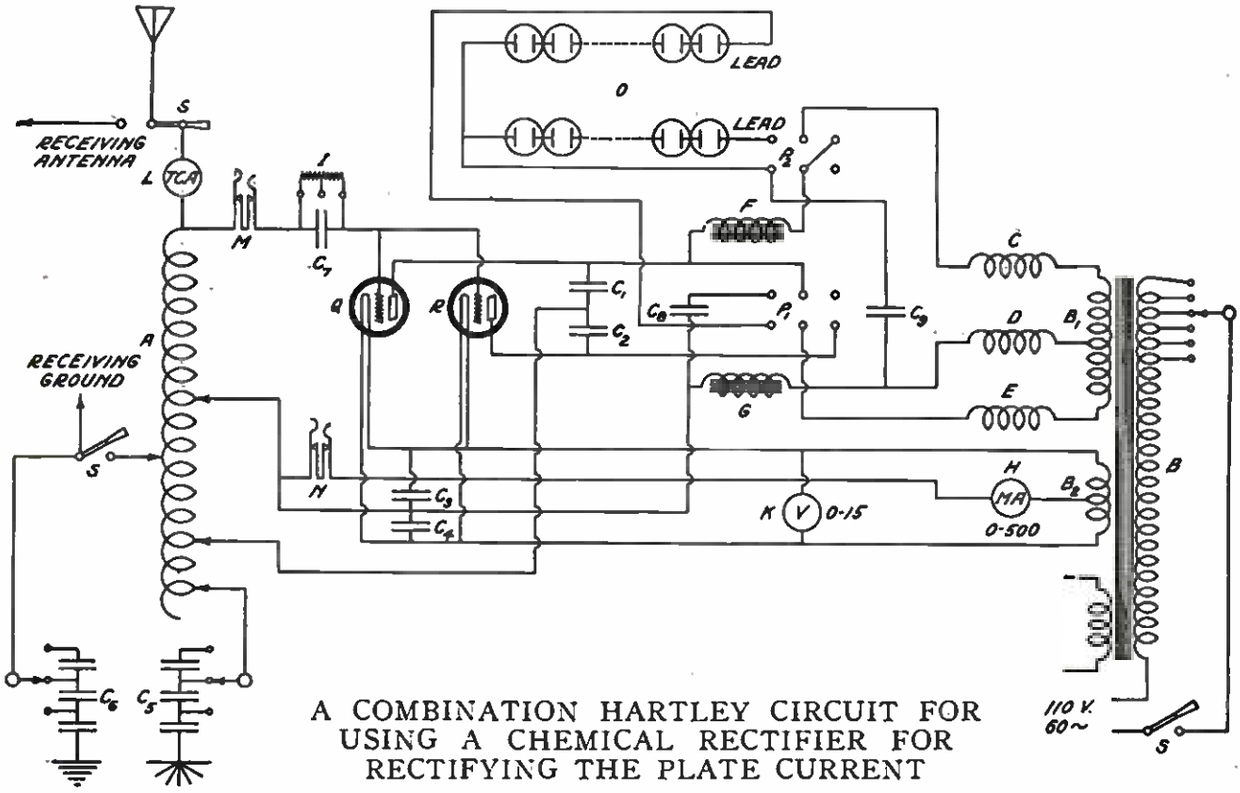
*(See POPULAR RADIO, *July, 1923, page 42, for constructional details.)*



THE HARTLEY CIRCUIT
FOR AC CW

Cost of parts: Not more than $30.00.
Emitted wave: Fairly broad.
Operation: Easy to get working and very inexpensive. It will work on any type of antenna. A counterpoise is advisable.
Construction: Simplicity itself.*
Approximate range: 500 miles.
Outstanding features: Simple to make and easy to get into operation. It is also most economical to set up.

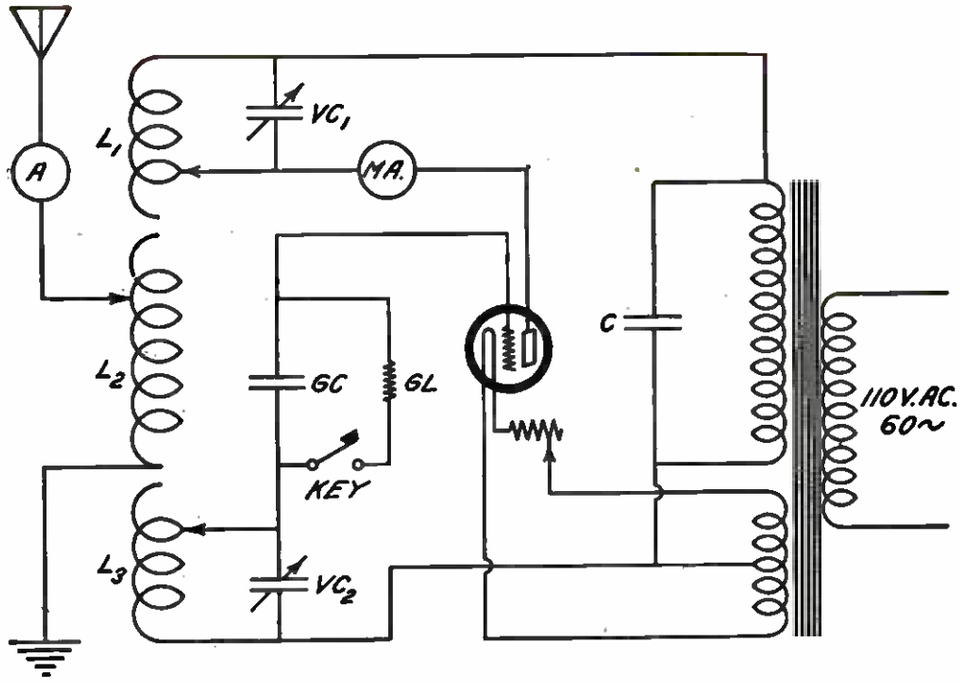
(See POPULAR RADIO, December, 1923, page 513, for constructional details.)



A COMBINATION HARTLEY CIRCUIT FOR USING A CHEMICAL RECTIFIER FOR RECTIFYING THE PLATE CURRENT

Cost of parts: Not more than $125.00 (for use with 50-watt tubes).
Emitted wave: Broad (with self-rectified AC). Somewhat sharper (with chemically-rectified AC. It depends upon how good the filter is).
Operation: Complicated.
Construction: None but the experienced amateur had better try to build this set alone.*
Approximate range: 2,500 to 3,000 miles (on telephony).
Outstanding feature: A powerful set which can be used without batteries for CW telegraphy.

(See POPULAR RADIO, April, 1923, page 298, for constructional details.)



MODIFIED MEISSNER CIRCUIT WITH AC POWER SUPPLY

Cost of parts: Not more than $40.00 (*Note:* The costs of tubes and batteries are considered "extras" and are not included in the costs given in these descriptions).

Emitted wave: Fairly broad. Using straight AC on the plate of the oscillator tube causes a 30-cycle note to be transmitted (as the modulator frequency) which spreads out the frequency to a band instead of a single pure wave. This will cause interference in nearby receivers which do not tune sharply.

Operation: Easy to get working and inexpensive to keep up. The first cost is the last cost except for tube replacements. It will work on any type of antenna.

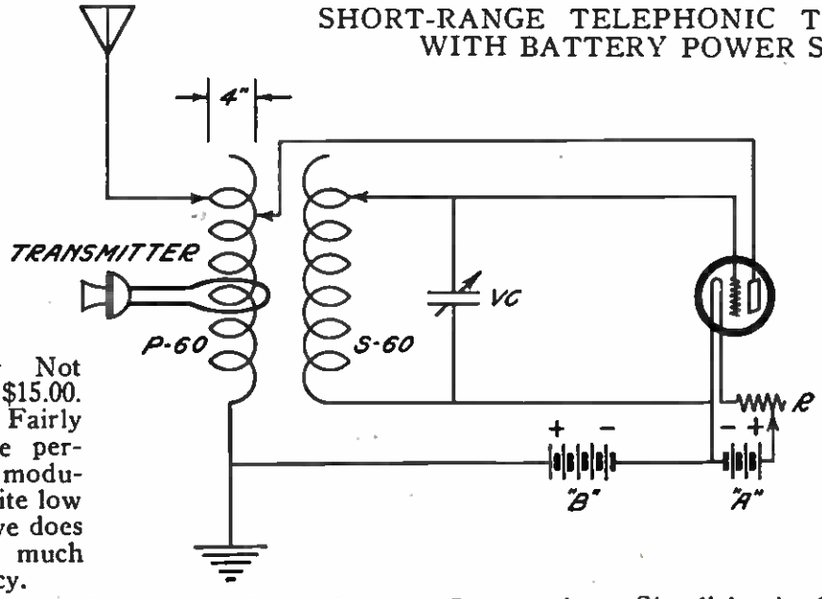
Construction: Nothing difficult about making this set, probably as simple as a single-tube receiving set.*

Approximate transmitting range: 500 miles.

Outstanding features: Simple to make and get into operation. Set functions without any moving parts to wear out, is applicable to a large band of wavelengths with any type of antenna, and requires no batteries. It may cause interference to nearby broadcast listeners, however, if they use single-circuit tuners or other simple sets that are deficient in tuning qualities for reception.

(See POPULAR RADIO, April, 1923, page 312, for constructional details.)

SHORT-RANGE TELEPHONIC TRANSMITTER WITH BATTERY POWER SUPPLY



Cost of parts: Not more than $15.00.

Emitted wave: Fairly sharp. The percentage of modulation is quite low and the wave does not spread much in frequency.

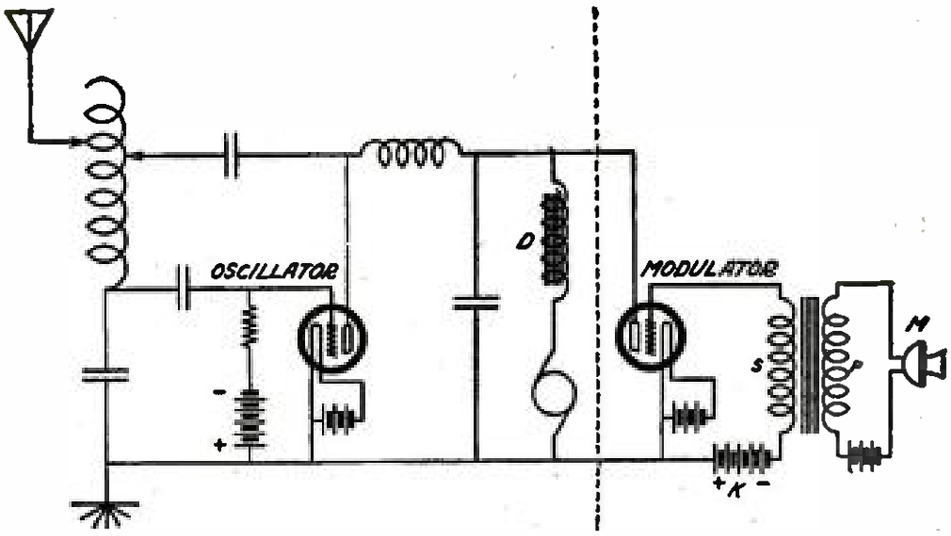
Operation: Just as simple as a single-circuit receiving set. The UV-201-a tube may be used with about 100 volts of "B" battery for the plate supply.

Construction: Simplicity itself.*

Approximate transmitting range: 5 miles.

Outstanding features: Simple to make and operate.

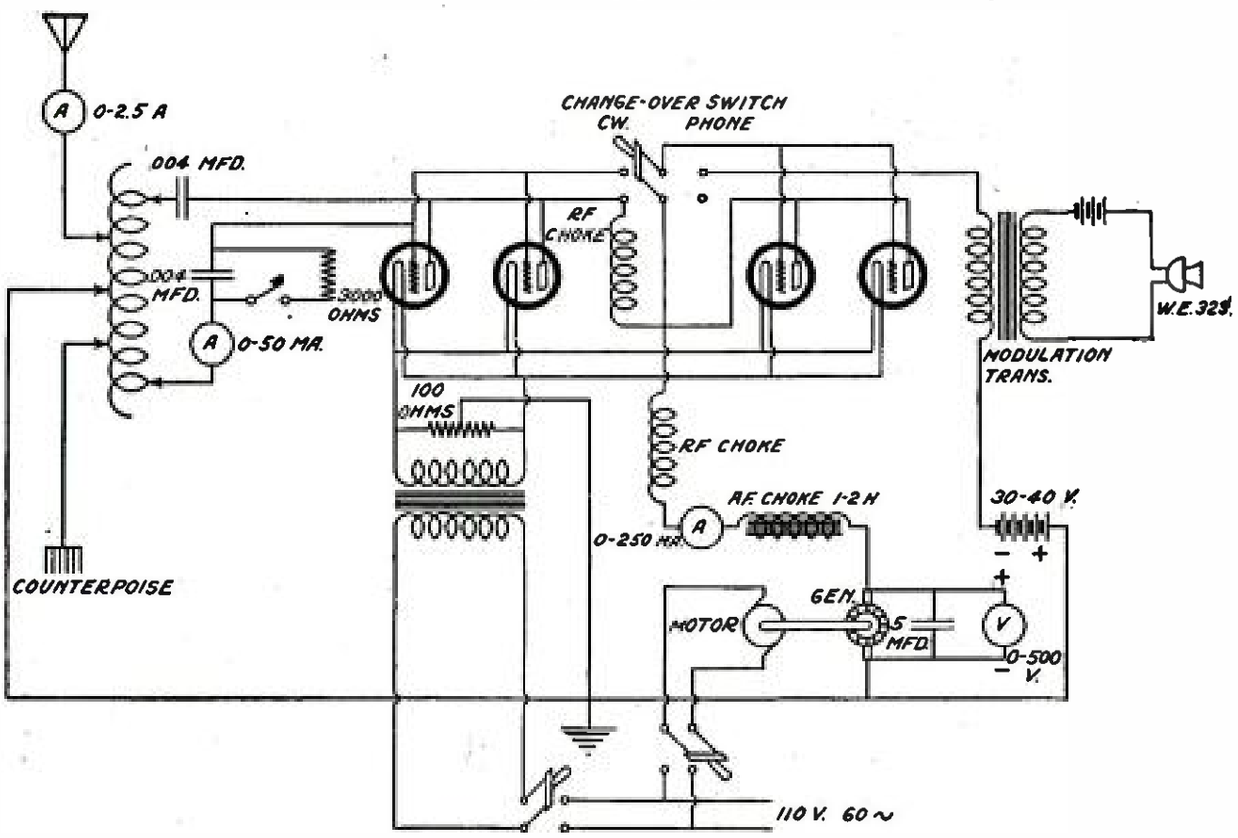
(See POPULAR RADIO, April, 1923, page 309, for constructional details.)



THE COLPITTS CIRCUIT WITH HEISING MODULATION

Cost of parts: Not more than $130.00.
Emitted wave: Fairly sharp. The modulation is (if the set is properly adjusted) of a very high order and also of a high percentage. This may cause the wave to be broadened out so that the set may interfere locally.
Operation: Simple and efficient.
Construction: Rather complicated.*
Approximate range: 500 to 1,000 miles (on telephony).
Outstanding features: The best modulating system and the one most used for broadcasting.

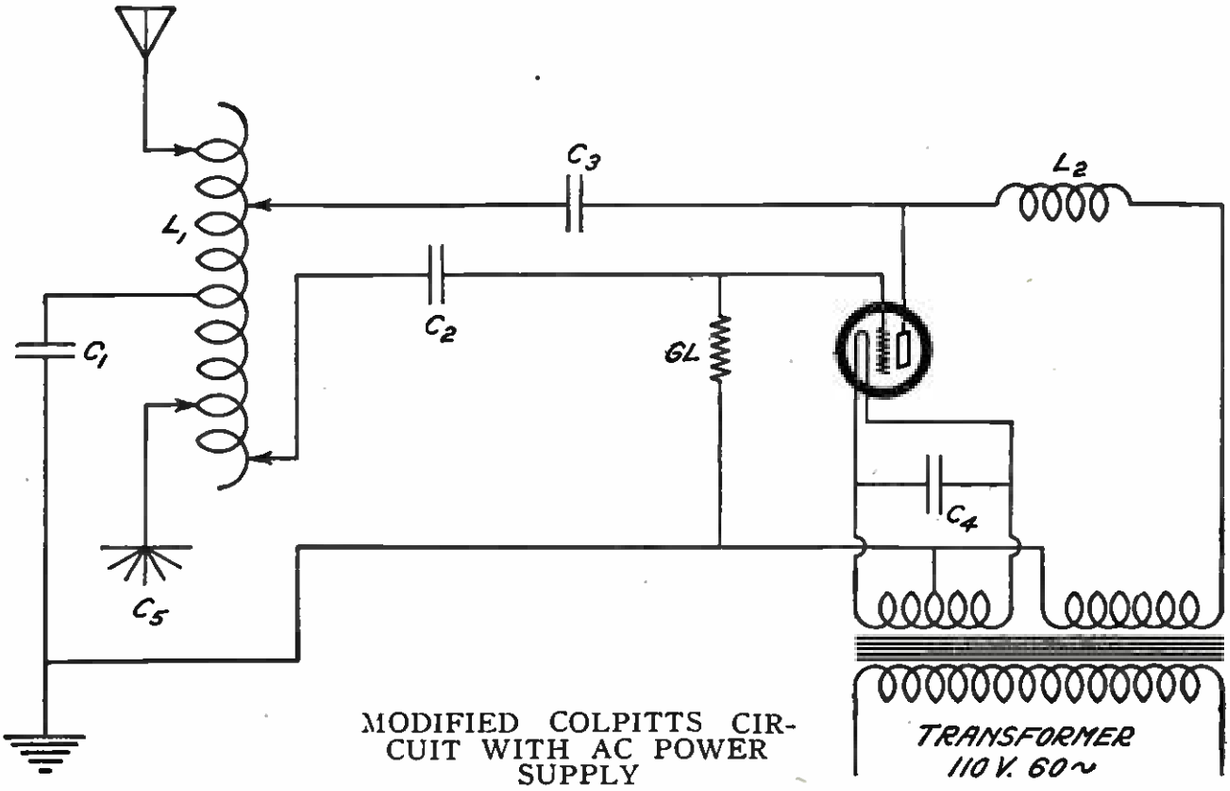
(See POPULAR RADIO, July, 1923, page 46, for constructional details.)



THE HARTLEY CIRCUIT USING HEISING MODULATION FOR TELEPHONY

Cost of parts: Not more than $175.00.
Emitted wave: Extremely sharp for CW and good on telephony.
Operation: Complicated. A thorough understanding of the principles of modulation is necessary to get the set operating efficiently on telephony.
Construction: Difficult.*
Approximate range: 2,500 miles (on CW), and 1,000 miles (on telephony).
Outstanding features: This circuit is noted for its efficiency and perfection of modulation. This type of modulation is used at most of the broadcasting stations.

(See POPULAR RADIO, December, 1922, page 256, for constructional details.)

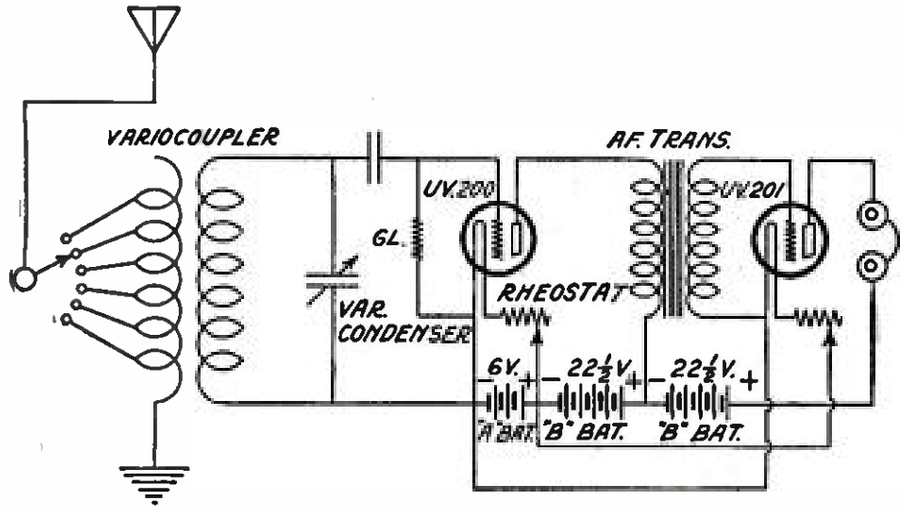


MODIFIED COLPITTS CIRCUIT WITH AC POWER SUPPLY

Cost of parts: Not more than $35.00.
Emitted wave: Fairly broad. (This is due to the AC power supply and not to the type of circuit used.)
Operation: Simple to get into successful operation (if a counterpoise is used).
Construction: Not complicated.*
Approximate range: 500 miles.
Outstanding features: A persistent oscillator and efficient. This set employs no batteries of any kind. It is run wholly from the 110-volt, 60-cycle, AC lighting mains.

(See POPULAR RADIO, September, 1923, page 249, for constructional details.)

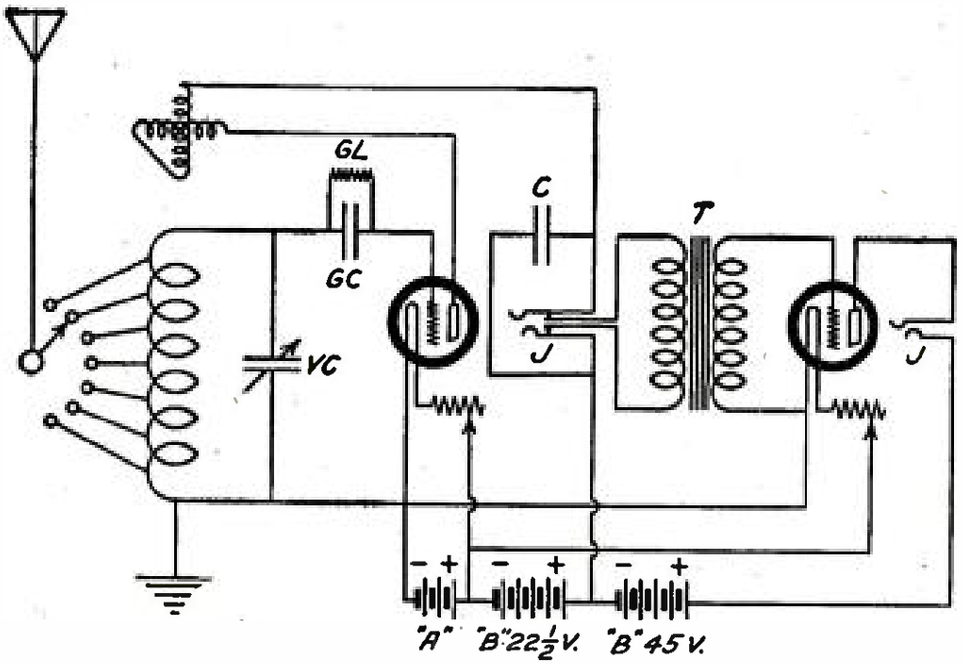
Two-tube Circuits



INDUCTIVELY-COUPLED, VACUUM-TUBE RECEIVER WITH ONE STAGE OF AUDIO-FREQUENCY AMPLIFICATION

Cost of parts: Not more than $28.00.
Selectivity: Fairly good.
Operation: Simple.
Construction: Easy to make.*
Approximate range: About 100 miles.
Outstanding features: The added stage of amplification increases the operating range considerably and makes the local programs more enjoyable for use with a number of headphones.

(See POPULAR RADIO, October, 1922, page 147, for constructional details.)



THE CONDUCTIVELY-COUPLED, TUNED-PLATE REGENERATIVE CIRCUIT WITH ONE STAGE OF AUDIO-FREQUENCY AMPLIFICATION

Cost of parts: Not more than $30.00.

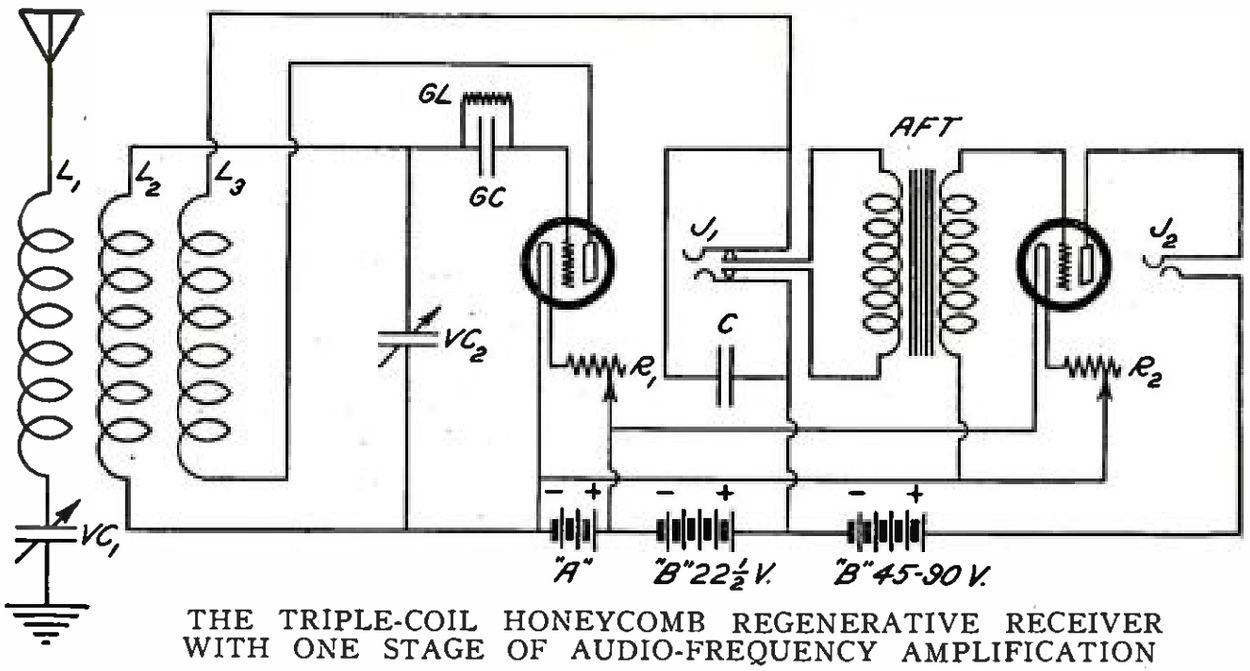
Selectivity: Fair.

Operation: Not very complicated. The antenna is tuned by means of a tapped switch, the secondary by means of a variable condenser and the regeneration is controlled by the variometer.

Ease of construction: Just an ordinary acquaintance with tools and some ability in wiring up the circuit are necessary.

Approximate range: 800 to 1,000 miles.

Outstanding features: Easy to operate and will bring in distance with good volume on a pair of telephones. Good for amateur CW reception.



THE TRIPLE-COIL HONEYCOMB REGENERATIVE RECEIVER WITH ONE STAGE OF AUDIO-FREQUENCY AMPLIFICATION

Cost of parts: Between $25.00 and $30.00 (depending on the wavelength).

Selectivity: Very good.

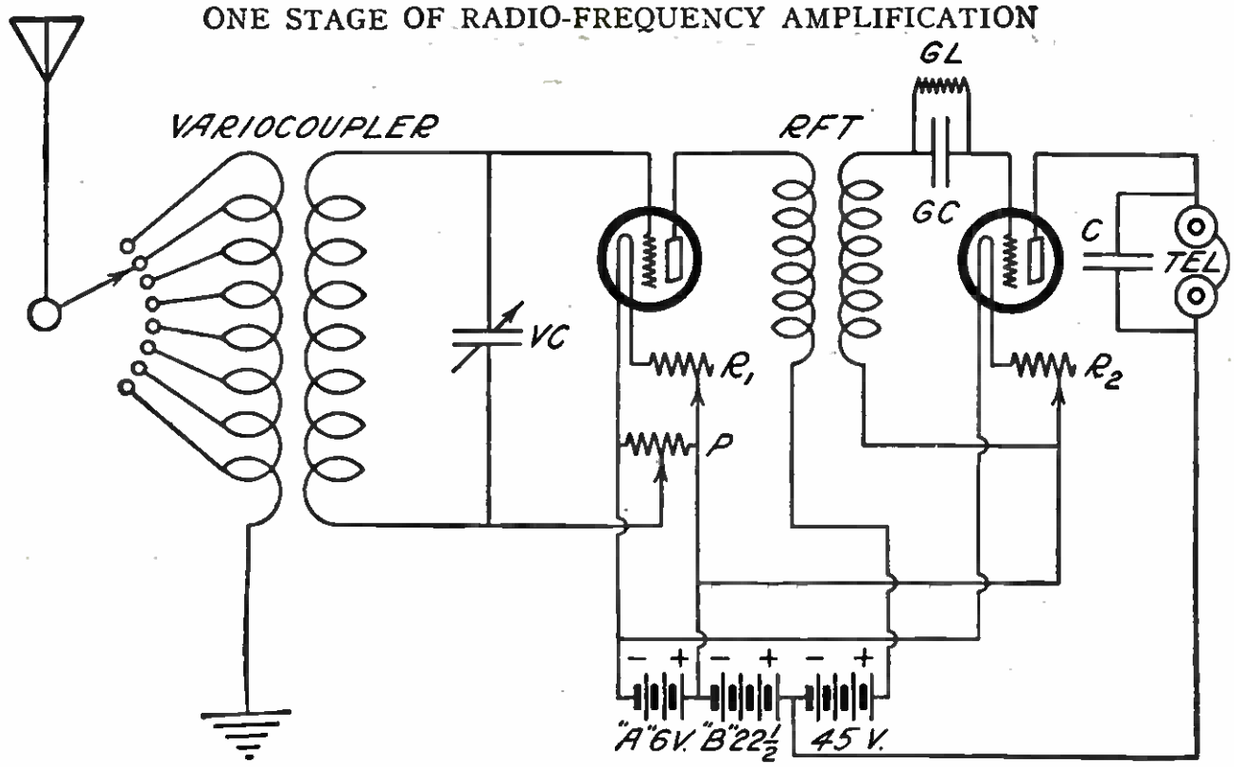
Operation: Rather complicated for a beginner.

Ease of construction: Fairly simple.

Approximate range: 800 miles.

Outstanding features: Can be used on any wavelength. By merely changing the three coils, using large or small, for the long or short waves, the set can be used for commercial reception, broadcast reception or amateur reception.

ONE STAGE OF RADIO-FREQUENCY AMPLIFICATION

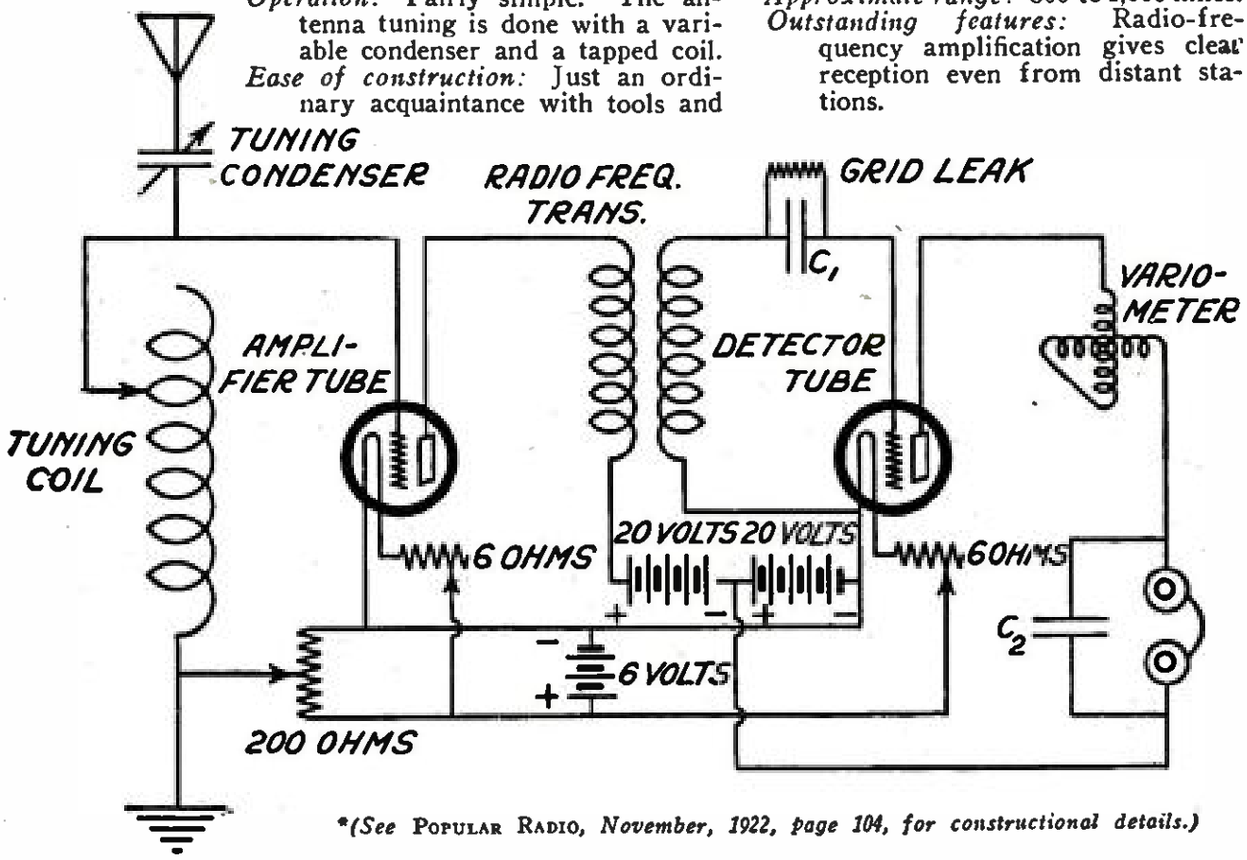


Cost of parts: Not more than $28.00.
Selectivity: Good.
Operation: Not difficult.
Construction: Nothing especially complicated.*
Approximate range: 500 miles.
Outstanding feature: A good circuit for the man who has a simple vacuum-tube circuit and wishes to make it more sensitive.

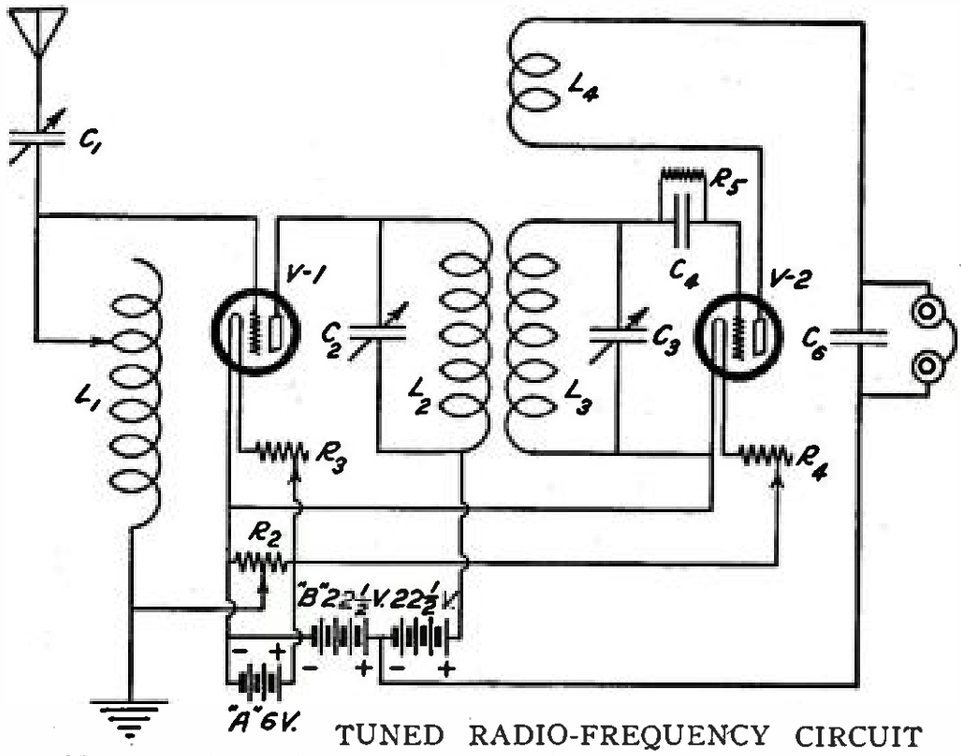
*(See POPULAR RADIO, *June, 1923, page 471, for constructional details.)*

A REGENERATIVE DETECTOR CIRCUIT

Cost of parts: Not more than $40.00.
Selectivity: Good.
Operation: Fairly simple. The antenna tuning is done with a variable condenser and a tapped coil.
Ease of construction: Just an ordinary acquaintance with tools and some ability in wiring up a circuit are necessary.*
Approximate range: 800 to 1,000 miles.
Outstanding features: Radio-frequency amplification gives clear reception even from distant stations.

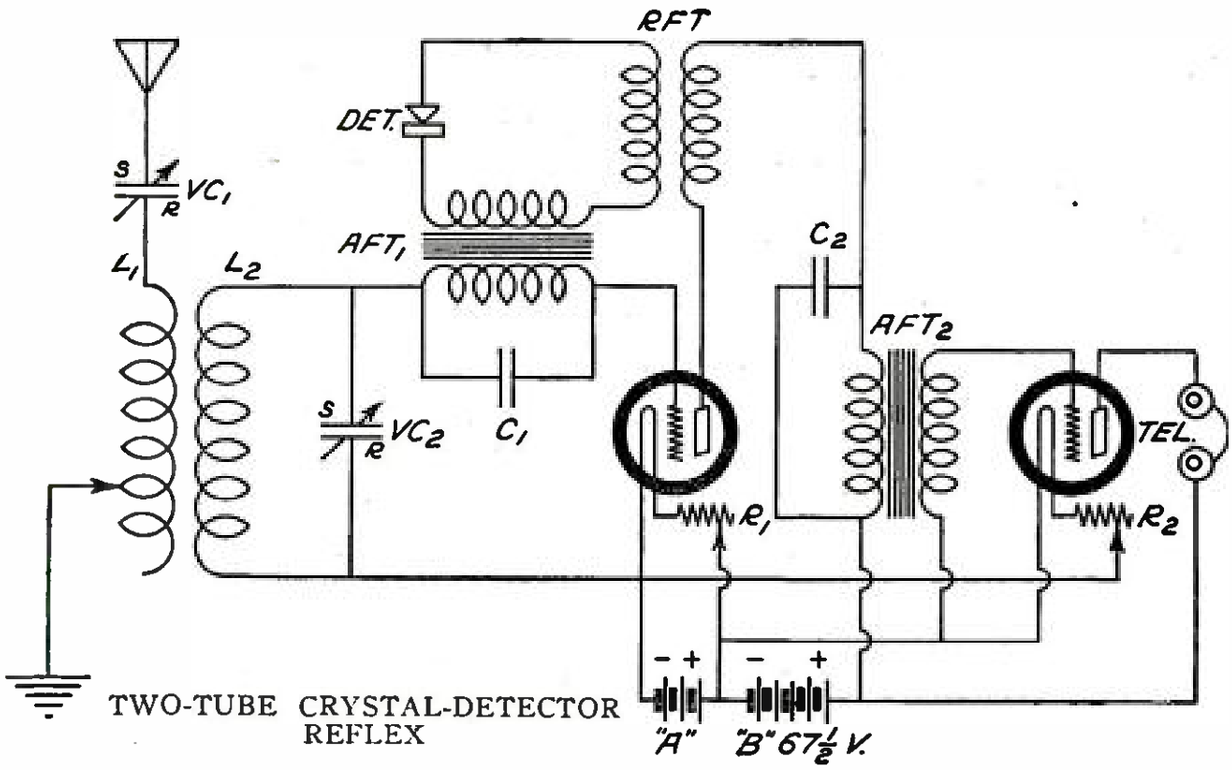


*(See POPULAR RADIO, *November, 1922, page 104, for constructional details.)*



TUNED RADIO-FREQUENCY CIRCUIT

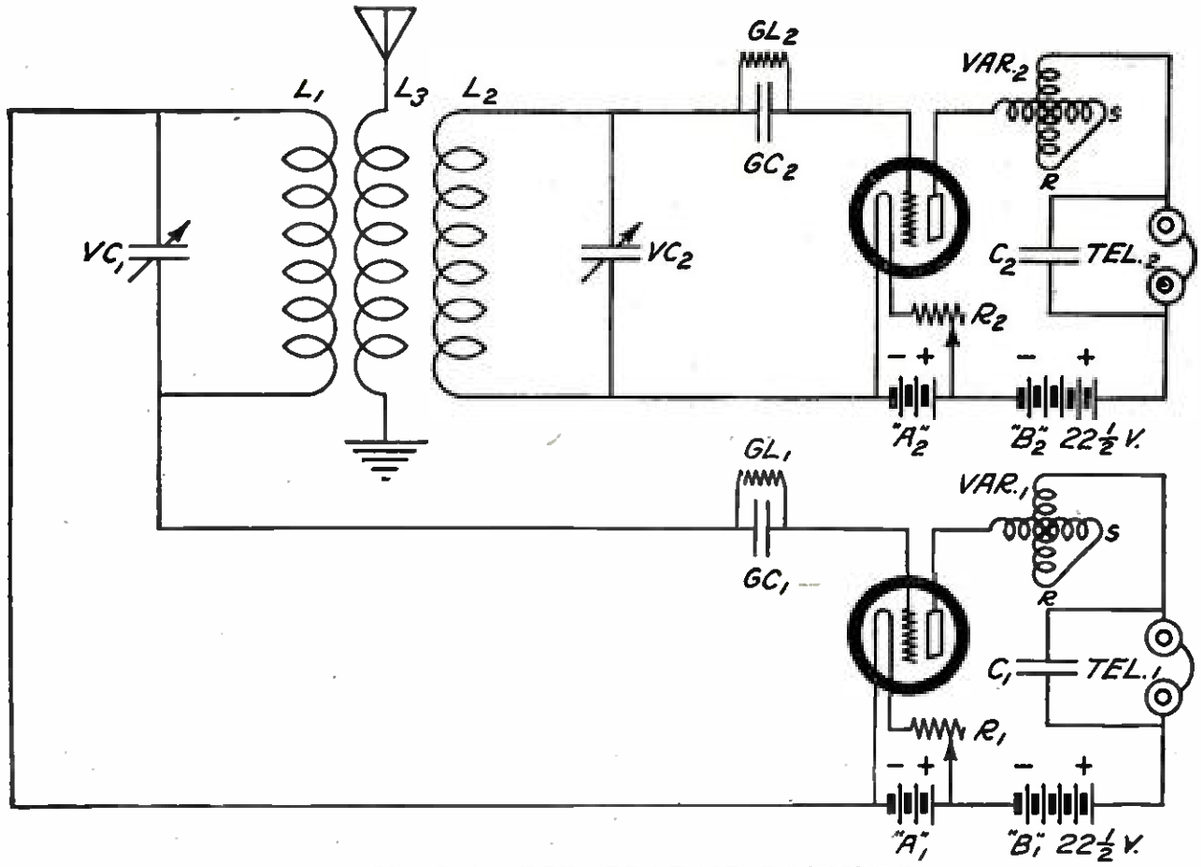
Cost of parts: Not more than $28.00.
Selectivity: Good.
Operation: Rather complicated for a beginner.
Ease of construction: Easy.
Approximate range: 500 miles.
Outstanding features: May be used with short indoor antenna. It may be made from a single-circuit, honeycomb set to stop re-radiation, and may be used to give the builder a good idea of radio-frequency amplification before he tries out the more complicated circuits.



TWO-TUBE CRYSTAL-DETECTOR REFLEX

Cost of parts: Not more than $45.00.
Selectivity: Very good.
Operation: Fairly simple.
Construction: Not easy to make. Care must be used in mounting the transformers in the proper position with respect to each other.*
Approximate range: 1,000 miles.
Outstanding features: Loudspeaker operation is possible with only two tubes. The circuit has the advantage, also, of being workable with a short antenna.

*(See POPULAR RADIO, *March, 1924, page 293, for constructional details.)*



A DUPLEX REGENERATIVE RECEIVER

Cost of parts: Not more than $55.00.

Selectivity: Very good.

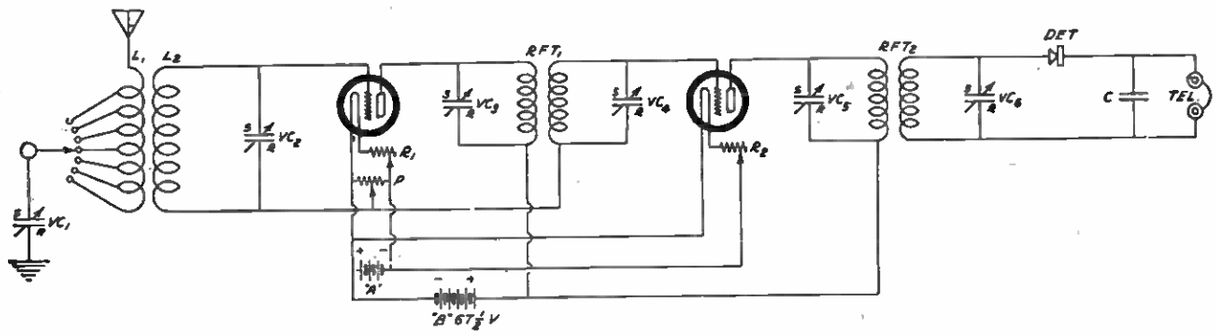
Operation: A few weeks' practice will suffice to enable efficient tuning of both parts of the set.

Construction: Just an ordinary acquaintance with tools and some ability in wiring up the circuit are necessary.*

Approximate range: 500 miles.

Outstanding features: Sharp tuning, and the fact that the set will bring in two programs (on different wavelengths) at the same time on two pairs of telephones.

(See POPULAR RADIO, January, 1924, page 96, for constructional details.)



CIRCUIT EMPLOYING TWO STAGES OF TUNED-RADIO-FREQUENCY AMPLIFICATION, WITH A CRYSTAL DETECTOR

Cost of parts: Not more than $56.00.

Selectivity: Excellent.

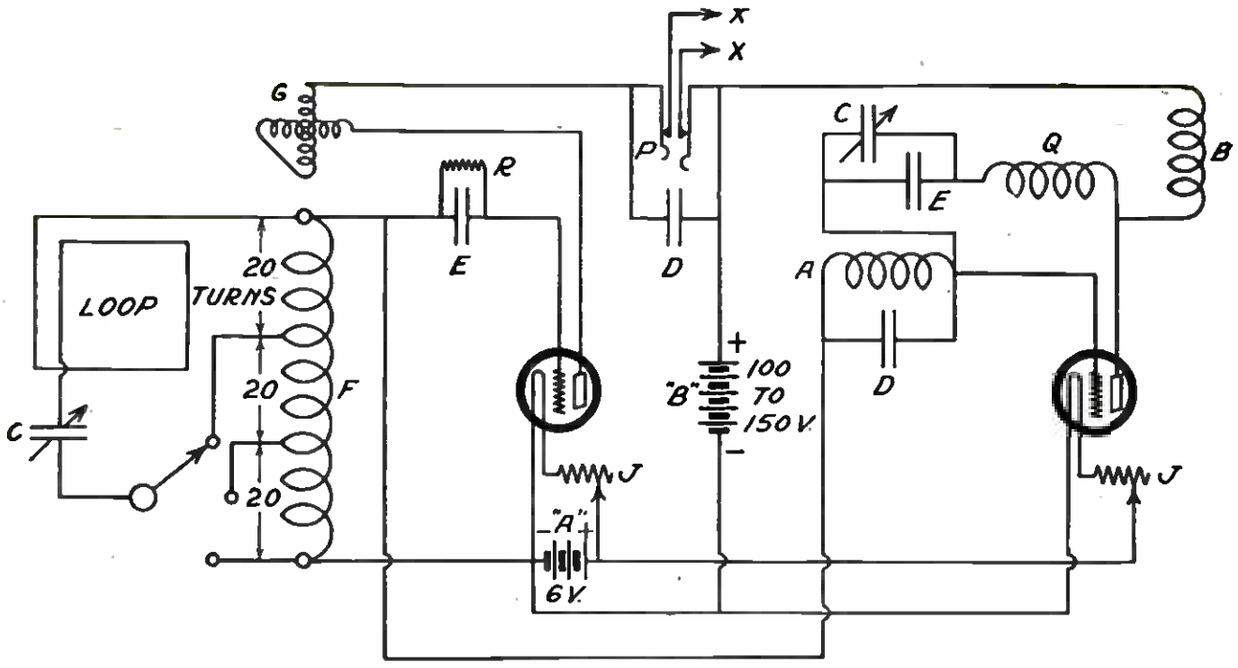
Operation: Rather critical in operation.

Construction: Not very hard to make. Be sure that the best parts are obtained and the results will exceed expectations. Poor parts will render the circuit useless.*

Approximate range: 1,500 miles.

Outstanding features: A set for the man who wants distance, but who is willing to depend on the headphones instead of trying to use a loudspeaker.

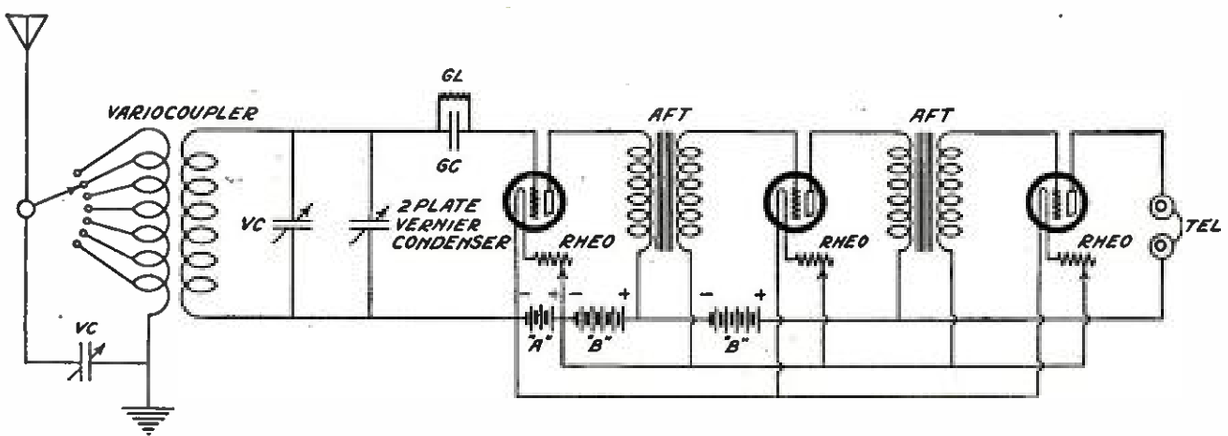
(See POPULAR RADIO, April, 1924, pages 400-1, for constructional details.)



TWO-TUBE SUPER-REGENERATIVE CIRCUIT

Cost of parts: Not more than $45.00
Selectivity: Good.
Operation: Difficult. It is a real engineering feat to get the oscillator circuit to function with the correct frequency and amplitude to cause the proper "super" action and at the same time filter out the high-pitched whistle in the detector circuit.
Ease of construction: Difficult. Every part of the circuit must be just right before the set will function as it should.
Approximate range: Variable; from local reception on the higher broadcasting wavelengths up to 1,000 miles on lower wavelengths (with a loop).
Outstanding features: The best method for unlimited amplification at the extremely short wavelengths. Especially suitable for local reception with great volume for a minimum number of tubes.

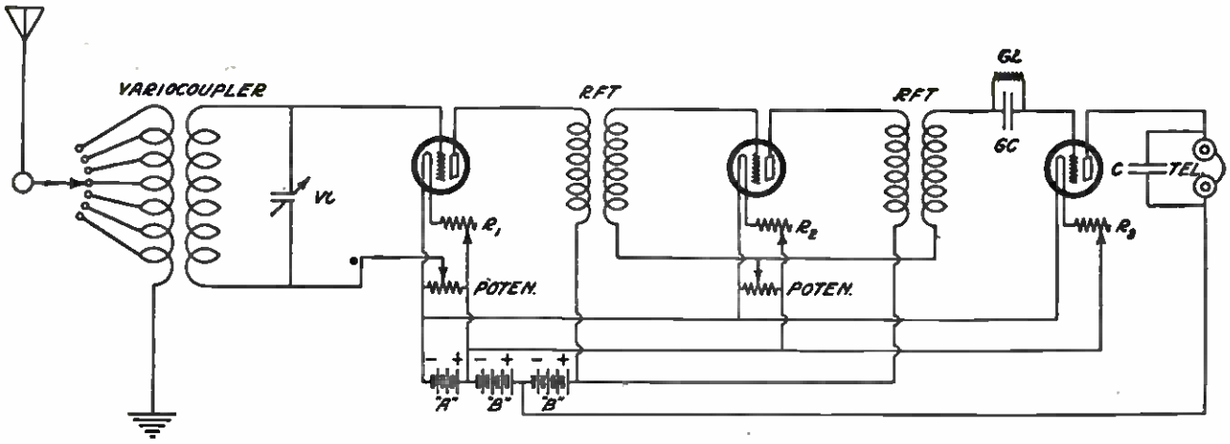
Three-tube Circuits



A SIMPLE AUDION CIRCUIT WITH TWO STAGES OF AUDIO-FREQUENCY AMPLIFICATION

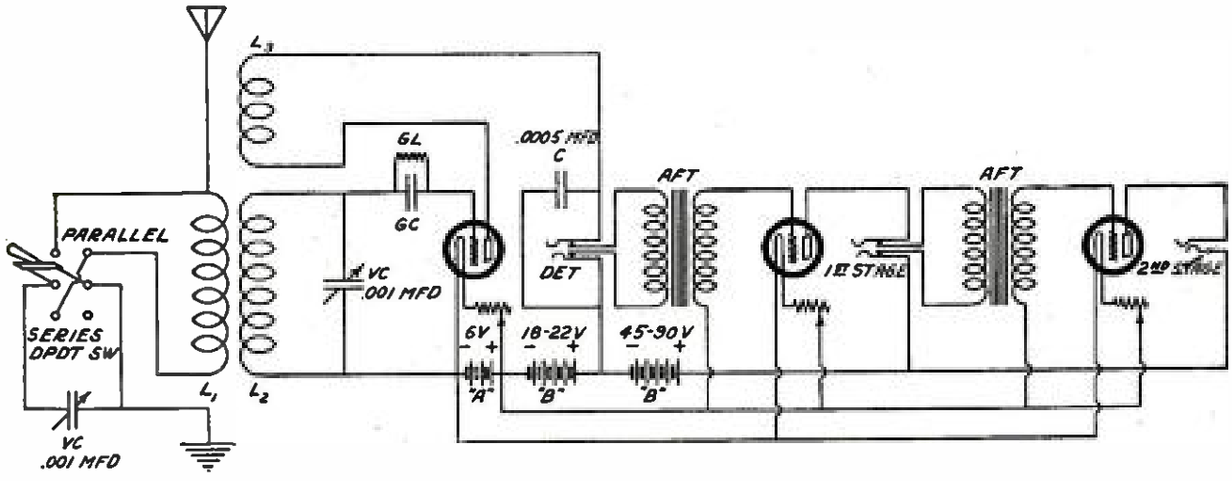
Cost of parts: Not more than $40.00.
Selectivity: Fairly good.
Operation: Easy to operate.
Construction: Simple.*
Approximate range: 300 miles.
Outstanding feature: The set will bring in any signals, with great clarity, as long as they are strong enough to operate the detector.

*(See POPULAR RADIO, *March, 1923, pages 232-233, for constructional details.)*



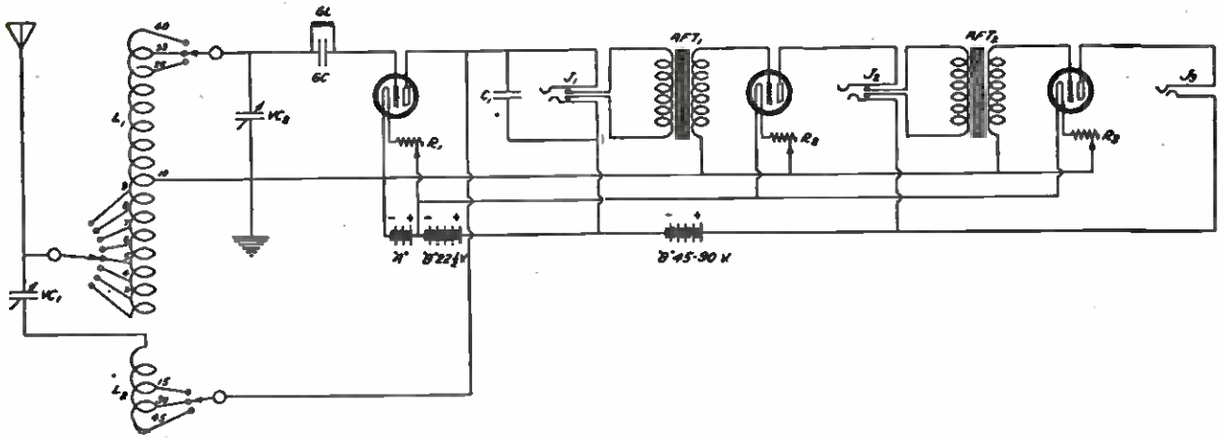
TRANSFORMER-COUPLED RADIO-FREQUENCY CIRCUIT WITH VACUUM-TUBE DETECTOR

Cost of parts: Not more than $35.00.
Selectivity: Good.
Operation: Simple. Two controls for wavelength, one for coupling and one for regeneration (the potentiometer).
Ease of construction: Not easy for the experimenter to get working right but a little patience and experimenting will soon get results.
Approximate range: 1,000 miles.
Outstanding feature: Although the amplification with this type is not as great (per stage), as with tuned-radio-frequency amplification, the tuning control is simplified.



TRIPLE-COIL, HONEYCOMB REGENERATIVE CIRCUIT WITH TWO STAGES OF AMPLIFICATION

Cost of parts: Not more than $35.00.
Selectivity: Good.
Operation: Rather complicated.
Ease of construction: Not hard to make.
Approximate range: 1,000 miles on the low broadcasting and amateur wavelengths and 3,000 miles on the extreme high wavelengths.
Outstanding features: It may be made to cover all wavelengths by interchanging coils. The coils may be plugged into sockets at will, thus making the set into a high or low wave receptor which is regenerative.



THE REINARTZ CIRCUIT, WITH TWO STAGES OF AUDIO AMPLIFICATION

Cost of parts: Not more than $35.00.

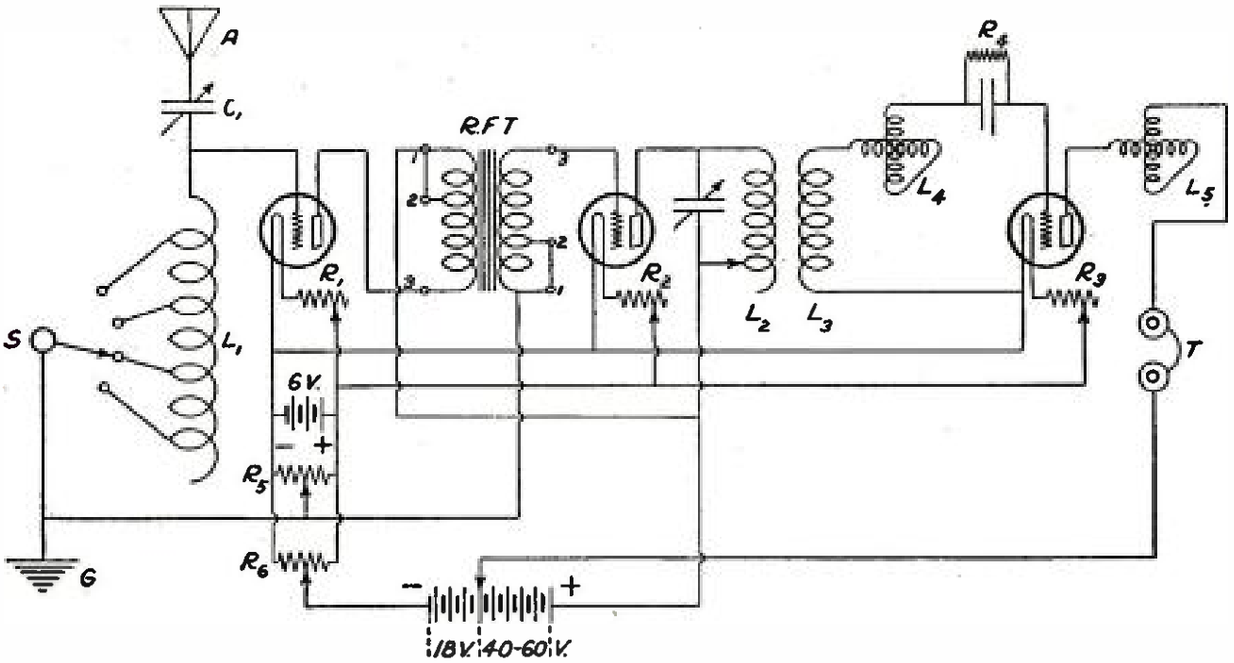
Selectivity: Excellent on amateur wavelengths, very good on broadcasting wavelengths.

Operation: Easy when mastered; about a month's practice should suffice to become well enough acquainted with the peculiarities of the tuning.

Ease of construction: Simple.

Approximate range: 1,500 miles.

Outstanding features: It is noted for its DX amateur reception and its low cost.



TWO STAGES OF TRANSFORMER-COUPLED, RADIO-FREQUENCY AMPLIFICATION ADDED TO THE TWIN-VARIOMETER, VARIO-COUPLER, REGENERATIVE CIRCUIT

Cost of parts: Not more than $50.00.

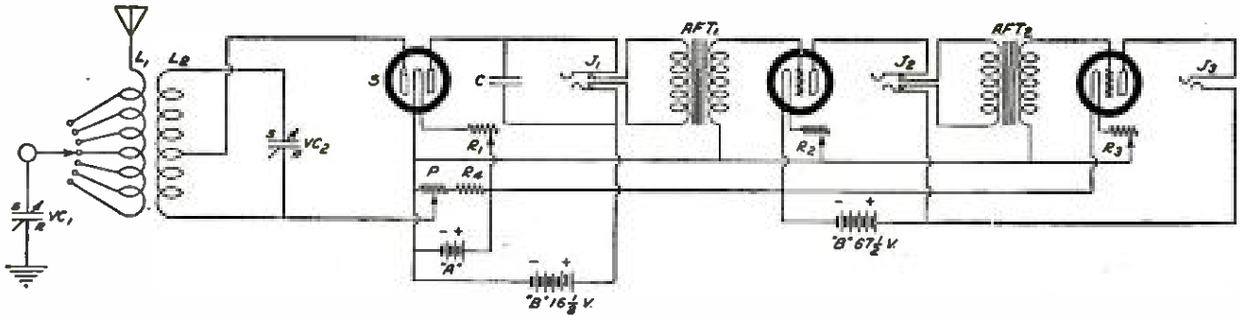
Selectivity: Good.

Operation: Complicated. The antenna must be tuned with the tapped switch and the variable condenser. There are two potentiometer adjustments, one for the stabilizer for the radio-frequency tubes, and one for adjusting the plate potential of the detector tube. Then the output circuit of the second radio-frequency tube must be tuned with the variable condenser, and the regular tuning of the variometers in the grid and plate circuits of the detector must be done before the signal is tuned in properly.

Ease of construction: Fairly complicated.

Approximate range: 1,500 miles.

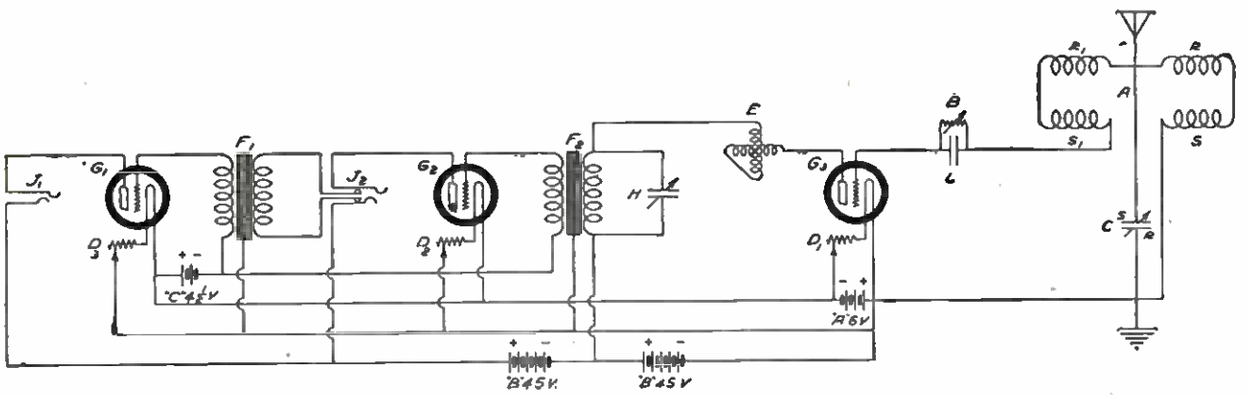
Outstanding features: Is reliable for distance reception without the audio-frequency amplification that is usually used with this detector circuit. The radio-frequency amplification brings in the distance with much greater strength without appreciably increasing the local signals.



DONLE DETECTOR CIRCUIT WITH TWO STAGES OF AUDIO-FREQUENCY AMPLIFICATION

Cost of parts: Not more than $38.00.
Selectivity: Fair.
Operation: Very simple.
Construction: Not hard to put together.*
Approximate range: 1,000 miles.
Outstanding feature: This circuit uses the new type of sodion tube which is extremely sensitive but which cannot oscillate or radiate.

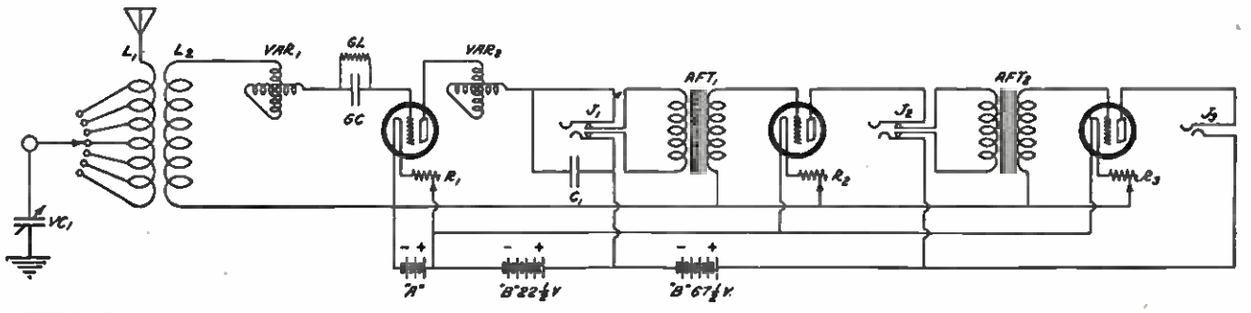
*(See POPULAR RADIO, *March, 1924, pages 294-5, for constructional details.)*



THE TOBIAS CIRCUIT FOR RECEPTION WITH AN INDOOR ANTENNA

Cost of parts: Not more than $55.00.
Selectivity: Excellent, if used on a short antenna.
Operation: Not hard to tune, once the mode of adjustment has been thoroughly learned.
Construction: No more complicated than other types of regenerative circuits.*
Approximate range: 1,200 miles.
Outstanding feature: Operates on a short indoor antenna with results about equal to the ordinary regenerative receiver used on an outdoor one.

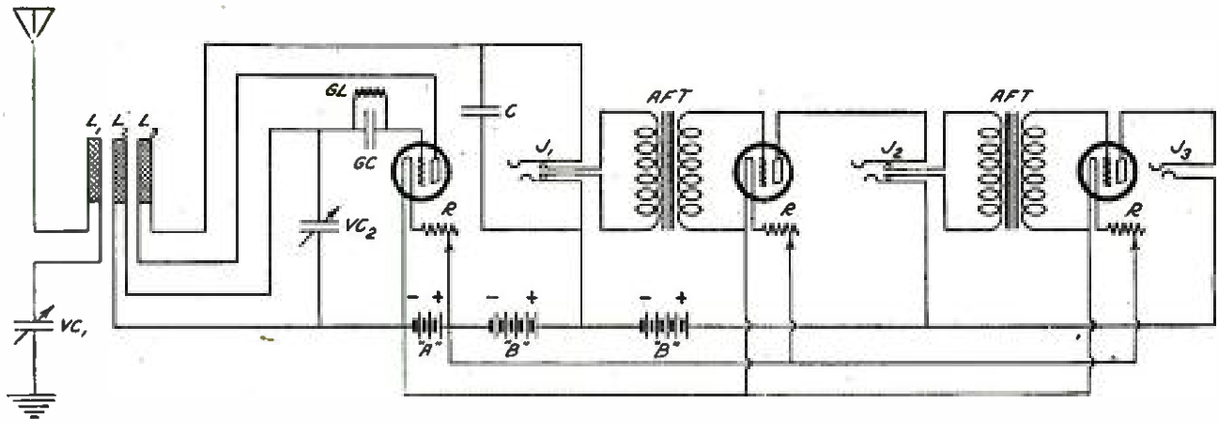
*(See POPULAR RADIO, *June, 1924, page 567, for constructional details.)*



TWIN-VARIOMETER, VARIOCOUPLER REGENERATIVE CIRCUIT WITH TWO STAGES OF AUDIO-FREQUENCY AMPLIFICATION

Cost of parts: Not more than $45.00.
Selectivity: Good
Operation: Difficult.
Ease of construction: Just an ordinary acquaintance with tools and some ability in wiring up the circuit is necessary.*
Approximate range: 1,200 miles.
Outstanding features: All the tuning is inductive and this makes for louder signals, at a slight loss of selectivity. Both tuning and regeneration are controlled by variometers.

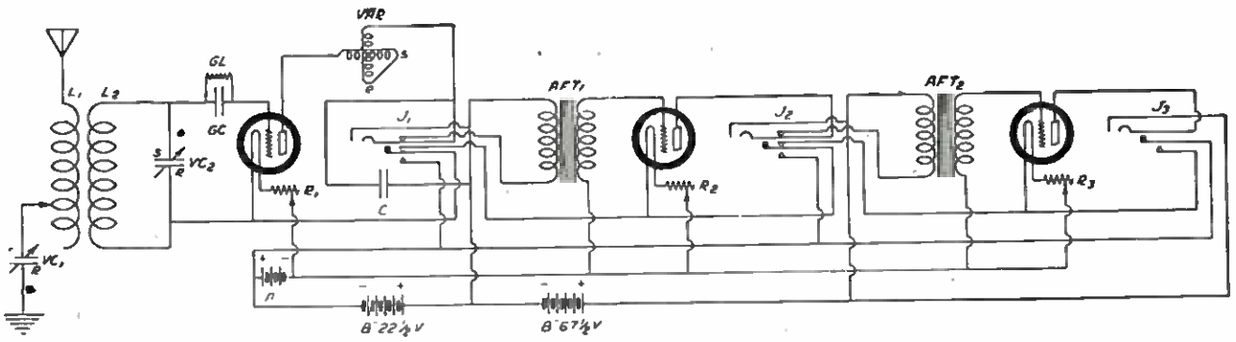
*(See POPULAR RADIO, *October, 1923, page 329, for constructional details.)*



TRIPLE-COIL HONEYCOMB REGENERATIVE RECEIVER WITH TWO STAGES OF AUDIO-FREQUENCY AMPLIFICATION

Cost of parts: Not more than $45.00.
Selectivity: Good.
Operation: Rather difficult to tune.
Ease of construction: The building of such a set is more difficult than the single-circuit tuner but better results in tuning will be worth the extra trouble, and the amplifier will make the set suitable for loudspeaker reception.*
Approximate range: 1,200 miles.
Outstanding feature: The set can be used for reception on any wavelength range by merely changing the size of coils.

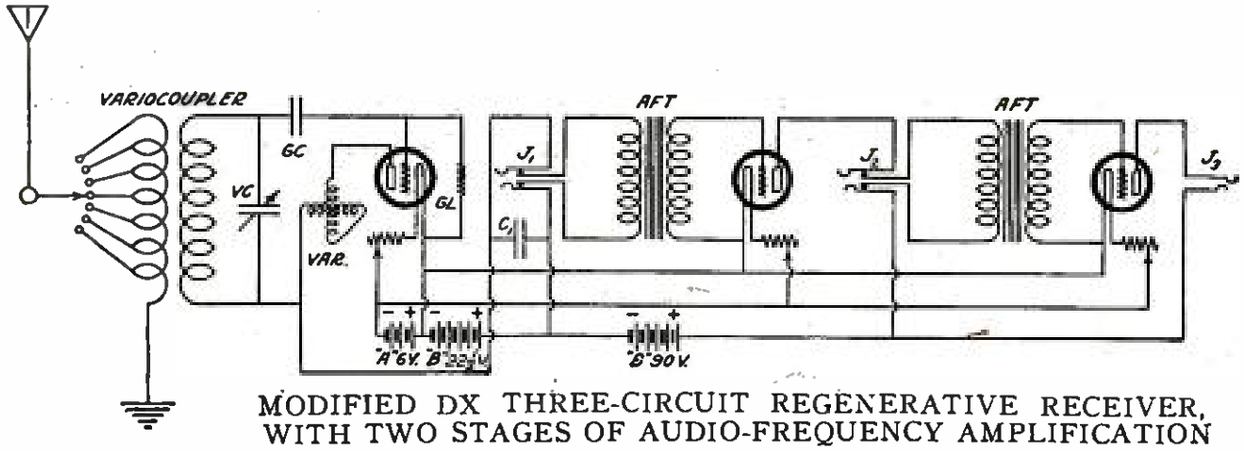
*(See POPULAR RADIO, *April, 1923, page 308, for constructional details.)*



REGENERATIVE RECEIVER WITH TWO STAGES OF AUDIO-FREQUENCY AMPLIFICATION, EQUIPPED WITH AUTOMATIC FILAMENT-LIGHTING JACKS

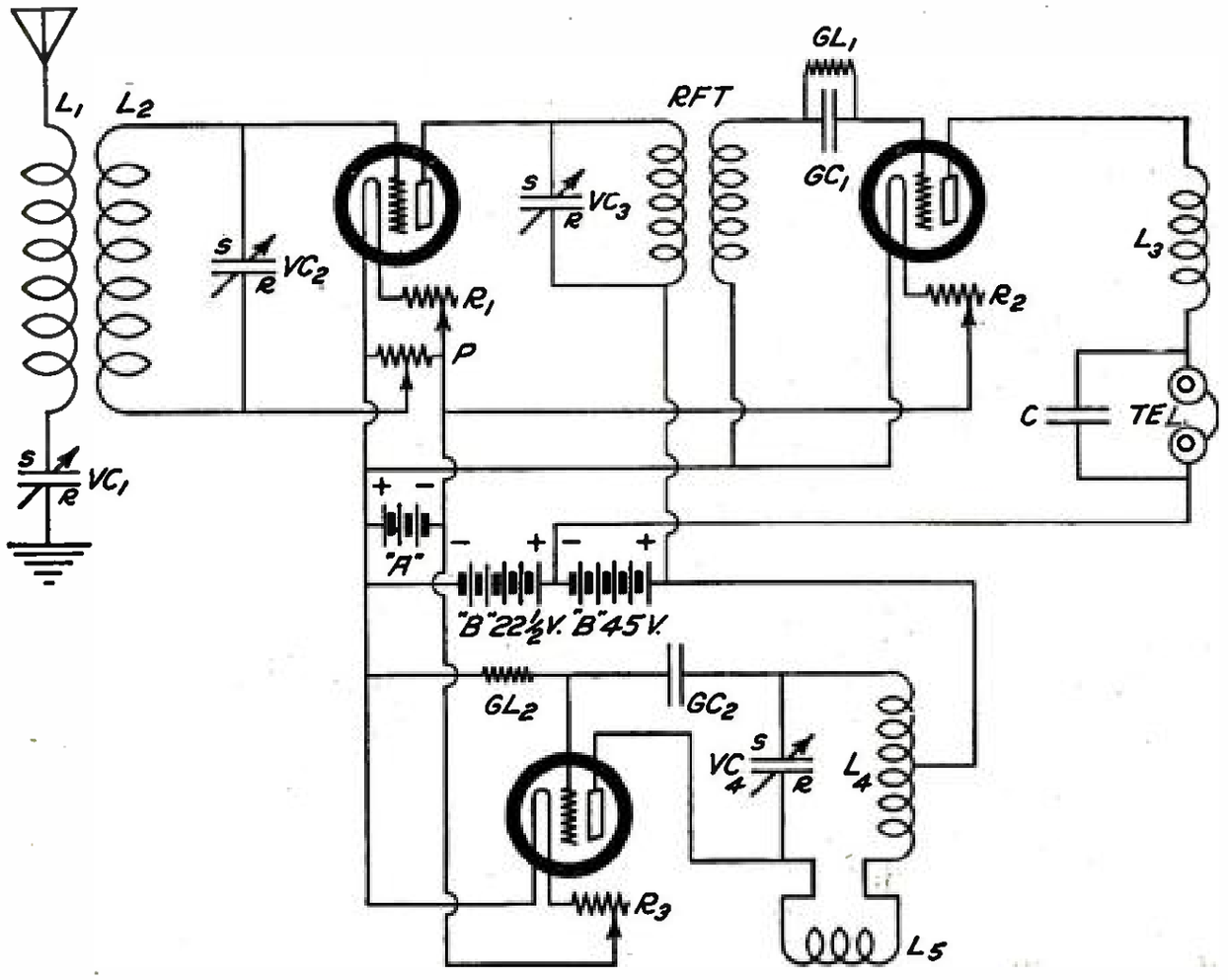
Cost of parts: Not more than $45.00.
Selectivity: Excellent.
Operation: Simple. The primary and secondary condensers control tuning, with the variocoupler for coupling control and the plate variometer for effecting regeneration. By merely inserting the telephone plug into the stage desired the filaments used are automatically turned on and off.
Construction: Some care is necessary in laying out the circuit and in wiring up the filament circuit.*
Approximate range: 1,200 to 1,500 miles.
Outstanding features: Selectivity. Automatic filament control.

*(See POPULAR RADIO, *July, 1924, pages 80-1, for constructional details.)*



MODIFIED DX THREE-CIRCUIT REGENERATIVE RECEIVER, WITH TWO STAGES OF AUDIO-FREQUENCY AMPLIFICATION

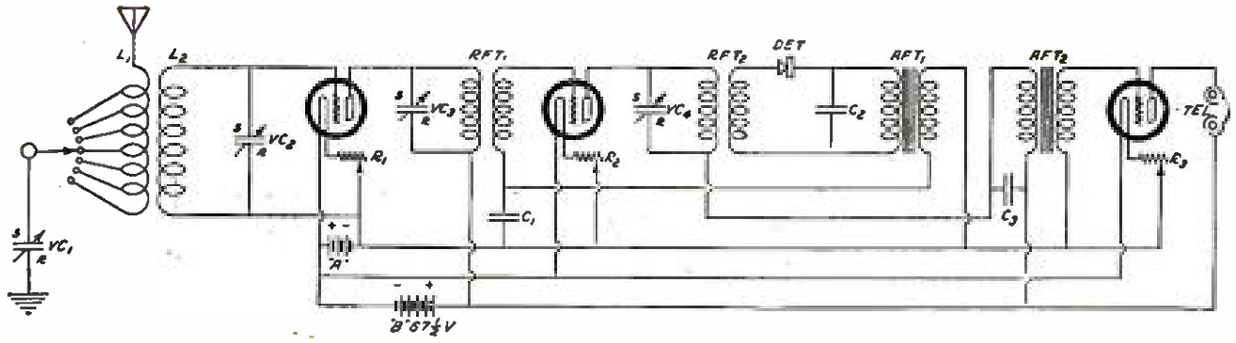
Cost of parts: Not more than $35.00
Selectivity: Excellent.
Operation: Fairly simple.
Ease of construction: Fairly easy to build.
Approximate range: 1,500 miles.
Outstanding features: Noted for DX amateur and broadcast reception and for its exceptionally sharp tuning.



ONE STAGE OF TUNED-RADIO-FREQUENCY, VACUUM-TUBE DETECTOR, WITH SEPARATE HETERODYNE FOR CW RECEPTION

Cost of parts: Not more than $50.00.
Selectivity: Excellent.
Operation: Difficult to tune.
Construction: Only the experienced radio experimenter should try to build this receiver.*
Approximate range: 1,500 to 2,000 miles for CW.
Outstanding feature: Excellent for reception of continuous-wave telegraphy.

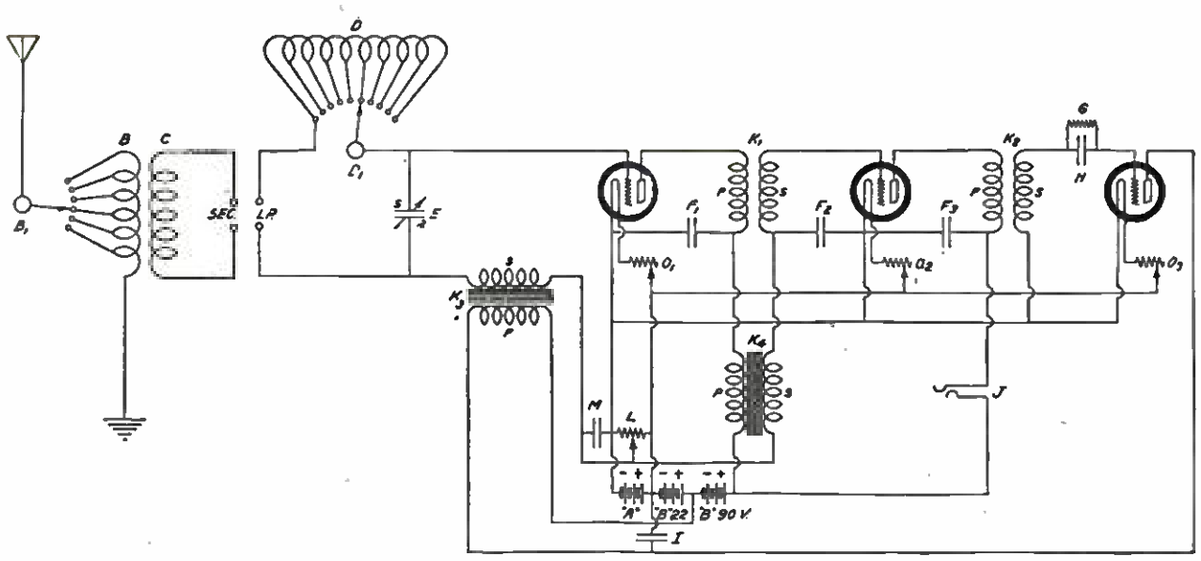
*(See POPULAR RADIO, *July 1924, page 77, for constructional details.)*



TWO STAGES OF TUNED-RADIO-FREQUENCY AMPLIFICATION, CRYSTAL DETECTOR AND TWO STAGES OF AUDIO-FREQUENCY AMPLIFICATION

Cost of parts: Not more than $60.00.
Selectivity: Very good. Tuning is accomplished entirely by means of variable condensers.
Operation: Rather complicated. The tuning should be done by logging the settings for the various wavelengths.
Construction: Not a simple set to make. Some experience in making sets should be had before attempting construction.*
Approximate range: 2,500 miles.
Outstanding features: Only three tubes are used. One stage of audio-frequency amplification is reflexed.

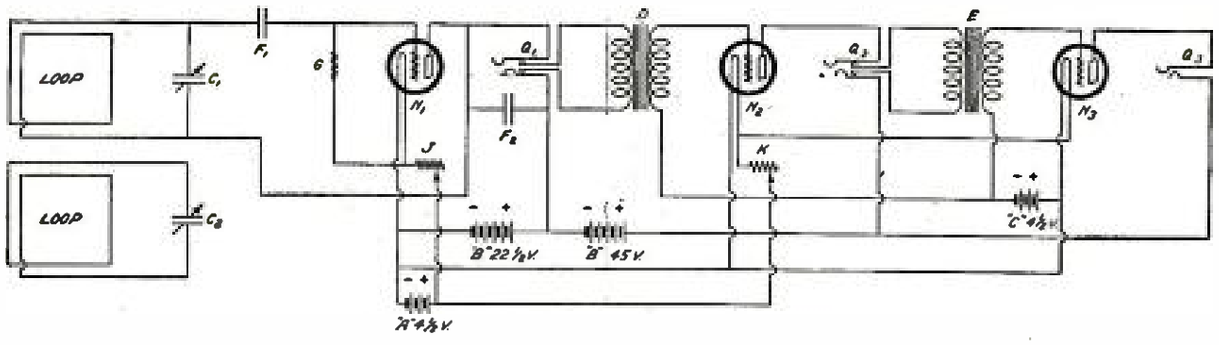
**(See* POPULAR RADIO, *January, 1924, pages 80-1, for constructional details.)*



THE REMY REFLEX

Cost of parts: Not more than $70.00.
Selectivity: Very good.
Operation: Simple.
Construction: Not very difficult to make. Refer to the article in the issue given below.*
Approximate range: See Remy's article.
Outstanding features: Simplicity of control and economical from a tube standpoint.

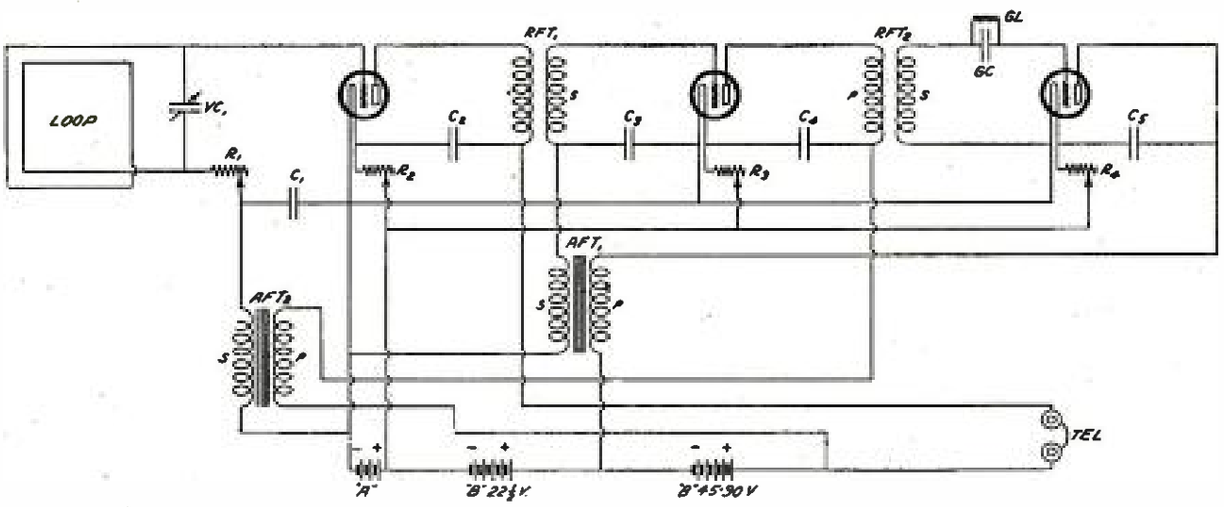
**(See* POPULAR RADIO, *February, 1924, page 167, for constructional details.)*



FOUR-CIRCUIT PORTABLE RECEIVER

Cost of parts: Not more than $50.00.
Selectivity: Excellent.
Operation: Simple.
Construction: Not difficult.*
Approximate range: Local.
Outstanding feature: All parts mounted in a cabinet, including loops, batteries and tubes.

(See POPULAR RADIO, February, 1924, page 152, for constructional details.)



THE GRIMES REFLEX CIRCUIT

Cost of parts: Not more than $40.00.

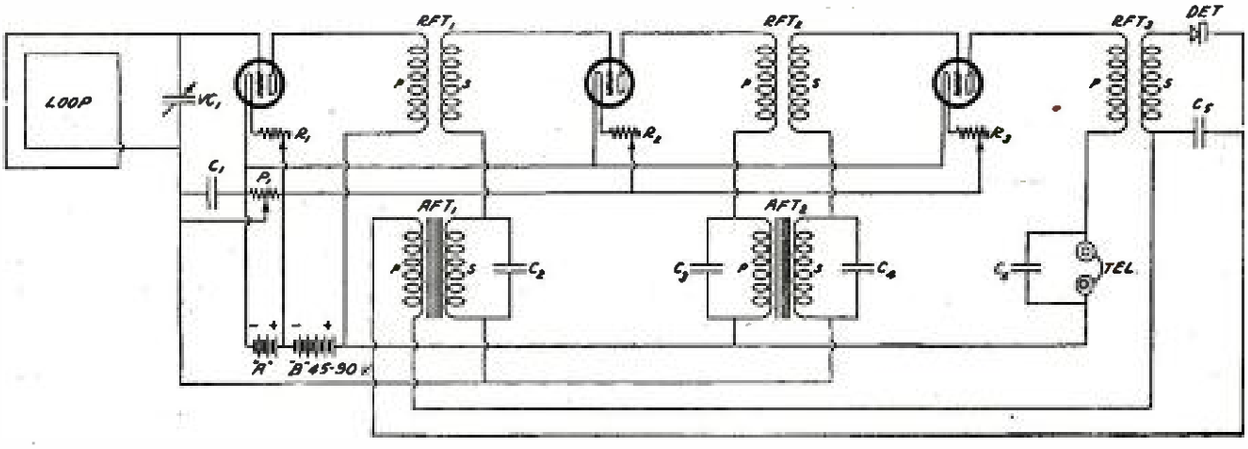
Selectivity: Excellent.

Operation: Extremely simple. Only one control for wavelength needed and one control for regeneration.

Ease of construction: This is a quite complicated circuit to follow out and to get in operation. There are a number of details that will give the beginner trouble when he first tries to make this set, but they can be overcome.

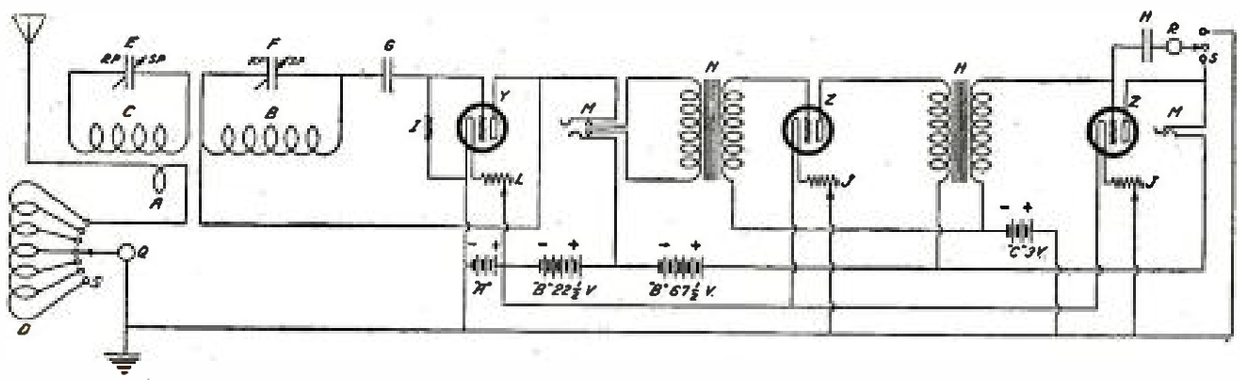
Approximate range: 500 miles (with loop antenna).

Outstanding features: No outdoor antenna is needed for DX reception. Simplicity of tuning. No crystal detector to bother with. The audio-frequency amplification is fed back to the next preceding tube in each stage.



THE SQUIRE REFLEX CIRCUIT

Cost of parts: Not more than $50.00.
Selectivity: Excellent.
Operation: Very simple. One control for wavelength and one control for regeneration; the only other adjustment that must be made is the setting of the crystal detector.
Ease of construction: More or less complicated. There are a number of precautions that must be taken to get the circuit to operate at highest efficiency.
Approximate range: 500 miles (with the loop antenna).
Outstanding features: No outdoor antenna is needed for DX reception. Simplicity of tuning.

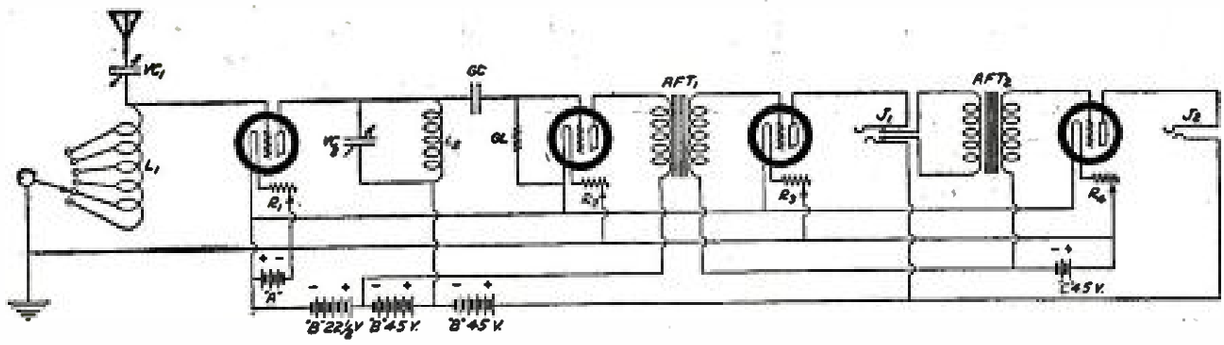


THE THREE-TUBE, 4-CIRCUIT TUNER

Cost of parts: Not more than $40.00.
Selectivity: Excellent.
Operation: Very simple. There is one dial which controls the wavelength and one dial which controls regeneration. This dial can be set for the whole band of wavelengths over which regeneration will be constant.
Ease of construction: Not complicated. Be sure that the best parts are obtained, and the results will exceed expectations. Poor parts will render the circuit useless.*
Approximate range: 2,400 miles.
Outstanding features: Loudspeaker reception from distant broadcasting. Regeneration is independent of wavelength. Best sensitivity and selectivity.

*(See POPULAR RADIO, *May, 1923; also August, 1923, page 165, for constructional details.)*

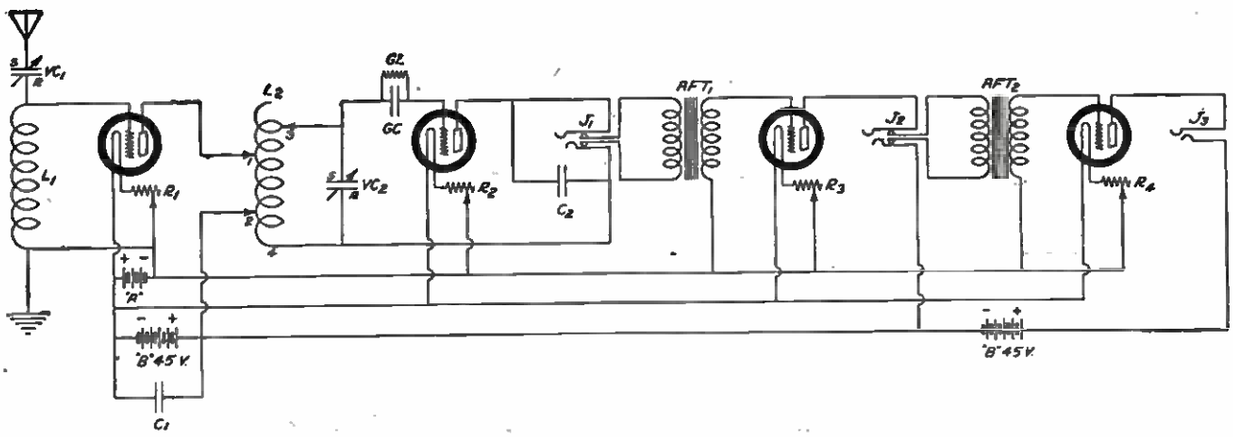
Four-tube Circuits



ONE STAGE OF TUNED-RADIO-FREQUENCY, DETECTOR AND TWO STAGES OF AUDIO-FREQUENCY AMPLIFICATION

Cost of parts: Not more than $30.00.
Selectivity: Good.
Operation: Not difficult to tune.
Construction: Not any more complicated than the ordinary 3-tube regenerative receiver.*
Approximate range: 2,000 miles.
Outstanding features: Good on DX reception. No potentiometer used. Truthful reproduction.

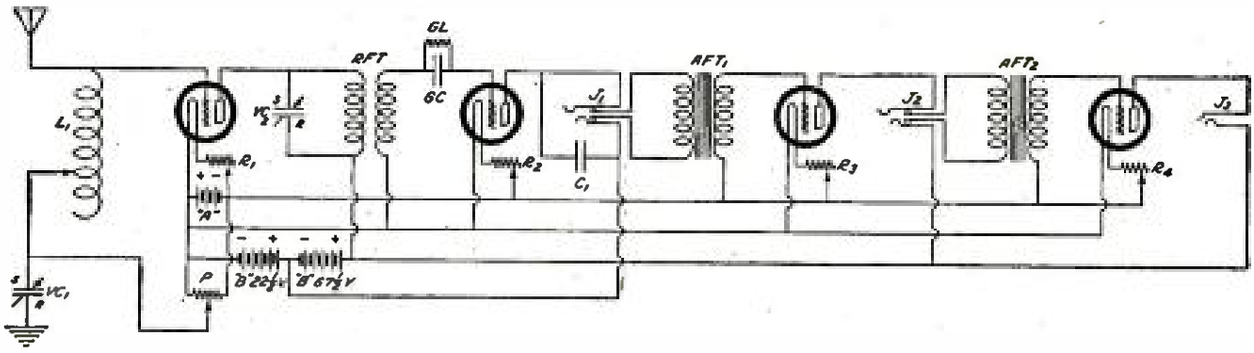
(See POPULAR RADIO, May, 1924, pages 446-7, for constructional details.)



ABELE CIRCUIT COMPRISING ONE STAGE OF TUNED-RADIO-FREQUENCY AMPLIFICATION, VACUUM-TUBE DETECTOR AND TWO STAGES OF AUDIO-FREQUENCY AMPLIFICATION

Cost of parts: Not more than $35.00.
Selectivity: Very good.
Operation: Fairly complicated.
Construction: Rather difficult to make.*
Approximate range: 2,000 miles.
Outstanding features: Tuned-radio-frequency amplification is employed with a novel means for coupling the plate circuits of the radio-frequency amplifier tube and the detector tube together, to obtain regeneration.

(See POPULAR RADIO, May, 1924, pages 502-3, for constructional details.)



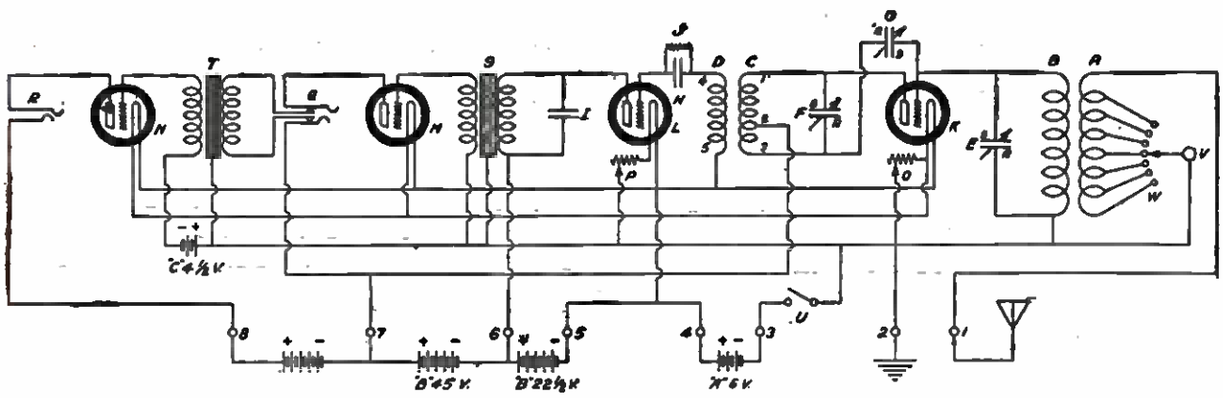
SINGLE-STAGE RADIO-FREQUENCY AMPLIFIER WITH TUNED-PLATE CIRCUIT, DETECTOR, AND TWO-STAGE AUDIO-FREQUENCY AMPLIFIER

Cost of parts: Not more than $45.00.
Selectivity: Very good.
Operation: Simple.
Ease of construction: Not any more complicated than the regular regenerative 3-tube circuit.*

Approximate range: 2,000 miles.

Outstanding features: Particularly good for DX reception of broadcasting. Simple to handle and truthful in reproduction of musical programs.

(See POPULAR RADIO, November, 1923, page 420, for constructional details.)

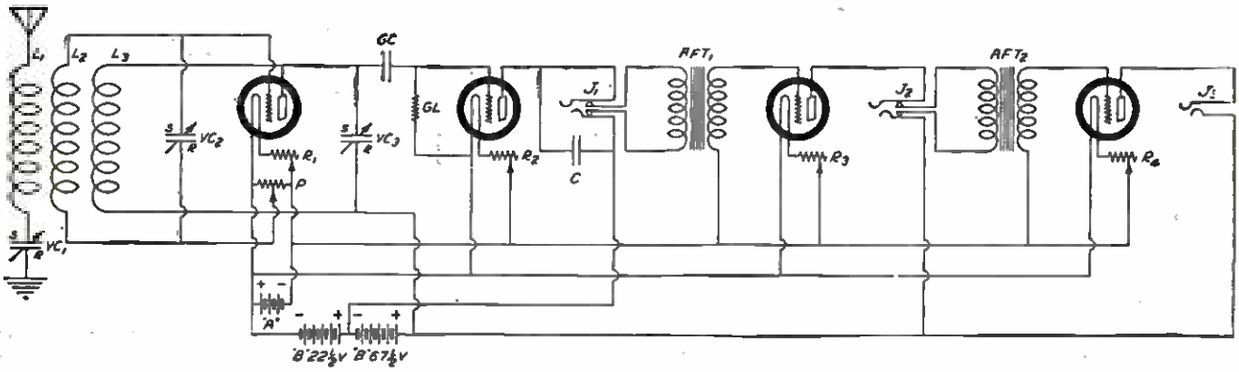


THE CRAIG CIRCUIT, EMPLOYING THE PRINCIPLE OF TUBE-CAPACITY NEUTRALIZATION

Cost of parts: Not more than $70.00.
Selectivity: Excellent.
Operation: Easy to tune. Two dials on the variable condensers tune the input and the output circuits of the radio-frequency tube.

Construction: Not hard to build.*
Approximate range: Up to 3,000 miles.
Outstanding features: Exceptional volume. DX reception and clarity of reception. Does not radiate.

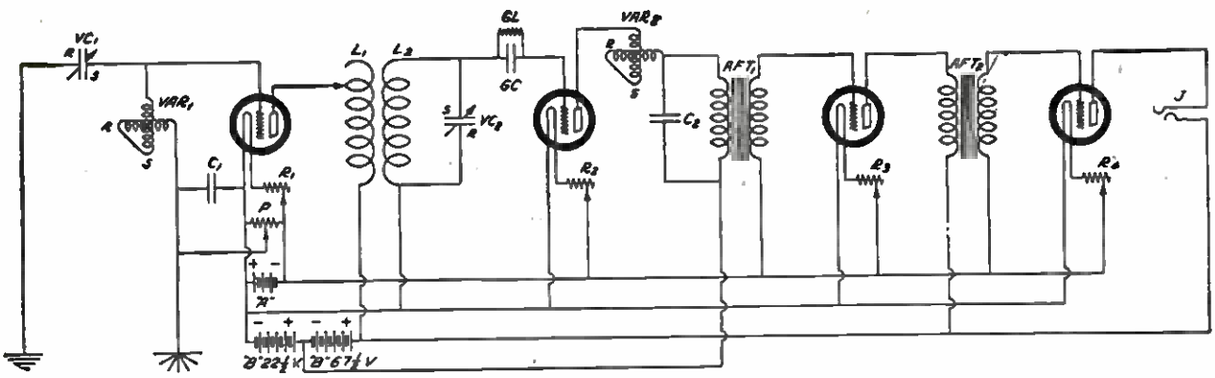
(See POPULAR RADIO, April, 1924, page 378, for constructional details.)



ONE STAGE OF TUNED-RADIO-FREQUENCY AMPLIFICATION, VACUUM TUBE DETECTOR AND TWO STAGES OF AUDIO-FREQUENCY AMPLIFICATION EMPLOYING HONEYCOMB COILS FOR TUNING

Cost of parts: Not more than $46.00.
Selectivity: Good.
Operation: Fairly complicated.
Construction: Not easy to build.*
Approximate range: 2,400 miles.
Outstanding features: With few additions, this set can be made from the standard triple-coil hook-up. It is good on distance reception.

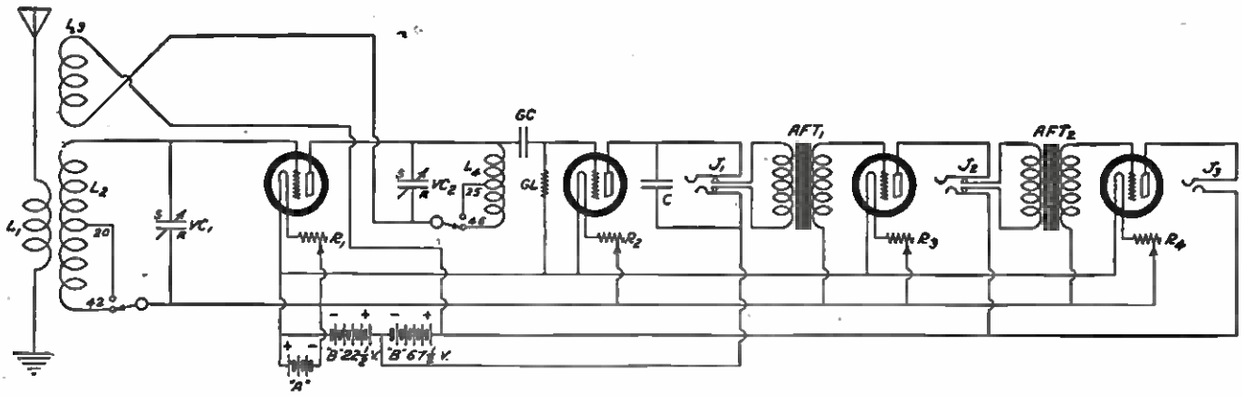
*(See POPULAR RADIO, July, 1924, pages 78-9, for constructional details.)



ONE STAGE OF TUNED-RADIO-FREQUENCY AMPLIFICATION, WITH A VACUUM-TUBE DETECTOR AND TWO STAGES OF AUDIO-FREQUENCY AMPLIFICATION

Cost of parts: Not more than $50.00.
Selectivity: Excellent.
Operation: Not hard to tune. Some experience will have to be gotten, however, before the operator will be able to get the most out of the set.
Construction: Rather complicated. The lay-out of the set should be carefully studied before it is finally decided upon.*
Approximate range: 500 miles.
Outstanding features: The set will operate without an antenna and employs two grounds or a ground and a short piece of wire acting as a counterpoise. It tunes extremely sharp, and will operate a loud-speaker.

*(See POPULAR RADIO, November, 1923, pages 374-5, for constructional details.)



THE SUPERDYNE CIRCUIT WHICH EMPLOYS A REVERSED-TICKLER FEED-BACK FOR ELIMINATING REGENERATION

Cost of parts: Not more than $47.00.

Selectivity: Excellent.

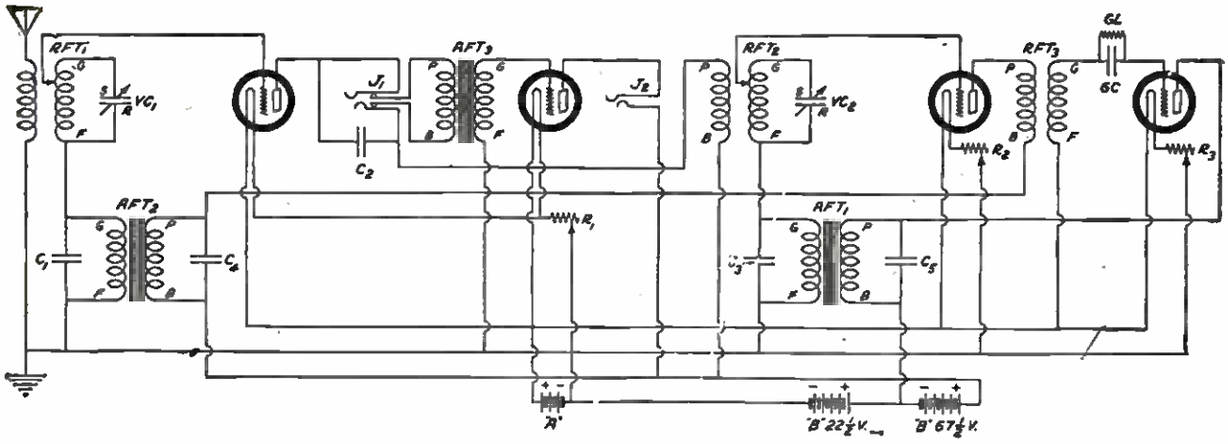
Operation: Rather complicated. The operator will have to get used to the proper adjustment of the tickler before he will get good results, but when this has been learned, the set will function nicely.

Construction: Fairly complicated.*

Approximate range: 2,000 miles.

Outstanding features: Excellent selectivity and sensitivity.

(See POPULAR RADIO, March, 1924, pages 296-7, for constructional details.)



GRIMES INVERSE-REFLEX

Using two stages of tuned-radio-frequency amplification, one stage of transformer-coupled radio-frequency amplification, vacuum-tube detector, and two stages of audio-frequency amplification.

Cost of parts: Not more than $55.00.

Selectivity: Very good.

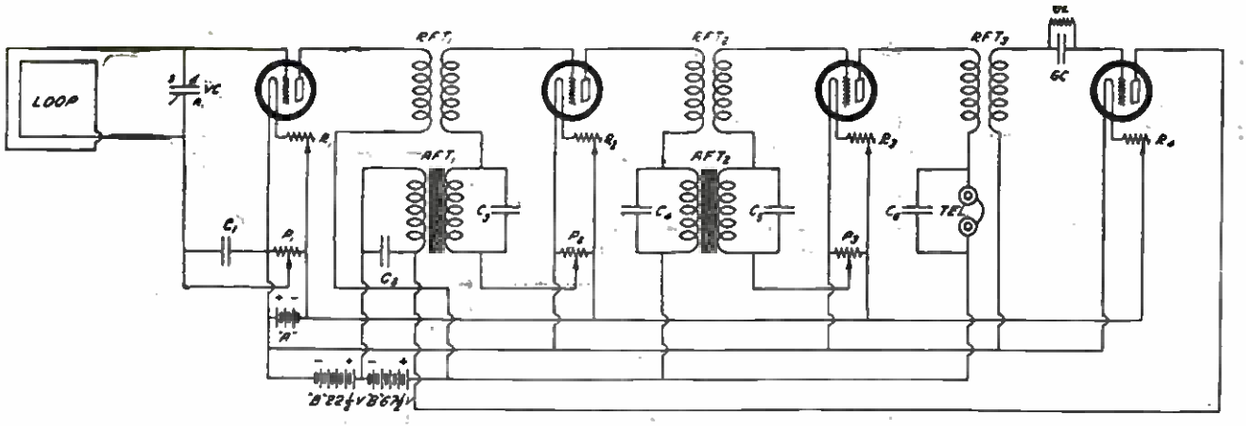
Operation: Not complicated. Two controls.

Construction: More or less complicated. There are a number of precautions that must be taken to get the circuit to function properly.*

Approximate range: 2,000 miles.

Outstanding features: Simplicity of control, and sensitivity to weak signals, as well as being economical from a tube standpoint.

(See POPULAR RADIO, April, 1924, page 398, for constructional details.)

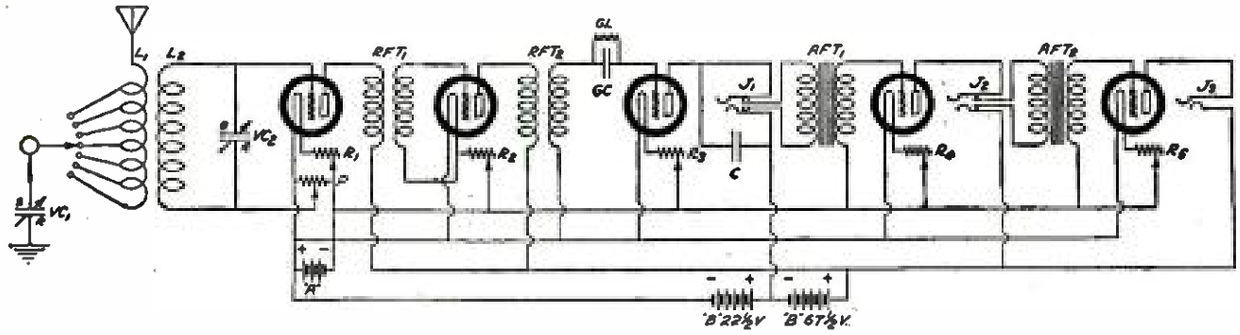


FOUR-TUBE REFLEX WITH THREE STAGES OF RADIO-FREQUENCY AMPLIFICATION, VACUUM-TUBE DETECTOR AND TWO STAGES OF AUDIO-FREQUENCY AMPLIFICATION

Cost of parts: Not more than $60.00.
Selectivity: Excellent.
Operation: Very simple. Just one control for tuning—a variable condenser connected in shunt to the loop. Regeneration is controlled in the radio-frequency circuits by means of potentiometers.
Ease of construction: More or less complicated. There are a number of precautions that must be taken to get the circuit to function properly.*
Approximate range: 1,000 miles (on a loop antenna).
Outstanding features: No outdoor antenna needed for DX reception. Simplicity of tuning. No crystal detector to bother with.

(See POPULAR RADIO, November, 1923, page 418, for constructional details.)

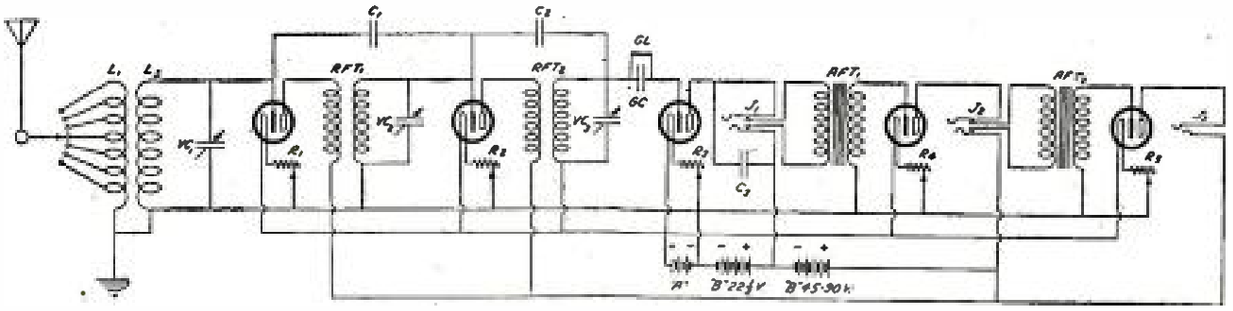
Five-tube Circuits



TWO STAGES OF TRANSFORMER-COUPLED RADIO-FREQUENCY AMPLIFICATION WITH VACUUM-TUBE DETECTOR AND TWO STAGES OF AUDIO-FREQUENCY AMPLIFICATION

Cost of parts: Not more than $54.00
Selectivity: Good.
Operation: Easy to tune. The two variable condensers control tuning. Coupling is varied by means of the variocoupler, and regeneration in the first stage is controlled with the potentiometer.
Construction: More or less complicated. There are a number of precautions that should be taken to get the circuit to function properly.*
Approximate range: 1,500 miles.
Outstanding features: Only two dials for changes of wavelength. The coupling can be set for the desired degree of selectivity and then all other tuning can be accomplished with the two condensers.

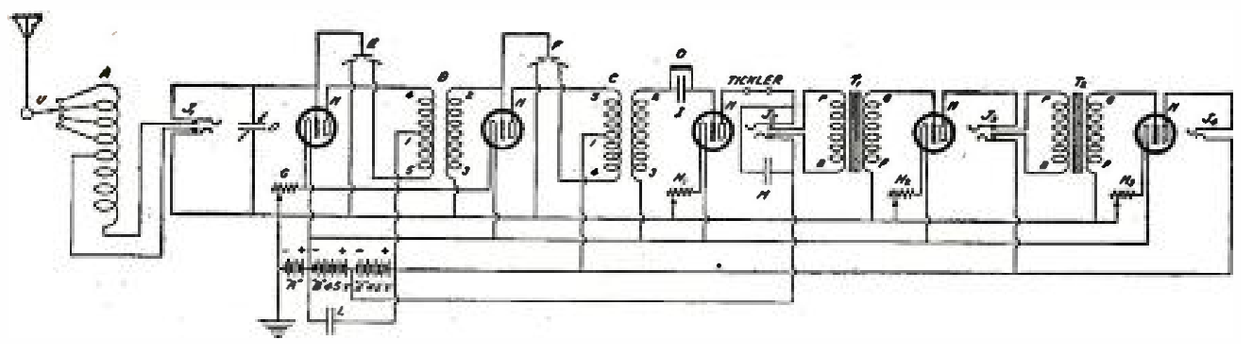
(See POPULAR RADIO, June, 1924, pages 610-1, for constructional details.)



FIVE-TUBE NEUTRODYNE

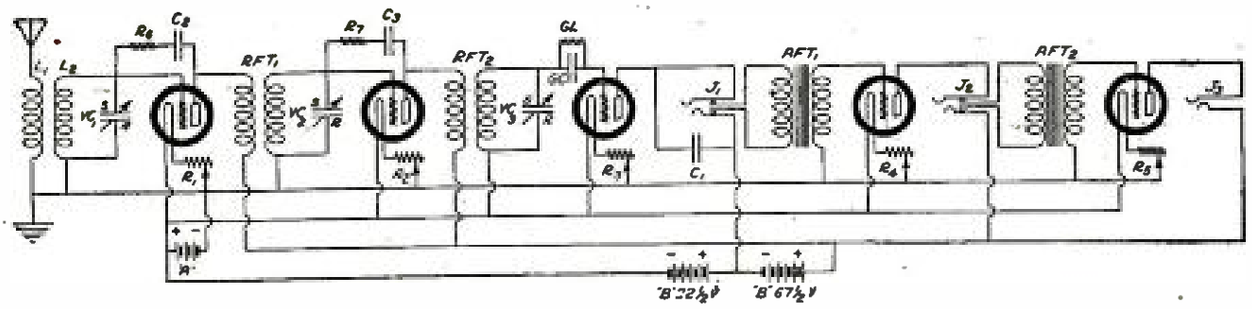
Cost of parts: Not more than $60.00.
Selectivity: Very good. There are three controls for wavelength.
Operation: Simple, if the set is tuned by means of a chart. In fact this is the only way to tune this receiver successfully.
Ease of construction: More or less complicated. There are a number of precautions that must be taken to get the circuit to function properly, especially in the matter of eliminating feedback. The set will operate more efficiently when the neutralizing condensers are upset slightly so that the set will regenerate without readily bursting into uncontrolled oscillation.*
Approximate range: 2,400 miles.
Outstanding features: The wavelength can be calibrated. The set will not re-radiate. Anyone can operate the set by means of the tuning chart.

**(See* POPULAR RADIO, *September, 1923, page 248, for constructional details.)*



MODIFIED ACMEDYNE CIRCUIT WITH TWO STAGES OF COMPENSATED RADIO-FREQUENCY AMPLIFICATION AND TWO STAGES OF AUDIO-FREQUENCY AMPLIFICATION

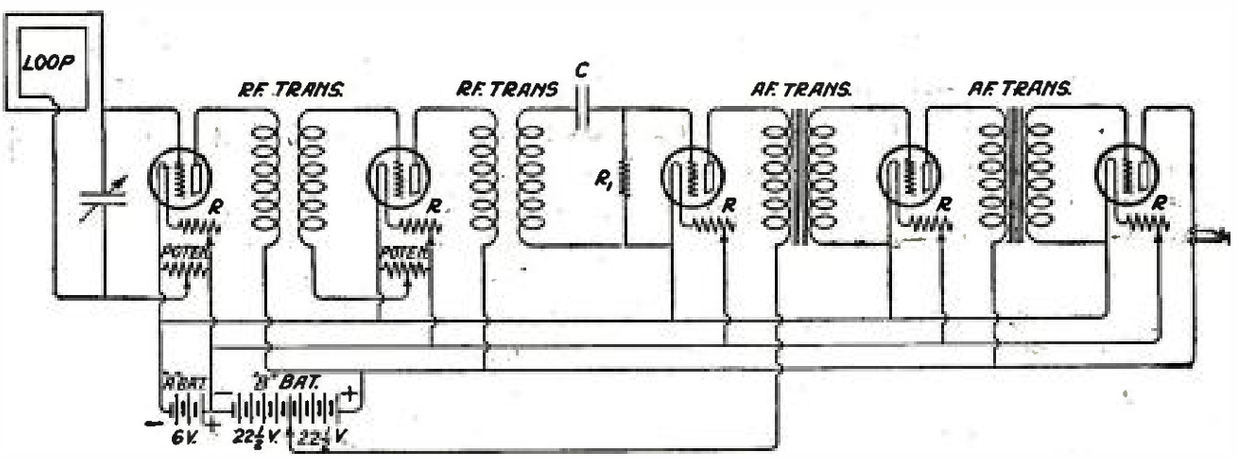
Cost of parts: Not more than $60.00.
Selectivity: Wonderful.
Operation: Rather complicated for the beginner, but the correct method can be acquired in a month's practice in tuning.
Ease of construction: This, of course, is a complicated circuit to follow out and to get going properly, but it can be done and the set is well worth while.
Approximate range: 2,500 miles.
Outstanding features: Extremely sharp tuning, DX reception and clarity of signals. The trouble encountered in most radio-frequency-amplification circuits, that of properly controlling or eliminating oscillation, is definitely taken out of this circuit by an ingenious device called a compensating condenser which has three plates attached respectively to the grid, filament, and plate circuits of the vacuum tubes.



THE PLIODYNE PRINCIPLE INCORPORATED INTO A RADIO-FREQUENCY CIRCUIT WITH VACUUM-TUBE DETECTOR AND TWO-STAGE AUDIO-FREQUENCY AMPLIFIER

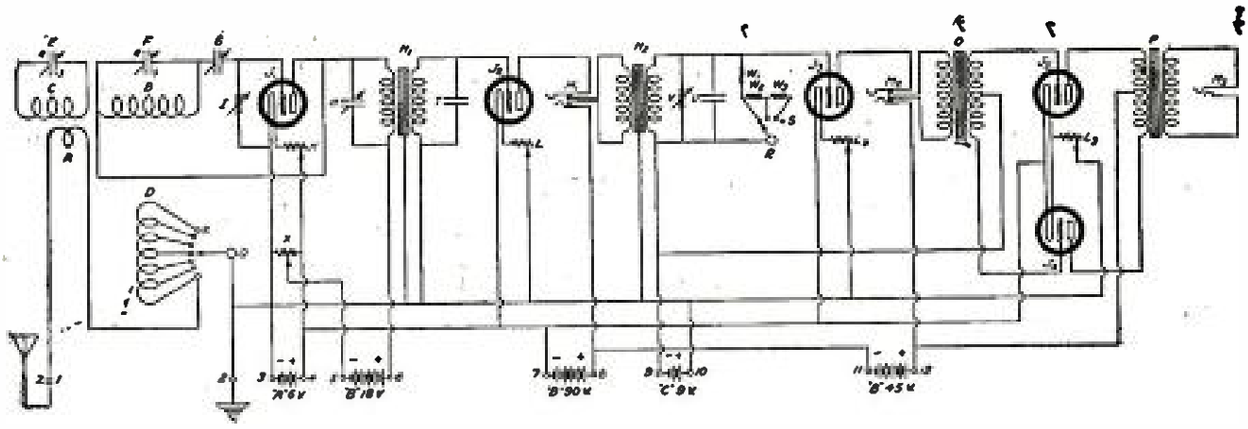
Cost of parts: Not more than $60.00.
Selectivity: Very good.
Operation: Not very difficult to tune. Three variable condensers, which are set at practically the same settings, control the tuning.
Construction: Complicated.*
Approximate range: 2,400 miles
Outstanding features: Oscillation and regeneration are prevented by means of "phasing out." The set will not radiate.

**(See* POPULAR RADIO, *May, 1924, pages 500-1, for constructional details.)*



TWO STAGES OF RADIO, DETECTOR, AND TWO STAGES OF AUDIO-FREQUENCY AMPLIFICATION

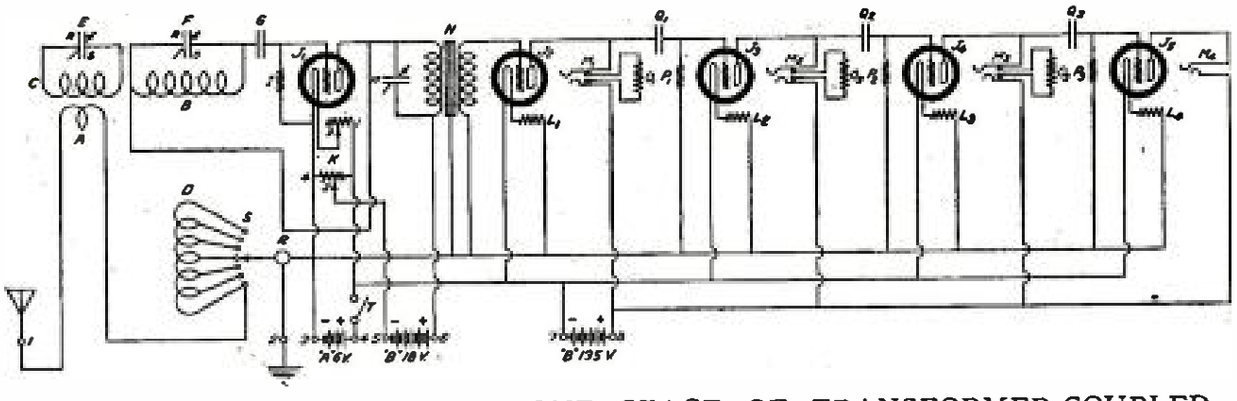
Cost of parts: Not more than $50.00.
Selectivity: Good.
Operation: Simple. Only one control for tuning the variable condenser. The two potentiometers are used as stabilizers for the control of regeneration in the radio-frequency stages.
Ease of construction: More or less complicated. There are a number of precautions that must be taken to get the circuit to function properly.
Approximate range: 500 miles (on a loop antenna).
Outstanding features: No outdoor antenna necessary and simplicity of tuning.



THE FOUR-CIRCUIT TUNER WITH TWO STAGES OF STRAIGHT TRANSFORMER-COUPLED AMPLIFICATION, AND ONE STAGE OF PUSH-PULL AMPLIFICATION

Cost of parts: Not more than $90.00.
Selectivity: Excellent.
Operation: Simple to tune.
Construction: Some experience in wiring up the circuit is necessary.*
Approximate range: 3,400 miles.
Outstanding features: Selectivity. Ease of tuning. Good reproduction.

**(See* POPULAR RADIO, *January, 1924, page 23, for constructional details.)*

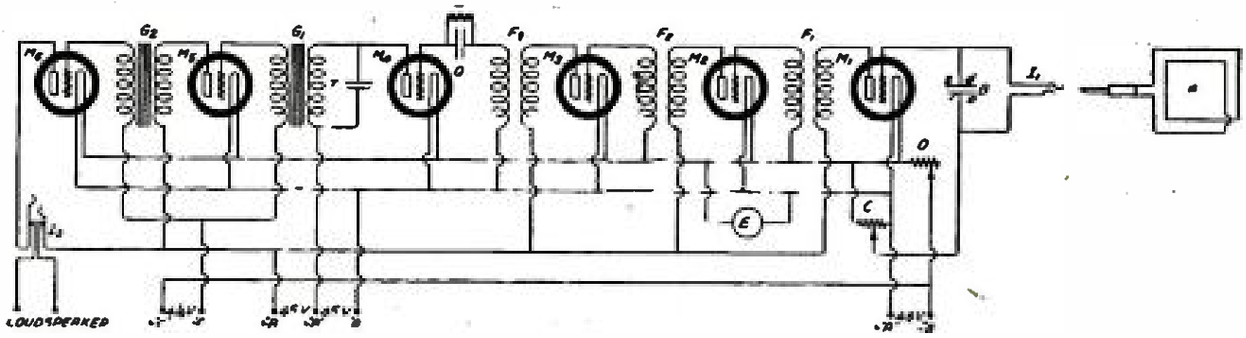


FOUR-CIRCUIT TUNER WITH ONE STAGE OF TRANSFORMER-COUPLED AND THREE STAGES OF RESISTANCE-COUPLED AMPLIFICATION

Cost of parts: Not more than $55.00.
Selectivity: Excellent.
Operation: Simple to tune.
Construction: Not difficult.*
Approximate range: 3,400 miles.
Outstanding features: Increased selectivity. Ease of tuning and wonderful reproduction are possible with this receiver. In fact, with this particular circuit there has been no other receiver ever tested in POPULAR RADIO LABORATORY that can beat it as to truthful and pleasing reproduction of speech and music.

**(See* POPULAR RADIO, *October, 1924, page 378, for constructional details.)*

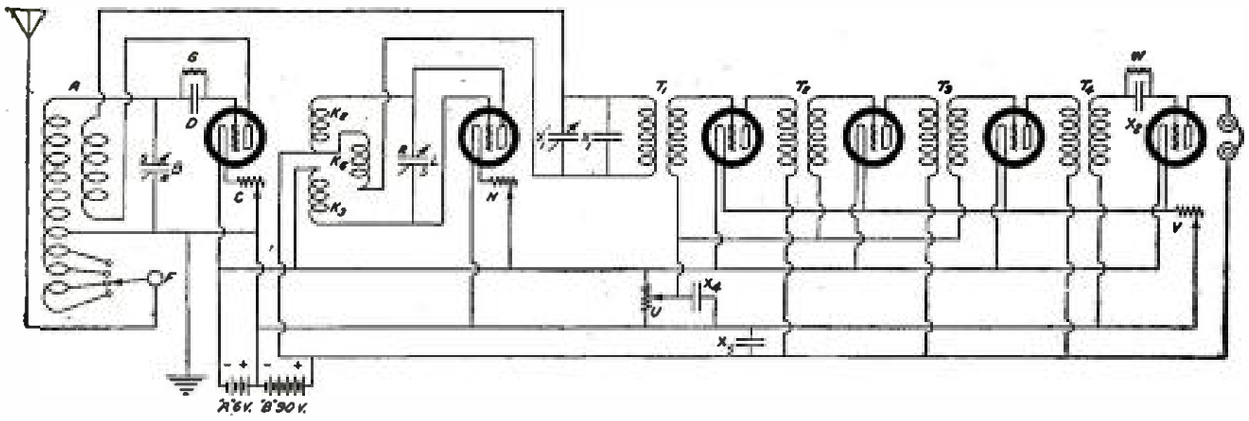
Circuits of More Than Five Tubes



THE POPULAR RADIO PORTABLE

Cost of parts: Not more than $100.00 (complete with tubes, batteries and loudspeaker).
Selectivity: Good.
Operation: Extremely simple. All tuning is done with the variable condenser, and regeneration in the first tube circuit is controlled by the potentiometer.
Construction: Not difficult, but there is a lot of work necessary.*
Approximate range: Up to 1,500 miles.
Outstanding features: Portability. All batteries and tubes and loudspeaker contained in carrying case. Simplicity of operation.

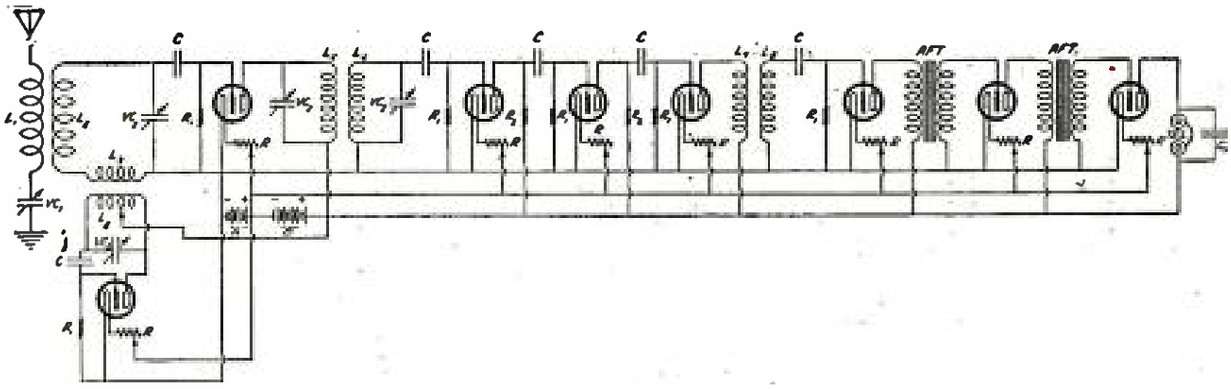
**(See* Popular Radio, *July, 1924, page 60, for constructional details.)*



A SUPERHETERODYNE CIRCUIT FOR AIR-CORE INTERMEDIATE-WAVE TRANSFORMERS

Cost of parts: Not more than $80.00.
Selectivity: Very good.
Operation: Not difficult to tune, when the mode of operation is learned.
Construction: Rather complicated.*
Approximate range: 3,400 miles.
Outstanding features: Easier to tune than most complicated circuits. Good distance and selectivity.

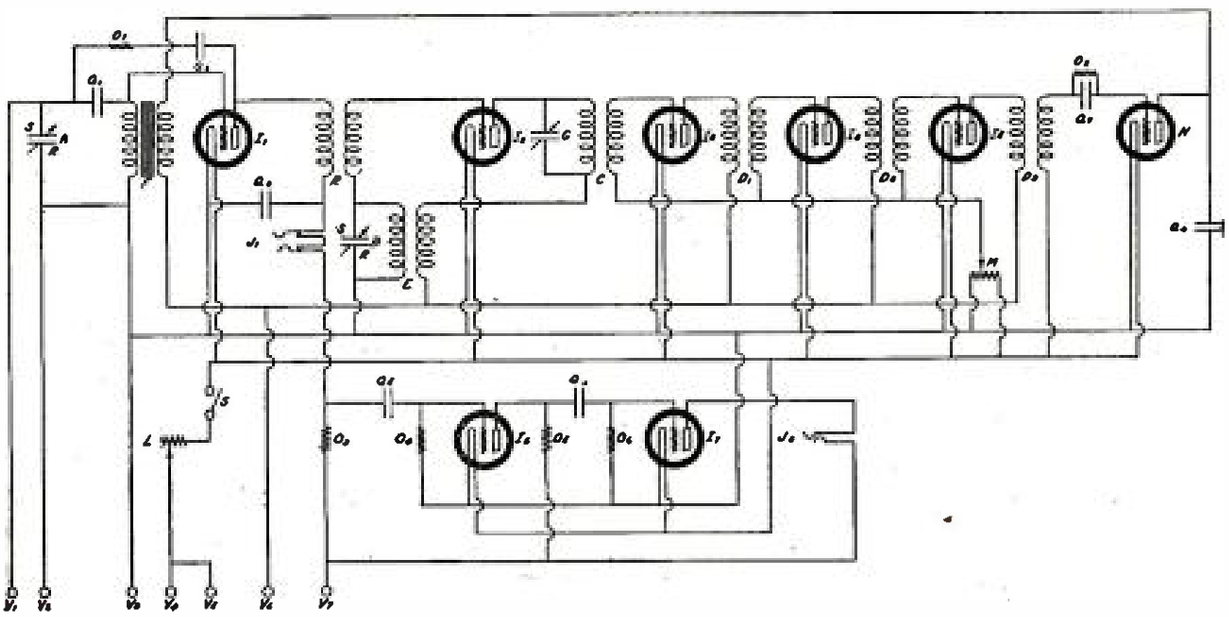
**(See* Popular Radio, *September, November and December, 1923, issues, for constructional details.)*



A RESISTANCE-COUPLED SUPERHETERODYNE WITH TWO STAGES OF AUDIO-FREQUENCY AMPLIFICATION

Cost of parts: Not more than $80.00.
Selectivity: Excellent.
Operation: Difficult.
Construction: A very complicated circuit to master.*
Approximate range: 3,000 miles.
Outstanding feature: This set combines sensitivity with great selectivity.

(See POPULAR RADIO, June, 1923, pages 468-9, for constructional details.)



8-TUBE SUPERHETERODYNE REFLEX CIRCUIT

Cost of parts: Not more than $80.00.
Selectivity: Excellent.
Operation: Rather simple.
Construction: A complicated circuit to put together and get into proper operation.*
Approximate range: 3,500 miles.
Outstanding features: This receiver has an exceptional range on a loop. Its tone quality is good and the directional effect of loop tuning helps to cut out a large percentage of interference that could not be eliminated through ordinary tuning means. Needs no outdoor antenna.

(See POPULAR RADIO, January, 1925, page 36, for constructional details.)

"What Set Shall I Buy?"

2nd Installment

For the guidance of readers who want specific and authoritative information concerning the best of the ready-made receivers that are now on the market, this feature will be published monthly until all of the receivers that have passed the tests of the POPULAR RADIO LABORATORY have been included

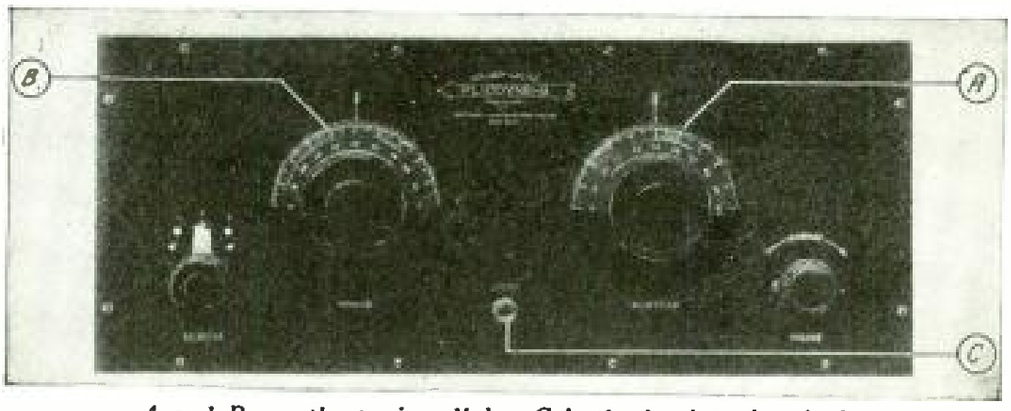
The Standardyne Receiver

MANUFACTURER'S NAME; The Standard Radio & Electric Company
MODEL; type C
NUMBER OF TUBES; six
TYPE OF TUNING; tuned-radio-frequency
TYPE OF DETECTOR; C-300 or UV-200
RANGE ON PHONES; 3,000 miles
RANGE ON LOUDSPEAKER; 2,500 miles
COST COMPLETE; $250.00
ANTENNA RECOMMENDED; loop
KIND OF TUBES FOR R. F.; C-301-a or UV-201-a
DETECTOR TUBE; C-300 or UV-200
AUDIO TUBES; C-301-a or UV-201
TYPE OF "A" BATTERY; storage
TYPE OF "B" BATTERY; dry-cells
DETECTOR "B" VOLTAGE; 22½-volt
WAVELENGTH RANGE; 220 to 550 meters
NUMBER OF TUNING CONTROLS; two
"A" BATTERY CURRENT USED; 6¼ amperes
"B" BATTERY CURRENT USED; 1¾ amperes.

Underwood & Underwood

HOW THE RECEIVER LOOKS, COMPLETE IN A CABINET

In this set the batteries, the loudspeaker and the set itself are completely installed in a neat cabinet with two doors which open outward in front. The controls on the receiver consist of the three tuning controls A and the two rheostats B.



A and B are the tuning dials. C is the loudspeaker jack.

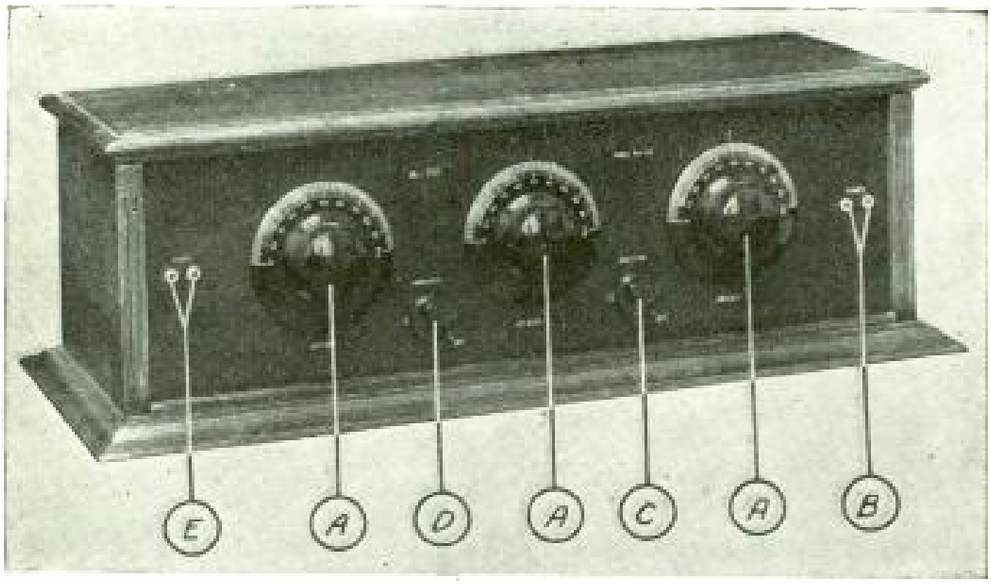
The Pliodyne Receiver

MANUFACTURER'S NAME; Golden Leutz, Incorporated
MODEL; Number six
NUMBER OF TUBES; six
TYPE OF TUNING; tuned-radio-frequency
TYPE OF DETECTOR; UV-200 or 201-a
RANGE ON PHONES; 3,000 miles
RANGE ON LOUDSPEAKER; 2,000 miles
COST COMPLETE; $150.00
ANTENNA RECOMMENDED; outdoor
KIND OF TUBES FOR R. F.; UV-201-a
DETECTOR TUBE; UV-200 or 201-a
AUDIO TUBES; UV-201-a
TYPE OF "A" BATTERY; 6-volt storage
TYPE OF "B" BATTERY; two 45-volt and one 22½-volt
DETECTOR "B" VOLTAGE; 22½-volt
WAVELENGTH RANGE; 200 to 546 meters
NUMBER OF TUNING CONTROLS; two
"A" BATTERY CURRENT USED; 1½ to 2½ amperes
"B" BATTERY CURRENT USED; 30 milliamperes.

A is the volume control. B is the detector rheostat. C is the tuning dial.

Paragon Type Two Receiver

MANUFACTURER'S NAME; Adams-Morgan Co., Inc.
MODEL; Type two
NUMBER OF TUBES; two
TYPE OF TUNING; capacity
TYPE OF DETECTOR; vacuum tube
RANGE ON PHONES; none specified
RANGE ON LOUDSPEAKER; none specified
COST, BARE RECEIVER; $27.50
ANTENNA RECOMMENDED; 100 ft.
KIND OF TUBES FOR R. F.; standard tubes
DETECTOR TUBE; standard tube
AUDIO TUBE; standard tube
TYPE OF "A" BATTERY; standard tubes
TYPE OF "B" BATTERY; standard tubes
DETECTOR "B" VOLTAGE; 20-45 volts
WAVELENGTH RANGE; 200 to 580 meters
NUMBER OF TUNING CONTROLS; one
"A" BATTERY CURRENT USED; ½-ampere
"B" BATTERY CURRENT USED; 6 milliamperes.

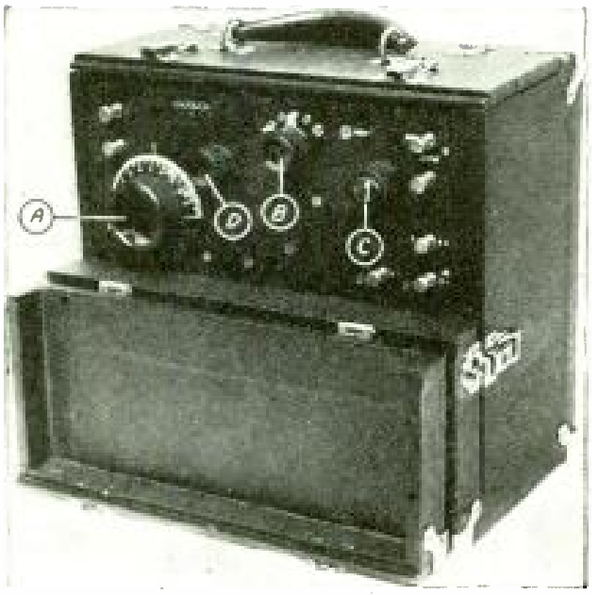


A are the three tuning dials. B are the plugs for the phones. C and D are the rheostats and E are the loudspeaker jacks.

Mu-Rad MA-20 Receiver

MANUFACTURER'S NAME; Mu-Rad Laboratories, Inc.
MODEL; MA-20
NUMBER OF TUBES; five
TYPE OF TUNING; three dials; tuned-radio-frequency
TYPE OF DETECTOR; vacuum tube
RANGE ON PHONES; not used
RANGE ON LOUDSPEAKER; 1,000 miles
COST WITHOUT HORN; $238.00
ANTENNA RECOMMENDED; single outside wire
KIND OF TUBES FOR R. F.; C-301-a
DETECTOR TUBE; C-299
AUDIO TUBES; C-301-a
TYPE OF "A" BATTERY USED; none
TYPE OF "B" BATTERY USED; *none*
DETECTOR "B" VOLTAGE; 36 volts
WAVELENGTH RANGE; 200 to 600 meters
NUMBER OF TUNING CONTROLS; three

Operates with Mu-Rad Recto-filter from 110-volt, 60-cycle light socket.



From a photograph made for POPULAR RADIO

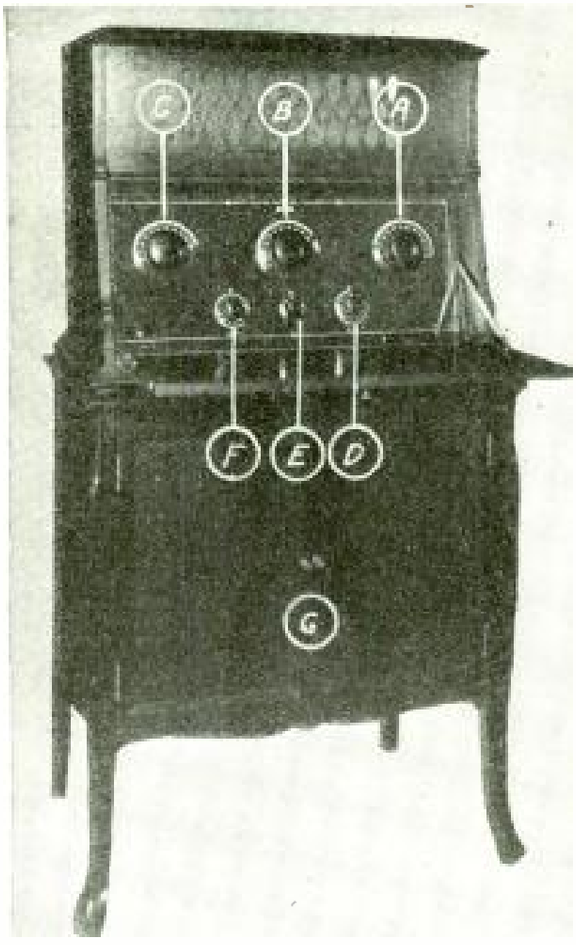
Note the tuning control A, the antenna inductance switch B, the rheostat C and a tickler D.

The Crosley Portable Receiver

MANUFACTURER'S NAME; The Crosley Radio Corporation
MODEL; Number 51
NUMBER OF TUBES; two
TYPE OF TUNING; regenerative
TYPE OF DETECTOR; vacuum tube
RANGE ON PHONES; 1,500 miles
RANGE ON LOUDSPEAKER; 1,000 miles
COST COMPLETE; $30.25
ANTENNA RECOMMENDED; outdoor
DETECTOR TUBE; any standard detector tube
AUDIO TUBES; any standard amplifier tube
TYPE OF "A" BATTERY; to suit tubes
TYPE OF "B" BATTERY; 90-volt
DETECTOR "B" VOLTAGE; 22½-volt
WAVELENGTH RANGE; 200 to 600 meters
NUMBER OF TUNING CONTROLS; one.

Fada Neutrola-Grand Receiver

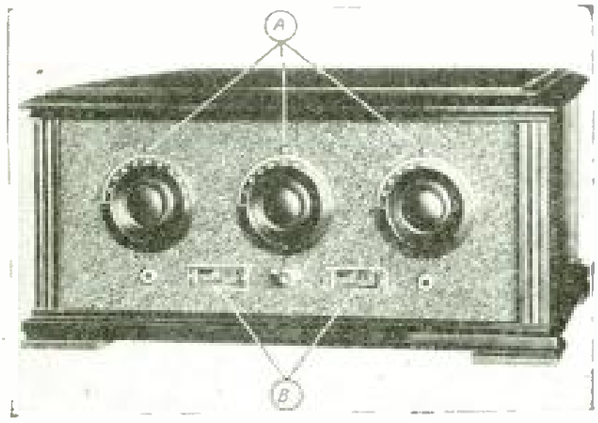
MANUFACTURER'S NAME; F. A. D. Andrea, Inc.
MODEL; Neutrola-Grand, Cat. No. 185/90-A
NUMBER OF TUBES; five
TYPE OF TUNING; tuned-radio-frequency (neutrodyne)
TYPE OF DETECTOR; hard tube
RANGE ON PHONES; none specified
RANGE ON LOUDSPEAKER; none specified
COST COMPLETE; $270.00 (without accessories)
ANTENNA RECOMMENDED; 40 to 150 feet
KIND OF TUBES FOR R. F.; UV-201-a, C-301-a, C-299, UV-199
DETECTOR TUBE; UV-201-a, C-301-a, C-299, UV-199
AUDIO TUBES; UV-201-a, C-301-a, C-299, UV-199
TYPE OF "A" BATTERY; 6-volt storage or 4½-volt dry-cell batteries
TYPE OF "B" BATTERIES; two 45-volt batteries
DETECTOR "B" VOLTAGE; 22½-volt
WAVELENGTH RANGE; 200 to 575 meters
NUMBER OF TUNING CONTROLS; three
"A" BATTERY CURRENT USED; 1¼ amperes
"B" BATTERY CURRENT USED; 7 to 20 milliamperes.



A, B and C are the tuning dials. D, E and F are the rheostats and volume control. G is the container for the batteries.

Eisemann Type 6-D Receiver

MANUFACTURER'S NAME; Eisemann Magneto Corporation
MODEL; Type 6-D
NUMBER OF TUBES; five
TYPE OF TUNING; tuned-radio-frequency



A marks the tuning dials and B the rheostats.

TYPE OF DETECTOR; vacuum tube
RANGE ON PHONES; none specified
RANGE ON LOUDSPEAKER; none specified
COST COMPLETE; $125.00 (less accessories)
ANTENNA RECOMMENDED; 75 to 125 feet, single wire
KIND OF TUBES FOR R. F.; UV-201-a
DETECTOR TUBE; UV-201-a
AUDIO TUBES; UV-201-a
TYPE OF "A" BATTERY; storage, 6-volt
TYPE OF "B" BATTERY; large size, 90 volts
DETECTOR "B" VOLTAGE; 22½ to 45 volts
WAVELENGTH RANGE; 200 to 560 meters
NUMBER OF TUNING CONTROLS; three
"A" BATTERY CURRENT USED; 1¼ amperes.
"B" BATTERY CURRENT USED; 15 milliamperes.

Broadcast Stations in the United States

Call Letters	Location	Wave-length
KDKA	E. Pittsburgh, Pa.	309
KDLR	Devils Lake, N. D.	231
KDPM	Cleveland, O.	270
KDPT	San Diego, Cal.	244
KDYL	Salt Lake City, Utah	250
KDYM	San Diego, Cal.	280
KDZB	Bakersfield, Cal.	240
KDZE	Seattle, Wash.	270
KDZI	Wenatchee, Wash.	360
KFAD	Phoenix, Ariz.	360
KFAE	Pullman, Wash.	348
KFAF	Denver, Col.	278
KFAJ	Boulder, Col.	360
KFAN	Moscow, Ida.	230
KFAU	Boise, Ida.	271
KFAW	Santa Ana, Cal.	280
KFBB	Havre, Mont.	360
KFBC	San Diego, Cal.	278
KFBE	San Luis Obispo, Cal.	218
KFBG	Tacoma, Wash.	250
KFBK	Sacramento, Cal.	283
KFBL	Everett, Wash.	224
KFBU	Laramie, Wyo.	283
KFCB	Phoenix, Ariz.	238
KFCC	Helena, Mont.	248
KFCF	Walla Walla, Wash.	256
KFCP	Ogden, Utah	360
KFCZ	Omaha, Neb.	258
KFDD	Boise, Ida.	252
KFDH	Tuscon, Ariz.	368
KFDJ	Corvallis, Ore.	254
KFDY	Brookings, S. D.	360
KFIM	Beaumont, Tex.	315
KFDX	Shreveport, La.	360
KFDZ	Minneapolis. Minn.	231
KFEC	Portland, Ore.	248
KFEK	Minneapolis, Minn.	261
KFEL	Denver, Col.	254
KFEQ	Oak, Neb.	268
KFER	Fort Dodge, Ia.	231
KFEY	Kellogg, Ida.	233
KFFP	Moberly, Mo.	266
KFFV	Lamoni, Ia.	280
KFGB	Utica, Neb.	224
KFGC	Baton Rouge, La.	254
KFGD	Chickasha, Okla.	248
KFGH	Stanford Univ., Cal.	273
KFGQ	Boone, Ia.	226
KFHA	Gunnison, Col.	252
KFHH	Neah Bay, Wash.	261
KFHL	Oskaloosa, Ia.	240
KFHR	Seattle, Wash.	283
KFI	Los Angeles, Cal.	468
KFIF	Portland, Ore.	248
KFIO	Spokane, Wash.	252
KFIQ	Yakima, Wash.	242
KFIU	Juneau, Alaska	226
KFIX	Independence, Mo.	240
KFIZ	Fond du Lac, Wis.	273
KFJB	Marshalltown, Ia.	248
KFJF	Oklahoma City, Okla.	252
KFJI	Astoria, Ore.	252
KFJL	Ottumwa. Ia.	242
KFJM	Grand Forks, N. D.	280
KFJR	Stevensville, Mont.	258
KFJX	Cedar Falls. Ia.	280
KFJY	Fort Dodge, Ia.	246
KFKA	Greeley, Col.	273
KFKB	Milford, Kan.	286
KFKQ	Conway, Ark.	250
KFKU	Lawrence, Kan.	275
KFKV	Butte, Mont.	283
KFKX	Hastings, Neb.	288
KFLA	Butte, Mont.	283
KFLB	Menominee, Mich.	248
KFLD	Franklinton, La.	234
KFLE	Denver, Col.	268
KFLP	Cedar Rapids, Ia.	256
KFLR	Albuquerque, N. M.	254
KFLU	San Benito, Tex.	236
KFLV	Rockford, Ill.	229
KFLX	Galveston, Tex.	240
KFLZ	Atlantic, Ia.	273
KFMB	Little Rock, Ark.	254
	AGRICULTURAL COL., N. D.	283
	AKRON, O.	258
	ALBUQUERQUE, N. M.	254
	ALLENTOWN, PA.	280
	ALLENTOWN, PA.	229
	ALTOONA, PA.	261
	AMES, IA.	207
	AMARILLO, TEX.	234
	AMARILLO, TEX.	263
	ANDERSON, IND.	246
	ANDERSON, IND.	218
	ANN ARBOR, MICH.	280
	ARNOLD, PA.	254
	ASHLAND, WIS.	233
	ASTORIA, ORE.	252
	ATLANTA, GA.	278
	ATLANTA, GA.	428
	ATLANTIC, IA.	273
	ATLANTIC CITY, N. J.	275
	ATLANTIC CITY, N. J.	300
	AUBURN, ALA.	250
	BAKERSFIELD, CAL.	240
	BALTIMORE, MD.	229
	BALTIMORE, MD.	254
	BALTIMORE, MD.	275
	BALTIMORE, MD.	452
	BANGOR, ME.	240
	BANGOR, ME.	252
	BERRIEN SPRINGS, MICH.	285
	BATAVIA, ILL.	275
	BATON ROUGE, LA.	254
	BEAUMONT, TEX.	315
	BELDEN, NEB.	273
	BELLEFONTAINE, O.	222
	BELOIT, WIS.	283
	BELVIDERE, ILL.	274
	BEMIS, TENN.	240
	BERKELEY, CAL.	275
	BOISE, IDA.	271
	BOISE, IDA.	252
	BOONE, IA.	226
	BOSTON, MASS.	256
	BOSTON, MASS.	244
	BOSTON, MASS.	250
	BOSTON, MASS.	284
	BOSTON, MASS.	475
	BOULDER, COL.	360
	BRECKENRIDGE, MINN.	242
	BRISTOW, OKLA.	394
	BROADLANDS, ILL.	233
	BROOKINGS, S. D.	360
	BROOKLYN, N. Y.	240
	BUCK HILL FALLS, PA.	268
	BUFFALO, N. Y.	319
	BURLINGAME, CAL.	231
	BURLINGAME, CAL.	231
	BURLINGTON, IA.	283
	BURLINGTON, VT.	250
	BUTLER, MO.	230
	BUTLER, PA.	286
	BUTTE, MONT.	254
	BUTTE, MONT.	283
	BUTTE, MONT.	283
	CAMBRIDGE, ILL.	242
	CAMBRIDGE, O.	248
	CAMDEN, ARK.	242
	CAMDEN, N. J.	224
	CANTON, N. Y.	280
	CANTON, O	245
	CAPE GIRARDEAU, MO.	275
	CARTERSVILLE, MO.	268
	CARTHAGE, ILL.	246
	CAZENOVIA, N. Y.	261
	CEDAR FALLS, IA.	280
	CEDAR RAPIDS, IA.	256
	CEDAR RAPIDS, IA.	268
	CEDAR RAPIDS, IA.	278
	CHARLESTON, S. C.	268
	CHARLES TOWN, W. VA.	273
	CHARLOTTE, N. C.	275
	CHATTANOOGA, TENN.	256
	CHESANING, MICH.	227
	CHICAGO, ILL.	535
	CHICAGO, ILL.	286
200	Joliet, Ill.	WIBD
205	San Pedro, Cal.	KFVD
206	Downers Grove, Ill.	WHBT
207	Ames, Ia.	WOI
208	Hollywood, Cal.	KFVF
209	Martinsburg, W. Va.	WIBE
209	Mechanicsburg, O.	WHBS
209	Fall River, Mass.	WGBH
209	New Bedford, Mass.	WEBH
211	Upland, Cal.	KFWC
212	Punxsutawny, Pa.	WHBX
212	Spring Valley, Ill.	WGBW
214	Ogden, Utah	KFWA
214	St. Louis, Mo.	KFWF
215	Philadelphia, Pa.	WHBW
216	Cincinnati, O.	WHBR
217	Chicago, Ill.	WFKB
217	Evansville, Ind.	WGBF
217	Pullman, Wash.	KFRX
218	Anderson, Ind.	WHBU
218	Flint, Mich.	WTHS
218	Manhattan, Kan.	KFVH
218	R. R. No. 2	WGBY
218	San Luis Obispo, Cal.	KFBE
220	Logansport, Ind.	WHBL
220	Oklahoma City, Okla.	KFQR
220	Olympia, Wash.	KFRW
220	Osseo, Wis.	WTAQ
221	Fort Worth, Tex.	KFQB
222	Bellefontaine, O.	WHBD
222	Cincinnati, O.	WHAG
222	Culver, Ind.	WHBH
222	Elkins Park, Pa.	WIBG
222	Hartington, Neb.	KFRZ
222	Norfolk, Va.	WBBX
222	Rock Island, Ill.	WHBF
222	St. Petersburg, Fla.	WIBC
222	Tacoma Park, Md.	WBES
224	Camden, N. J.	WABU
224	Everett, Wash.	KFBL
224	La Porte, Ind.	WRAF
224	Monmouth, Ill.	WBBU
224	Ogden, Utah	KFUR
224	Seattle, Wash.	KFPB
224	Utica, Neb.	KFGB
224	Wallace, Ida.	KFOD
225	Kenosha, Wis.	WOAR
226	Boone, Ia.	KFGQ
226	Chicago, Ill.	WBBM
226	Chicago, Ill.	WIBO
226	David City, Neb.	KFOR
226	Juneau, Alaska	KFIU
226	Los Angeles, Cal.	KFQG
226	Macon, Ga.	WCBW
226	Marion, Ind.	WIAQ
226	Montgomery, Ala.	WKAN
226	A Portable	WEBM
226	San Jose, Cal.	KFVJ
226	Seymour, Ind.	WFBE
226	St. Paul, Minn.	KFOY
226	St. Petersburg, Fla.	WDBI
226	Thrifton, Va.	WGBG
227	Chesaning, Mich.	WHBI
227	Cleveland, O.	WDBK
227	Elyria, O.	WGBL
227	Indianapolis, Ind.	WBBZ
227	Lake Forest, Ill.	WABA
229	Allentown, Pa.	WSAN
229	Baltimore, Md.	WCBM
229	Graniteville, O.	WJD
229	Lincoln. Neb.	WJAB
229	Marshfield, Wis.	WGBR
229	Pasadena, Cal.	KPPC
229	Roanoke, Va.	WDBJ
229	Rockford, Ill.	KFLV
229	Taunton, Mass.	WDBB
230	Butler, Mo.	WNAR
230	Moscow, Ida.	KFAN
231	Burlingame, Cal.	KFNZ
231	Burlingame, Cal.	KFQH
231	Devils Lake, N. D.	KDLR
231	Ellsworth, Me.	WHBK
231	Fort Dodge, Ia.	KFER
231	Greencastle, Ind.	WLAX

Call Letters	Location	Wave-length
KFMQ	Fayetteville, Ark.	299
KFMR	Sioux City, Ia.	261
KFMT	Minneapolis, Minn.	231
KFMW	Houghton, Mich.	266
KFMX	Northfield, Minn.	336
KFNF	Shenandoah, Ia.	266
KFMG	Coldwater, Miss.	254
KFNJ	Warrensburg, Mo.	234
KFNL	Pasa Robles, Cal.	240
KFNV	Santa Rosa, Cal.	234
KFNY	Helena, Mont.	261
KFNZ	Burlingame, Cal.	231
KFOA	Seattle, Wash.	384
KFOC	Whittier, Cal.	236
KFOD	Wallace, Ida.	224
KFOJ	Moberly, Mo.	246
KFOL	Marengo, Ia.	234
KFON	Long Beach, Cal.	234
KFOO	Salt Lake City, Utah	261
KFOP	Marshfield, Ore.	240
KFOR	David City, Neb.	226
KFOT	Wichita, Kan.	231
KFOU	Richmond, Cal.	254
KFOX	Omaha, Neb.	248
KFOY	St. Paul, Minn.	226
KFPB	Seattle, Wash.	224
KFPG	Los Angeles, Cal.	238
KFPH	Salt Lake City, Utah	242
KFPL	Dublin, Tex.	242
KFPM	Greenville, Tex.	242
KFPR	Los Angeles, Cal.	231
KFPT	Salt Lake City, Utah	268
KFPV	San Francisco, Cal.	236
KFPW	Carterville, Mo.	268
KFPY	Spokane, Wash.	283
KFQA	St. Louis, Mo.	264
KFQB	Forth Worth, Tex.	221
KFQC	Taft, Cal.	258
KFQG	Los Angeles, Cal.	226
KFQH	Burlingame, Cal.	231
KFQN	Portland, Ore.	283
KFQP	Iowa City, Ia.	284
KFQR	Oklahoma City, Okla.	220
KFQT	Dennison, Tex.	252
KFQU	Holy City, Cal.	253
KFQW	North Bend, Wash.	248
KFQX	Seattle, Wash.	233
KFQY	Belden, Neb.	273
KFQZ	Hollywood, Cal.	240
KFRJ	Conway, Ark.	250
KFRM	Fort Sill, Okla.	263
KFRO	Fort Worth, Tex.	246
KFRU	Bristow, Okla.	394
KFRW	Olympia, Wash.	220
KFRX	Pullman, Wash.	217
KFRY	State College, N. M.	266
KFRZ	Hartington, Neb.	222
KFSG	Los Angeles, Cal.	272
KFSY	Helena, Mont.	261
KFUJ	Breckenridge, Minn.	242
KFUL	Galveston, Tex.	258
KFUM	Colorado Springs, Col.	242
KFUO	St. Louis, Mo.	549
KFUP	Denver, Col.	234
KFUQ	San Francisco, Cal.	234
KFUR	Ogden, Utah	224
KFUS	Oakland, Cal.	233
KFUT	Salt Lake City, Utah	271
KFUU	San Leandro, Cal.	234
KFUY	Butte, Mont.	254
KFUZ	Virginia, Minn.	248
KFVC	Camden, Ark.	242
KFVD	San Pedro, Cal.	205
KFVK	Sacramento, Cal.	248
KFVF	Hollywood, Cal.	208
KFVJ	San Jose, Cal.	226
KFVH	Manhattan, Kan.	218
KFVI	Houston, Tex.	248
KFVL	Vancouver, Wash.	231
KFWA	Ogden, Utah	214
KFWB	Hollywood, Cal.	252
KFWC	Upland, Cal.	211
KFWF	St. Louis, Mo.	214
KGB	Tacoma, Wash.	252
KGO	Oakland, Cal.	361
KGU	Honolulu, Hawaii	360
KGW	Portland, Ore.	491
KGY	Lacy, Wash.	253
	CHICAGO, ILL.	226
	CHICAGO, ILL.	266
	CHICAGO, ILL.	258
	CHICAGO, ILL.	217
	CHICAGO, ILL.	370
	CHICAGO, ILL.	266
	CHICAGO, ILL.	370
	CHICAGO, ILL.	233
	CHICAGO, ILL.	226
	CHICAGO, ILL.	268
	CHICAGO, ILL.	447
	CHICKASHA, OKLA.	248
	CINCINNATI, O.	248
	CINCINNATI, O.	309
	CINCINNATI, O.	222
	CINCINNATI, O.	216
	CINCINNATI, O.	422
	CINCINNATI, O.	321
	CINCINNATI, O.	325
	CLEMSON COL., S. C.	331
	CLEMSON COL., S. C.	336
	CLEVELAND, O.	270
	CLEVELAND, O.	227
	CLEVELAND, O.	389
	CLEVELAND, O.	273
	CLEVELAND, O.	389
	COLDWATER, MISS.	254
	COL. STATION, TEX.	280
	COLLEGEVILLE, MINN.	236
	COLORADO SPRINGS, COL.	242
	COLUMBIA, MO.	254
	COLUMBIA, TENN.	268
	COLUMBUS, GA.	236
	COLUMBUS, GA.	244
	COLUMBUS, O.	292
	COLUMBUS, O.	286
	COLUMBUS, O.	293
	COLUMBUS, O.	286
	COLUMBUS, O.	286
	CONWAY, ARK.	250
	CONWAY, ARK.	250
	CORVALLIS, ORE.	254
	CRANSTON, R. I.	440
	CRANSTON, R. I.	234
	CRANSTON, R. I.	286
	CULVER, IND.	222
	DALLAS, TEX.	472
	DALLAS, TEX.	261
	DARTMOUTH, MASS.	360
	DAVENPORT, IA.	484
	DAVID CITY, NEB.	226
	DAYTON, O.	283
	DAYTON, O.	270
	DEARBORN, MICH.	273
	DECATUR, ILL.	360
	DEERFIELD, ILL.	238
	DENNISTON, TEX.	252
	DENVER, COL.	278
	DENVER, COL.	254
	DENVER, COL.	268
	DENVER, COL.	234
	DENVER, COL.	283
	DENVER, COL.	323
	DES MOINES, IA.	526
	DETROIT, MICH.	286
	DETROIT, MICH.	516
	DETROIT, MICH.	352
	DEVILS LAKE, N. D.	231
	DOWNERS GROVE, ILL.	206
	DUBLIN, TEX.	242
	EAST LANSING, MICH.	285
	EAST PITTSBURGH, PA.	309
	EAST PROVIDENCE, R. I.	240
	ELGIN, ILL.	278
	ELGIN, ILL.	303
	ELKINS PARK, PA.	222
	ELLSWORTH, ME.	231
	EL PASO, TEX.	268
	ELYRIA, O.	227
	ERIE, PA.	242
	ESCANABA, MICH.	256
	EUREKA, ILL.	240
	EVANSVILLE, IND.	217
	EVERETT, WASH.	224
WBBM		
WBCN		
WDBY		
WFKB		
WEBH		
WENR		
WGN		
WHBM		
WIBO		
WJAZ		
WLS		
WMAQ		
WMBB		
WTX		
WQJ		
KFGD		
WAAD		
WFBW		
WHAG		
WHBR		
WLW		
WMH		
WSAI		
WBAC		
WSAC		
KDPM		
WDBK		
WEAR		
WHK		
WTAM		
KFNG		
WTAW		
WFBJ		
KFUM		
WAAN		
WDBW		
WDBA		
WHBV		
WBAV		
WCAH		
WEAO		
WMAN		
WPAL		
KFKQ		
KFRJ		
KFDJ		
WDWF		
WKAP		
WKBF		
WHBH		
WFAA		
WRR		
WMAF		
WOC		
KFOR		
WDBS		
WEBT		
WWI		
WBAO		
WHT		
KFQT		
KFAF		
KFEL		
KFLE		
KFUP		
KLZ		
KOA		
WHO		
KOP		
WCX		
WWJ		
KDLR		
WHBT		
KFPL		
WKAR		
KDKA		
WKAD		
WCEE		
WTAS		
WIBG		
WHBK		
WDAH		
WGBL		
WOAV		
WRAK		
WFBB		
WGBF		
KFBL		

Wave-length	Location	Call Letters
231	Harrisburg, Pa.	WHBG
231	Los Angeles, Cal.	KFPR
231	Minneapolis, Minn.	KFDZ
231	Minneapolis, Minn.	KFMT
231	Pawtucket, R. I.	WHBO
231	Streator, Ill.	WTAX
231	Vancouver, Wash.	KFVL
231	Webster, Mass.	WKBE
231	Wheatland, Wis.	WIBF
231	Wichita, Kan.	KFOT
231	Wilkes-Barre, Pa.	WBRE
233	Ashland, Wis.	WJBD
233	Broadlands, Ill.	WSRF
233	Chicago, Ill.	WHBM
233	Highland Park, N. J.	WEBA
233	Kellogg, Ida.	KFEY
233	Kingston, N. Y.	WDBZ
233	Memphis, Tenn.	WHBQ
233	Newark, N. J.	WCBX
233	New York, N. Y.	WDBX
233	Oakland, Cal.	KFUS
233	Port Chester, N. Y.	WSAY
233	Port Huron, Mich.	WAFD
233	Seattle, Wash.	KFQX
234	Amarillo, Tex.	WQAC
234	Cranston, R. I.	WKAP
234	Denver, Col.	KFUP
234	Fort Wayne, Ind.	WHBJ
234	Franklinton, La.	KFLD
234	La Salle, Ill.	WJBC
234	Long Beach, Cal.	KFON
234	Marengo, Ia.	KFOL
234	McKeesport, Pa.	WIK
234	Menominee, Wis.	WGBQ
234	Philadelphia, Pa.	WFBD
234	Providence, R. I.	WGBM
234	Salem, N. J.	WDBQ
234	San Francisco, Cal.	KFUQ
234	San Leandro, Cal.	KFUU
234	Santa Rosa, Cal.	KFNV
234	Warrensburg, Mo.	KFNJ
234	Washington, D. C.	WDM
234	Wooster, O.	WABW
236	Collegeville, Minn.	WFBJ
236	Columbus, Ga.	WDBA
236	Greenville, S. C.	WGBT
236	Madison, Wis.	WIBA
236	Nashville, Tenn.	WCBQ
236	Pittsburgh, Pa.	WCBF
236	Richmond Hill, N. Y.	WBOQ
236	San Benito, Tex.	KFLU
236	San Francisco, Cal.	KFPV
236	Waterloo, Ia.	WRAN
236	Whittier, Cal.	KFOC
228	Deerfield, Ill.	WHT
238	Los Angeles, Cal.	KFPG
238	Phoenix, Ariz.	KFCB
238	Reading, Pa.	WRAW
238	Worcester, Mass.	WCBT
240	Bakersfield, Cal.	KDZB
240	Bangor, Me.	WABI
240	Bemis, Tenn.	WCBI
240	Brooklyn, N. Y.	WHAP
240	Eureka, Ill.	WFBB
240	East Providence, R. I.	WKAD
240	Galveston, Tex.	KFLX
240	Hollywood, Cal.	KFQZ
240	Independence, Mo.	KFIX
240	Marshfield, Ore.	KFOP
240	Oskaloosa, Ia.	KFHL
240	Owosso, Mich.	WSMH
240	Paso Robles, Cal.	KFNL
240	Rapid City, S. D.	WCAT
240	Sandusky, O.	WABH
240	San Jose, Cal.	KQW
240	Scranton, Pa.	WGBI
240	Stevens Point, Wis.	WHBB
240	Trenton, N. J.	WOAX
240	Winter Park, Fla.	WDBO
242	Breckenridge, Minn.	KFUJ
242	Cambridge, Ill.	WTAP
242	Camden, Ark.	KFVC
242	Colorado Springs, Col.	KFUM
242	Dublin, Tex.	KFPL
242	Erie, Pa.	WOAV
242	Greenville, Tex.	KFPM
242	Joliet, Ill.	WWAE
242	Oakland, Cal.	KLS

Call Letters	Location	Wave-length
KHJ	Los Angeles, Cal.	405
KHQ	Seattle, Wash.	273
KJR	Seattle, Wash.	384
KJS	Los Angeles, Cal.	293
KLS	Oakland, Cal.	242
KLX	Oakland, Cal.	508
KLZ	Denver, Col.	283
KMJ	Fresno, Cal.	243
KMO	Tacoma, Wash.	250
KNT	Kukah Bay, Alaska	263
KNX	Los Angeles, Cal.	337
KOA	Denver, Col.	323
KOB	State College, N. M.	348
KOP	Detroit, Mich.	286
KPO	San Francisco, Cal.	428
KPPC	Pasadena, Cal.	229
KQV	Pittsburgh, Pa.	270
KQW	San Jose, Cal.	240
KRE	Berkeley, Cal.	275
KSAC	Manhattan, Kan.	341
KSD	St. Louis, Mo.	545
KSL	Salt Lake City, Utah	299
KTHS	Hot Springs, Ark.	375
KTW	Seattle, Wash.	454
KUO	San Francisco, Cal.	246
KUOM	Missoula, Mont.	244
KWG	Stockton, Cal.	360
KWH	Los Angeles, Cal.	360
KYO	Honolulu, Hawaii	270
KYW	Chicago, Ill.	535
KZM	Oakland, Cal.	360
WAAB	New Orleans, La.	263
WAAC	New Orleans, La.	275
WAAD	Cincinnati, O.	248
WAAF	Chicago, Ill.	286
WAAM	Newark, N. J.	263
WAAN	Columbia, Mo.	254
WAAW	Omaha, Neb.	285
WABA	Lake Forest, Ill.	227
WABB	Harrisburg, Pa.	266
WABH	Sandusky, O.	240
WABI	Bangor, Me.	240
WABL	Sorrs, Conn.	283
WABM	Saginaw, Mich.	254
WABN	LaCrosse, Wis.	244
WABO	Rochester, N. Y.	283
WABQ	Haverford, Pa.	261
WABR	Toledo, O.	270
WABU	Camden, N. J.	224
WABW	Wooster, O.	234
WABX	Mt. Clemens, Mich.	270
WABY	Philadelphia, Pa.	242
WABZ	New Orleans, La.	263
WADC	Akron, O.	258
WAFD	Port Huron, Mich.	233
WAHG	Richmond Hill, N. Y.	315
WAMC	New York, N. Y.	340
WAMD	Minneapolis, Minn.	244
WBAA	W. Lafayette, Ind.	283
WBAC	Clemson Coll., S. C.	331
WBAH	Minneapolis, Minn.	417
WBAO	Decatur, Ill.	360
WBAP	Fort Worth, Tex.	476
WBAV	Columbus, O.	292
WBAX	Wilkes-Barre, Pa.	254
WBAY	New York, N. Y.	492
WBBG	Mattapoisett, Mass.	248
WBBL	Richmond, Va.	253
WBBM	Chicago, Ill.	226
WBBN	Wilmington, N. C.	275
WBBP	Petoskey, Mich.	246
WBBR	Rossville, N. Y.	273
WBBS	New Orleans, La.	252
WBBU	Monmouth, Ill.	224
WBBV	Johnstown, Pa.	245
WBBX	Norfolk, Va.	222
WBBY	Charleston, S. C.	268
WBBZ	Indianapolis, Ind.	227
WBCN	Chicago, Ill.	266
WBDC	Grand Rapids, Mich.	256
WBES	Tacoma Park, Md.	222
WBGA	Baltimore, Md.	254
WBOQ	Richmond Hill, N. Y.	236
WBR	Butler, Pa.	286
WBRE	Wilkes-Barre, Pa.	231
WBS	Newark, N. J.	252
WBT	Charlotte, N. C.	275
WBZ	Springfield, Mass.	333

Location	Wave-length	Call Letters
FALL RIVER, MASS.	209	WGBH
FALL RIVER, MASS.	254	WSAR
FALL RIVER, MASS.	248	WTAB
FARGO, N. D.	244	WDAY
FAYETTEVILLE, ARK.	299	KFMQ
FLINT, MICH.	250	WEAA
FLINT, MICH.	218	WTHS
FOND DU LAC, WIS.	273	KFIZ
FT. BEN HARRISON, IND.	266	WCBN
FT. BEN. HARRISON, IND.	258	WFBY
FORT DODGE, IA.	231	KFER
FORT DODGE, IA.	246	KFJY
FORT SILL, OKLA.	263	KFRM
FORT WAYNE, IND.	258	WDBV
FORT WAYNE, IND.	234	WHBJ
FORT WORTH, TEX.	221	KFQB
FORT WORTH, TEX.	246	KFRO
FORT WORTH, TEX.	476	WBAP
FRANKLINTON, LA.	234	KFLD
FREEPORT, N. Y.	244	WGBB
FREMONT, NEB.	280	WOAE
FRESNO, CAL.	243	KMJ
GALESBURG, ILL.	254	WFBZ
GALESBURG, ILL.	244	WRAM
GALVESTON, TEX.	240	KFLX
GALVESTON, TEX.	258	KFUL
GLOUCESTER CITY, N. J.	268	WRAX
GRAND FORKS, N. D.	280	KFJM
GRAND RAPIDS, MICH.	256	WBDC
GRANITEVILLE, O.	229	WJD
GREELEY, COL.	273	KFKA
GREENCASTLE, IND.	231	WLAX
GREENTOWN, IA.	254	WJAK
GREENVILLE, S. C.	236	WGBT
GREENVILLE, TEX.	242	KFPM
GROVE CITY, PA.	258	WSAJ
GUNNISON, COL.	252	KFHA
HAMILTON, O.	360	WRK
HARRISBURG, PA.	266	WABB
HARRISBURG, PA.	231	WHBG
HARTFORD, CONN.	323	WTIC
HARTINGTON, NEB.	222	KFRZ
HASTINGS, NEB.	288	KFKX
HAVERFORD, PA.	261	WABQ
HAVRE, MONT.	360	KFBB
HELENA, MONT.	248	KFCC
HELENA, MONT.	261	KFNY
HELENA, MONT.	261	KFSY
HIGHLAND PARK, N. J.	233	WEBA
HOLLYWOOD, CAL.	240	KFQZ
HOLLYWOOD, CAL.	208	KFVF
HOLLYWOOD, CAL.	252	KFWB
HOLY CITY, CAL.	253	KFQU
HONOLULU, HAWAII	360	KGU
HONOLULU, HAWAII	270	KYO
HOT SPRINGS, ARK.	375	KTHS
HOUGHTON, MICH.	266	KFMW
HOUGHTON, MICH.	244	WWOA
HOULTON, MO.	280	WCBL
HOUSTON, TEX.	248	KFVI
HOUSTON, TEX.	256	WRAA
HOUSTON, TEX.	360	WEAY
HOUSTON, TEX.	360	WSAV
INDEPENDENCE, MO.	240	KFIX
INDIANAPOLIS, IND.	227	WBBZ
IOWA CITY, IA.	284	KFQP
IOWA CITY, IA.	498	WSUI
ITHACA, N. Y.	286	WEAI
JAMESTOWN, N. Y.	275	WOCL
JEFFERSON CITY, MO.	440	WOS
JENNINGS, LA.	244	WCBJ
JOHNSTOWN, PA.	245	WBBV
JOHNSTOWN, PA.	248	WGBK
JOHNSTOWN, PA.	256	WHBP
JOHNSTOWN, PA.	360	WTAC
JOLIET, ILL.	200	WIB
JOLIET, ILL.	242	WWAE
JOPLIN, MO.	283	WHAH
JUNEAU, ALASKA	226	KFIU
KALAMAZOO, MICH.	283	WLAQ
KANSAS CITY, MO.	365	WDAF
KANSAS CITY, MO.	365	WHB
KELLOGG, IDA.	233	KFEY
KENOSHA, WIS.	225	WOAR
KINGSTON, N. Y.	233	WDBZ
KNOXVILLE, TENN.	250	WFBC
KUKAH BAY, ALASKA	263	KNT
LACONIA, N. H.	254	WKAV

Wave-length	Location	Call Letters
242	Ottumwa, Ia.	KFJL
242	Oxford, Miss.	WCBH
242	Philadelphia, Pa.	WABY
242	Salt Lake City, Utah	KFPH
242	Superior, Wis.	WEBC
242	Tecumseh, Neb.	WTAU
242	Yakima, Wash.	KFIQ
242	Yellow Springs, O.	WRAV
243	Fresno, Cal.	KMJ
244	Boston, Mass.	WTAT
244	Columbus, Ga.	WHBV
244	Fargo, N. D.	WDAY
244	Freeport, N. Y.	WGBB
244	Galesburg, Ill.	WRAM
244	Houghton, Mich.	WWOA
244	Jennings, La.	WCBJ
244	La Crosse, Wis.	WABN
244	Minneapolis, Minn.	WAMD
244	Missoula, Mont.	KUOM
244	San Diego, Cal.	KDPT
245	Canton, O.	WHBC
245	Johnstown, Pa.	WBBV
248	Anderson, Ind.	WEBD
248	Carthage, Ill.	WCAZ
248	Fort Dodge, Ia.	KFJY
248	Fort Worth, Tex.	KFRO
248	Milwaukee, Wis.	WSOE
246	Moberly, Mo.	KFOJ
246	Petoskey, Mich.	WBBP
246	Providence, R. I.	WCBR
246	San Francisco, Cal.	KUO
248	Cambridge, O.	WEBE
248	Chickasha, Okla.	KFGD
248	Cincinnati, O.	WAAD
248	Fall River, Mass.	WTAB
248	Helena, Mont.	KFCC
248	Houston, Tex.	KFVI
248	Johnstown, Pa.	WGBK
248	Lancaster, Pa.	WGAL
248	Marshalltown, Ia.	KFJB
248	Mattapoisette, Mass.	WBBG
248	Menominee, Mich.	KFLB
248	Northbend, Wash.	KFQW
248	Omaha, Neb.	KFOX
248	Portland, Ore.	KFEC
248	Portland, Ore.	KFIF
248	Sacramento, Cal.	KFVK
248	Virginia, Minn.	KFUZ
248	Yankton, S. D.	WNAX
250	Auburn, Ala.	WMAV
250	Boston, Mass.	WNAB
250	Burlington, Vt.	WCAX
250	Chicago, Ill.	WMBB
250	Conway, Ark.	KFKQ
250	Conway, Ark.	KFRJ
250	Flint, Mich.	WEAA
250	Knoxville, Tenn.	WFBC
250	Memphis, Tenn.	WCBO
250	Oil City, Pa.	WHBA
250	Salt Lake City, Utah	KDYL
250	Tacoma, Wash.	KFBG
250	Tacoma, Wash.	KMO
250	Tampa, Fla.	WGBP
250	Tulsa, Okla.	WLAL
252	Astoria, Ore.	KFJI
252	Bangor, Me.	WDBN
252	Boise, Ida.	KFDD
252	Dennison, Tex.	KFQT
252	Gunnison, Col.	KFHA
252	Hollywood, Cal.	KFWB
252	Newark, N. J.	WBS
252	New Orleans, La.	WBBS
252	Oklahoma City, Okla.	KFJF
252	Orono, Me.	WGBX
252	Shreveport, La.	WGAQ
252	Spokane, Wash.	KFIO
252	Springfield, Mo.	WFUV
252	Tacoma, Wash.	KGB
252	Toledo, O.	WTAL
252	Tullahoma, Tenn.	WCBV
253	Holy City, Cal.	KFQU
253	Lacy, Wash.	KGY
253	Richmond, Va.	WBBL
254	Albuquerque, N. M	KFLR
254	Arnold, Pa.	WCBU
254	Baltimore, Md.	WBGA
254	Baton Rouge, La.	KFGC
254	Butte, Mont.	KFUY

Call Letters	Location	Wave-length
WCAD	Canton, N. Y.	280
WCAE	Pittsburgh, Pa.	461
WCAG	New Orleans, La.	262
WCAH	Columbus, O.	286
WCAJ	University Pl., Neb.	283
WCAL	Northfield, Minn.	336
WCAO	Baltimore, Md.	275
WCAP	Washington, D. C.	468
WCAR	San Antonio, Tex.	263
WCAS	Minneapolis, Minn.	280
WCAT	Rapid City, S. D.	240
WCAU	Philadelphia, Pa.	278
WCAV	Little Rock, Ark.	263
WCAX	Burlington, Vt.	250
WCAZ	Carthage, Ill.	246
WCBA	Allentown, Pa.	280
WCBC	Ann Arbor, Mich.	280
WCBD	Zion, Ill.	344
WCBE	New Orleans, La.	263
WCBF	Pittsburgh, Pa.	236
WCBG	Pascagoula, Miss.	268
WCBH	Oxford, Miss.	242
WCBI	Bemis, Tenn.	240
WCBJ	Jennings, La.	244
WCBL	Houlton, Mo.	280
WCBM	Baltimore, Md.	229
WCBN	Ft. Ben. Harrison, Ind.	266
WCBO	Memphis, Tenn.	250
WCBQ	Nashville, Tenn.	236
WCBR	Providence, R. I.	246
WCBT	Worcester, Mass.	238
WCBU	Arnold, Pa.	254
WCBV	Tullahoma, Tenn.	252
WCBW	Macon, Ga.	226
WCBX	Newark, N. J.	233
WCBY	Buck Hill Falls, Pa.	268
WCCO	Twin Cities, Minn.	416
WCEE	Elgin, Ill.	278
WCK	St. Louis, Mo.	275
WCX	Detroit, Mich.	516
WDAE	Tampa, Fla.	365
WDAF	Kansas City, Mo.	365
WDAG	Amarillo, Tex.	263
WDAH	El Paso, Tex.	268
WDAR	Philadelphia, Pa.	394
WDAY	Fargo, N. D.	244
WDBA	Columbus, Ga.	236
WDBB	Taunton, Mass.	229
WDBC	Lancaster, Pa.	258
WDBE	Atlanta, Ga.	278
WDBF	Youngstown, O.	315
WDBH	Worcester, Mass.	268
WDBI	St. Petersburg, Fla.	226
WDBJ	Roanoke, Va.	229
WDBK	Cleveland, O.	227
WDBL	Stevens Point, Wis.	278
WDBN	Bangor, Me.	252
WDBO	Winter Park, Fla.	240
WDBP	Superior, Wis.	261
WDBQ	Salem, N. J.	234
WDBR	Boston, Mass.	256
WDBS	Dayton, O.	283
WDBV	Fort Wayne, Ind.	258
WDBW	Columbia, Tenn.	268
WDBX	New York, N. Y.	233
WDBY	Chicago, Ill.	258
WDBZ	Kingston, N. Y.	233
WDM	Washington, D. C.	234
WDOB	Chattanooga, Tenn.	256
WDWF	Cranston, R. I.	440
WDZ	Tuscola, Ill.	278
WEAA	Flint, Mich.	250
WEAF	New York, N. Y.	485
WEAH	Wichita, Kan.	280
WEAI	Ithaca, N. Y.	286
WEAJ	Vermilion, S. D.	283
WEAM	North Plainfield, N. J.	286
WEAN	Providence, R. I.	273
WEAO	Columbus, O.	293
WEAR	Cleveland, O.	389
WEAU	Sioux City, Ia.	275
WEAY	Houston, Tex.	360
WEB	St. Louis, Mo.	273
WEBA	Highland Park, N. J.	233
WEBC	Superior, Wis.	242
WEBD	Anderson, Ind.	246
WEBE	Cambridge, O.	248
WEBH	Chicago, Ill.	370
LA CROSSE, WIS.		244
LACY, WASH.		253
LAKE FOREST, ILL.		227
LAMBERTVILLE, N. J.		283
LAMONI, IA.		280
LANCASTER, PA.		258
LANCASTER, PA.		248
LANSING, MICH.		286
LAPORTE, IND.		224
LARAMIE, WYO.		283
LA SALLE, ILL.		266
LA SALLE, ILL.		234
LAWRENCE, KAN.		275
LAWRENCEBURG, TENN.		280
LIMA, O.		260
LINCOLN, NEB.		275
LINCOLN, NEB.		229
LINCOLN, NEB.		254
LITTLE ROCK, ARK.		254
LITTLE ROCK, ARK.		263
LOCKPORT, N. Y.		273
LOGANSPORT, IND.		220
LONG BEACH, CAL.		234
LOS ANGELES, CAL.		468
LOS ANGELES, CAL.		238
LOS ANGELES, CAL.		231
LOS ANGELES, CAL.		226
LOS ANGELES, CAL.		272
LOS ANGELES, CAL.		405
LOS ANGELES, CAL.		293
LOS ANGELES, CAL.		337
LOS ANGELES, CAL.		360
LOUISVILLE, KY.		399
LOUISVILLE, KY.		286
LOWELL, MASS.		266
MACON, GA.		226
MACON, GA.		261
MADISON, WIS.		535
MADISON, WIS.		236
MANHATTAN, KAN.		218
MANHATTAN, KAN.		341
MANHATTAN, KAN.		273
MARENGO, IA.		234
MARION, IND.		226
MARSHALLTOWN, IA.		248
MARSHFIELD, ORE.		240
MARSHFIELD, WIS.		229
MARTINSBURG, W. VA.		209
MATTAPOISETT, MASS.		248
MECHANICSBURG, O.		208
McKEESPORT, PA.		234
MEDFORD HILLSIDE, MASS.		261
MEMPHIS, TENN.		250
MEMPHIS, TENN.		266
MEMPHIS, TENN.		233
MEMPHIS, TENN.		503
MENOMINEE, MICH.		248
MENOMINEE, WIS.		234
MIAMI, FLA.		283
MIAMI BEACH, FLA.		384
MILFORD, KAN.		286
MILWAUKEE, WIS.		280
MILWAUKEE, WIS.		246
MINNEAPOLIS, MINN.		231
MINNEAPOLIS, MINN.		261
MINNEAPOLIS, MINN.		231
MINNEAPOLIS, MINN.		244
MINNEAPOLIS, MINN.		417
MINNEAPOLIS, MINN.		280
MINNEAPOLIS, MINN.		417
MINNEAPOLIS, MINN.		278
MISHAWAKA, IND.		369
MISSOULA, MONT.		244
MOBERLY, MO.		266
MOBERLY, MO.		246
MONMOUTH, ILL.		224
MONTGOMERY, ALA.		226
MOOREHEAD, MINN.		286
MOOSEHEART, ILL.		303
MOSCOW, IDA.		230
MT. CLEMENT, MICH.		270
NASHVILLE, TENN.		236
NASHVILLE, TENN.		263
NEAH BAY, WASH.		261
NEW BEDFORD, MASS.		209
NEW HAVEN, CONN.		268
NEW ORLEANS, LA.		263
NEW ORLEANS, LA.		275
KFNG	Coldwater, Miss.	254
WAAN	Columbia, Mo.	254
KFDJ	Corvallis, Ore.	254
KFEL	Denver, Col.	254
WSAR	Fall River, Mass.	254
WFBZ	Galesburg, Ill.	254
WJAK	Greentown, Ia.	254
WKAV	Laconia, N. H.	254
WMAH	Lincoln, Neb.	254
KFMB	Little Rock, Ark.	254
WIAD	Philadelphia, Pa.	254
WNAT	Philadelphia, Pa.	254
KFOU	Richmond, Cal.	254
WABM	Saginaw, Mich.	254
WBAX	Wilkes-Barre, Pa.	254
WNAL	Omaha, Neb.	255
WFBQ	Raleigh, N. C.	256
WDBR	Boston, Mass.	256
KFLP	Cedar Rapids, Ia.	256
WDOD	Chattanooga, Tenn.	256
WRAK	Escanaba, Mich.	256
WBDC	Grand Rapids, Mich.	256
WRAA	Houston, Tex.	256
WHBP	Johnstown, Pa.	256
WMAL	Trenton, N. J.	256
KFCF	Walla Walla, Wash.	256
WRHF	Washington, D. C.	256
WADC	Akron, O.	258
WDBY	Chicago, Ill.	258
WFBY	Ft. Ben. Harrison, Ind.	258
WDBV	Fort Wayne, Ind.	258
KFUL	Galveston, Tex.	258
WSAJ	Grove City, Pa.	258
WDBC	Lancaster, Pa.	258
WNAD	Norman, Okla.	258
KFCZ	Omaha, Neb.	258
WSAZ	Pomeroy, O.	258
WHEC	Rochester, N. Y.	258
WHBN	St. Petersburg, Fla.	258
KFJR	Stevensville, Mont.	258
KFQC	Taft, Cal.	258
WOAC	Lima, O.	260
WWL	New Orleans, La.	260
WMU	Washington, D. C.	260
WFBG	Altoona, Pa.	261
WMAC	Cascnovia, N. Y.	261
WRR	Dallas, Tex.	261
WABQ	Haverford, Pa.	261
KFNY	Helena, Mont.	261
KFSY	Helena, Mont.	261
WMAZ	Macon, Ga.	261
WGI	Medford Hillside, Mass.	261
KFEK	Minneapolis, Minn.	261
KFHH	Neah Bay, Wash	261
WSAD	Providence, R. I.	261
KFOO	Salt Lake City, Utah	261
KFMR	Sioux City, Ia.	261
WDBP	Superior, Wis.	261
WCAG	New Orleans, La.	262
WDAG	Amarillo, Tex.	263
KFRM	Fort Sill, Okla.	263
KNT	Kukak Bay, Alaska	263
WCAV	Little Rock, Ark.	263
WEBX	Nashville, Tenn.	263
WAAM	Newark, N. J.	263
WAAB	New Orleans, La.	263
WABZ	New Orleans, La.	263
WCBE	New Orleans, La.	263
WSAP	New York, N. Y.	263
WCAR	San Antonio, Tex.	263
WRAO	St. Louis, Mo.	263
KFQA	St. Louis, Mo.	264
WSAG	St. Petersburg, Fla.	264
WBCN	Chicago, Ill.	268
WENR	Chicago, Ill.	266
WCBN	Ft. Ben. Harrison, Ind.	266
WABB	Harrisburg, Pa.	266
KFMW	Houghton, Mich.	266
WGBN	La Salle, Ill.	266
WQAS	Lowell, Mass.	266
WGBC	Memphis, Tenn.	266
WFEP	Moberly, Mo.	266
KFNF	Shenandoah, Ia.	266
KFRY	State College, N. M.	266
WCBY	Buck Hill Falls, Pa.	268
KFPW	Cartersville, Mo.	268
WJAM	Cedar Rapids, Ia.	266
WBBY	Charleston, S. C.	268

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WEBP	New Orleans, La.	280
WEBT	Dayton, O.	270
WEBW	Beloit, Wis.	283
WEBX	Nashville, Tenn.	263
WEEI	Boston, Mass.	475
WEMC	Berrien Springs, Mich.	285
WENR	Chicago, Ill.	266
WEW	St. Louis, Mo.	280
WFAA	Dallas, Tex.	472
WFAM	St. Cloud, Minn.	273
WFAV	Lincoln, Neb.	275
WFBB	Eureka, Ill.	240
WFBC	Knoxville, Tenn.	250
WFBD	Philadelphia, Pa.	234
WFBE	Seymour, Ind.	226
WFBG	Altoona, Pa.	261
WFBH	New York, N Y.	273
WFBJ	Collegeville, Minn.	236
WFBQ	Raleigh, N. C.	255
WFBR	Baltimore, Md.	452
WFBW	Cincinnati, O.	309
WFBY	Ft. Ben Harrison, Ind.	258
WFBZ	Galesburg, Ill.	254
WFI	Philadelphia, Pa.	394
WFKB	Chicago, Ill.	217
WFUV	Springfield, Mo.	252
WGAL	Lancaster, Pa.	248
WGAQ	Shreveport, La.	252
WGAZ	South Bend, Ind.	360
WGBB	Freeport, N. Y.	244
WGBC	Memphis, Tenn.	266
WGBF	Evansville, Ind.	217
WGBG	Thrifton, Va.	226
WGBH	Fall River, Mass.	209
WGBI	Scranton, Pa.	240
WGBK	Johnstown, Pa.	248
WGBM	Providence, R. I.	234
WGBN	LaSalle, Ill.	266
WGBO	San Juan, P. R.	275
WGBP	Tampa, Fla.	250
WGBL	Elyria, O.	227
WGBQ	Menominee, Wis.	234
WGBR	Marshfield, Wis.	229
WGBS	New York, N. Y.	315
WGBT	Greenville, S. C.	236
WGBW	Spring Valley, Ill.	212
WGBX	Orono, Me.	252
WGBY	R. R. No. 2	218
WGI	Medford Hillside, Mass.	261
WGN	Chicago, Ill.	370
WGR	Buffalo, N. Y.	319
WGY	Schenectady, N. Y.	379
WHA	Madison, Wis.	535
WHAD	Milwaukee, Wis.	280
WHAG	Cincinnati, O.	222
WHAH	Joplin, Mo.	283
WHAM	Rochester, N. Y.	278
WHAP	Brooklyn, N. Y.	240
WHAR	Atlantic City, N. J.	275
WHAS	Louisville, Ky.	399
WHAV	Wilmington, Del.	360
WHAZ	Troy, N. Y.	385
WHB	Kansas City, Mo.	365
WHBA	Oil City, Pa.	250
WHBB	Stevens Point, Wis.	240
WHBC	Canton, O.	245
WHBD	Bellefontaine, O.	222
WHBF	Rock Island, Ill.	222
WHBG	Harrisburg, Pa.	231
WHBH	Culver, Ind.	222
WHBI	Chesaning, Mich.	227
WHBJ	Fort Wayne, Ind.	234
WHBK	Ellsworth, Me.	231
WHBL	Logansport, Ind.	220
WHBM	Chicago, Ill.	233
WHBN	St. Petersburg, Fla.	258
WHBO	Pawtucket, R. I.	231
WHBP	Johnstown, Pa.	256
WHBQ	Memphis, Tenn.	233
WHBR	Cincinnati, O.	216
WHBS	Mechanicsburg, O.	208
WHBT	Downers Grove, Ill.	206
WHBU	Anderson, Ind.	218
WHBV	Columbus, Ga.	244
WHBW	Philadelphia, Pa.	215
WHBX	Punxsutawny, Pa.	212
NEW ORLEANS, LA.		263
NEW ORLEANS, LA.		252
NEW ORLEANS, LA.		262
NEW ORLEANS, LA.		263
NEW ORLEANS, LA.		280
NEW ORLEANS, LA.		270
NEW ORLEANS, LA.		319
NEW ORLEANS, LA.		260
NEWARK, N. J.		263
NEWARK, N. J.		252
NEWARK, N. J.		233
NEWARK, N. J.		405
NEW YORK, N. Y.		340
NEW YORK, N. Y.		492
NEW YORK, N. Y.		233
NEW YORK, N. Y.		485
NEW YORK, N. Y.		273
NEW YORK, N. Y.		273
NEW YORK, N. Y.		315
NEW YORK, N. Y.		360
NEW YORK, N. Y.		455
NEW YORK, N. Y.		455
NEW YORK, N. Y.		526
NEW YORK, N. Y.		360
NEW YORK, N. Y.		263
NORFOLK, NEB.		283
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NORFOLK, VA.		280
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NORTHFIELD, MINN.		336
N. PLAINFIELD, N. J.		286
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OAKLAND, CAL.		508
OAKLAND, CAL.		360
OAK PARK, ILL.		283
OGDEN, UTAH		360
OGDEN, UTAH		224
OGDEN, UTAH		214
OIL CITY, PA.		250
OKLAHOMA CITY, OKLA.		252
OKLAHOMA CITY, OKLA.		220
OKLAHOMA CITY, OKLA.		275
OKMULGEE, OKLA.		360
OLYMPIA, WASH.		220
OMAHA, NEB.		258
OMAHA, NEB.		248
OMAHA, NEB.		285
OMAHA, NEB.		273
OMAHA, NEB.		255
OMAHA, NEB.		526
ORONO, ME.		252
OSKALOOSA, IA.		240
OSSEO, WIS.		220
OTTUMA, IA.		242
OWOSSO, MICH.		240
OXFORD, MISS.		242
PASADENA, CAL.		229
PASCAGOULA, MISS.		268
PASO ROBLES, CAL.		240
PARKERSBURG, PA.		270
PAWTUCKET, R. I.		231
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PHILADELPHIA, PA.		242
PHILADELPHIA, PA.		278
PHILADELPHIA, PA.		394
PHILADELPHIA, PA.		234
PHILADELPHIA, PA.		394
PHILADELPHIA, PA.		215
PHILADELPHIA, PA.		254
PHILADELPHIA, PA..		254
PHILADELPHIA, PA.		509
PHILADELPHIA, PA.		360
PHOENIX, ARIZ.		360
PHOENIX, ARIZ.		238
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PITTSBURGH, PA.		461
PITTSBURGH, PA.		236
PITTSBURGH, PA.		286
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WBAY		
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WSAP		
WJAG		
WBBX		
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268	Chicago, Ill.	WJAZ
268	Chicago, Ill.	WTX
268	Columbia, Tenn.	WDBW
268	Denver, Col.	KFLE
268	El Paso, Tex.	WDAH
268	Gloucester City, N. J.	WRAX
268	New Haven, Conn.	WPAJ
268	Oak, Neb.	KFEQ
268	Pascagoula, Miss.	WCBG
268	Salt Lake City, Utah	KFPT
268	Worcester, Mass.	WDBH
270	Cleveland, O.	KDPM
270	Dayton, O.	WEBT
270	Honolulu, Hawaii	KYO
270	Mt. Clemens, Mich.	WABX
270	New Orleans, La.	WOWL
270	Parkersburg, Va.	WQAA
270	Pittsburgh, Pa.	KQV
270	Schenectady, N. Y.	WRL
270	Seattle, Wash.	WDZE
270	Toledo, O.	WABR
271	Boise, Ida.	KFAU
271	Salt Lake City, Utah	KFUT
271	Springfield, O.	WNAP
272	Los Angeles, Cal.	KFSG
273	Atlantic, Ia.	KFLZ
273	Belden, Neb.	KFQY
273	Charlestown, W. Va.	WPAZ
273	Cleveland, O.	WHK
273	Dearborn, Mich.	WWI
273	Fond du Lac, Wis.	KFIZ
273	Greeley, Col.	KFKA
273	Lockport, N. Y.	WMAK
273	Manhattan, Kan.	WTG
273	New York, N. Y.	WEBJ
273	New York, N. Y.	WFBH
273	Omaha, Neb.	WIAK
273	Providence, R. I.	WEAN
273	Rossville, N. Y.	WBBR
273	Seattle, Wash.	KHQ
273	Stanford U., Cal.	KFGH
273	St. Cloud, Minn.	WFAM
273	St. Louis, Mo.	WEB
273	Tarrytown, N. Y.	WRW
273	Urbana, Ill.	WRM
273	Utica, N. Y.	WSL
274	Belvidere, Ill.	WOAG
275	Atlantic City, N. J.	WHAR
275	Baltimore, Md.	WCAO
275	Batavia, Ill.	WORD
275	Berkeley, Cal.	KRE
275	Cape Girardeau, Mo.	WSAB
275	Charlotte, N. C.	WBT
275	Jamestown, N. Y.	WOCL
275	Lawrence, Kan.	KFKU
275	Lincoln, Neb.	WFAV
275	New Orleans, La.	WAAC
275	Oklahoma City, Okla.	WKY
275	San Juan, P. R.	WGBO
275	Sioux City, Ia.	WEAU
275	Springfield, Vt.	WQAE
275	St. Louis, Mo.	WCK
275	Wilmington, N. C.	WBRN
278	Atlanta, Ga.	WDBE
278	Cedar Rapids, Ia.	WKAA
278	Denver, Col.	KFAF
278	Elgin, Ill.	WCEE
278	Minneapolis, Minn.	WLB
278	Philadelphia, Pa.	WCAU
278	Rochester, N. Y.	WHAM
278	San Diego, Cal.	KFBC
278	Stevens Point, Wis.	WDBL
278	Stevens Point, Wis.	WLBL
278	Tuscola, Ill.	WDZ
278	Valparaiso, Ind.	WRBC
280	Allentown, Pa.	WCBA
280	Ann Arbor, Mich.	WCBC
280	Canton, N. Y.	WCAD
280	Cedar Falls, Ia.	KFJX
280	College Station, Tex.	WTAW
280	Fremont, Neb.	WOAE
280	Grand Forks, N. D.	KFJM
280	Houlton, Mo.	WCBL
280	Lawrenceburg, Tenn.	WOAN
280	Lamoni, Ia.	KFFV
280	Milwaukee, Wis.	WHAD
280	Minneapolis, Minn.	WCAS
280	New Orleans, La.	WEBP

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WHO	Des Moines, Ia.	526
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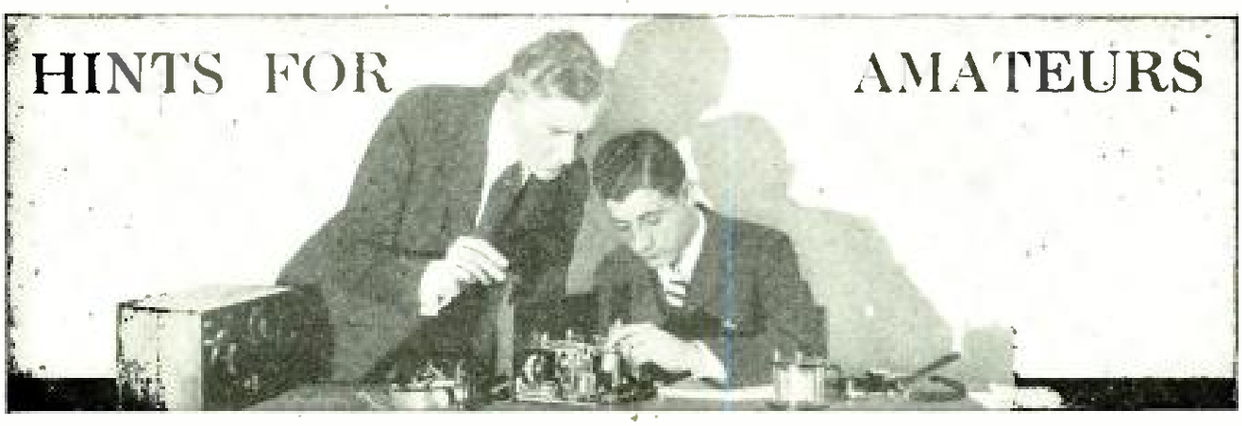
WIAD	Philadelphia, Pa.	254
WIAK	Omaha, Neb.	273
WIAQ	Marion, Ind.	226
WIAS	Burlington, Ia.	283
WIBA	Madison, Wis.	236
WIBC	St. Petersburg, Fla.	222
WIBD	Joliet, Ill.	200
WIBE	Martinsburg, W. Va.	209
WIBF	Wheatland, Wis.	231
WIBG	Elkins Park, Pa.	222
WIBH	New Bedford, Mass.	209
WIBO	Chicago, Ill.	226
WIK	McKeesport, Pa.	234
WIL	Washington, D. C.	360
WIP	Philadelphia, Pa.	509
WJAB	Lincoln, Neb.	229
WJAD	Waco Tex.	352
WJAG	Norfolk, Neb.	283
WJAK	Greentown, Ia.	254
WJAM	Cedar Rapids, Ia.	268
WJAN	Peoria, Ill.	280
WJAR	Providence, R. I.	305
WJAS	Pittsburgh, Pa.	286
WJBC	La Salle, Ill.	234
WJAZ	Chicago, Ill.	268
WJBD	Ashland, Wis.	233
WJD	Graniteville, O.	229
WJJD	Mooseheart, Ill.	303
WJY	New York, N. Y.	455
WJZ	New York, N. Y.	455
WKAA	Cedar Rapids, Ia.	278
WKAD	East Providence, R. I.	240
WKAN	Montgomery, Ala.	226
WKAP	Cranston, R. I.	234
WKAQ	San Juan, P. R.	340
WKAR	East Lansing, Mich.	285
WKAV	Laconia, N. H.	254
WKBE	Webster, Mass.	231
WKBF	Cranston, R. I.	286
WKY	Oklahoma City, Okla.	275
WLAG	Minneapolis, Minn.	417
WLAL	Tulsa, Okla.	250
WLAP	Louisville, Ky.	286
WLAQ	Kalamazoo, Mich.	283
WLAX	Greencastle, Ind.	231
WLB	Minneapolis, Minn.	278
WLBL	Stevens Point, Wis.	278
WLS	Chicago, Ill.	344
WLW	Cincinnati, O.	422
WMAC	Cazenovia, N. Y.	261
WMAF	Dartmouth, Mass.	360
WMAH	Lincoln, Neb.	254
WMAK	Lockport, N. Y.	273
WMAL	Trenton, N. J.	256
WMAN	Columbus, O.	286
WMAQ	Chicago, Ill.	447
WMAV	Auburn, Ala.	250
WMAY	St. Louis, Mo.	280
WMAZ	Macon, Ga.	261
WMBB	Chicago, Ill.	250
WMBF	Miami Beach, Fla.	384
WMC	Memphis, Tenn.	503
WMH	Cincinnati, O.	321
WMU	Washington, D. C.	260
WNAB	Boston, Mass.	250
WNAC	Boston, Mass.	284
WNAD	Norman, Okla.	258
WNAL	Omaha, Neb.	255
WNAP	Springfield, O.	271
WNAR	Butler, Mo.	230
WNAT	Philadelphia, Pa.	254
WNAX	Yankton, S. D.	248
WNYC	New York, N. Y.	526
WOAC	Lima, O.	260
WOAE	Fremont, Neb.	280
WOAG	Belvidere, Ill.	274
WOAI	San Antonio, Tex.	392
WOAN	Lawrenceburg, Tenn.	280
WOAO	Mishawaka, Ind.	369
WOAR	Kenosha, Wis.	225
WOAT	Wilmington, Del.	360
WOAV	Erie, Pa.	242
WOAW	Omaha, Neb.	526
	PORT HURON, MICH.	233 WAFD
	PORTLAND, ORE.	248 KFIF
	PORTLAND, ORE.	248 KFEC
	PORTLAND, ORE.	283 KFQN
	PORTLAND, ORE.	491 KGW
	PROVIDENCE, R. I.	246 WCBR
	PROVIDENCE, R. I.	273 WEAN
	PROVIDENCE, R. I.	234 WGBM
	PROVIDENCE, R. I.	305 WJAR
	PROVIDENCE, R. I.	261 WSAD
	PULLMAN, WASH.	348 KFAE
	PULLMAN, WASH.	217 KFRX
	PUNXSUTAWNY, PA.	212 WHBX
	RALEIGH, N. C.	255 WFBQ
	RAPID CITY, S. D.	240 WCAT
	READING, PA.	238 WRAW
	RICHMOND, CAL.	254 KFOU
	RICHMOND, VA	253 WBBL
	RICHMOND HILL, N. Y.	315 WAHG
	RICHMOND HILL, N. Y.	236 WBOQ
	ROANOKE, VA.	229 WDBJ
	ROCHESTER, N. Y.	278 WHAM
	ROCHESTER, N. Y.	283 WABO
	ROCHESTER, N. Y.	258 WHEC
	ROCKFORD, ILL.	229 KFLV
	ROCK ISLAND, ILL.	222 WHBF
	ROSSVILLE, N. Y.	273 WBBR
	R. R. NO. 2	218 WGBY
	SACRAMENTO, CAL.	283 KFBK
	SACRAMENTO, CAL.	248 KFVK
	SANDUSKY, O.	240 WABH
	SAGINAW, MICH.	254 WABM
	SALEM, N. J.	234 WDBQ
	SALT LAKE CITY, UTAH	250 KDYL
	SALT LAKE CITY, UTAH	261 KFOO
	SALT LAKE CITY, UTAH	242 KFPH
	SALT LAKE CITY, UTAH	268 KFPT
	SALT LAKE CITY, UTAH	271 KFUT
	SALT LAKE CITY, UTAH	209 KSL
	SAN ANTONIO, TEX.	263 WCAR
	SAN ANTONIO, TEX.	392 WOAI
	SAN BENITO, TEX.	236 KFLU
	SAN DIEGO, CAL.	244 KDPT
	SAN DIEGO, CAL.	280 KDYM
	SAN DIEGO, CAL.	278 KFBC
	SAN FRANCISCO, CAL.	236 KFPV
	SAN FRANCISCO, CAL.	234 KFUQ
	SAN FRANCISCO, CAL.	428 KPO
	SAN FRANCISCO, CAL.	246 KUO
	SAN JOSE, CAL.	226 KFVJ
	SAN JOSE, CAL.	240 KQW
	SAN JUAN, P. R.	275 WGBO
	SAN JUAN, P. R.	340 WKAQ
	SAN LEANDRO, CAL.	234 KFUU
	SAN LUIS OBISPO, CAL.	218 KFBE
	SAN PEDRO, CAL.	205 KFVD
	SANTA ANA, CAL.	280 KFAW
	SANTA ROSA, CAL.	234 KFNV
	SCHENECTADY, N. Y.	379 WGY
	SCHENECTADY, N. Y.	270 WRL
	SCRANTON, PA.	240 WGBI
	SCRANTON, PA.	280 WQAN
	SEATTLE, WASH.	270 KDZE
	SEATTLE, WASH.	283 KFHR
	SEATTLE, WASH.	384 KFOA
	SEATTLE, WASH.	224 KFPB
	SEATTLE, WASH.	233 KFQX
	SEATTLE, WASH.	273 KHQ
	SEATTLE, WASH.	384 KJR
	SEATTLE, WASH.	454 KTW
	SEYMOUR, IND.	226 WFBE
	SHENANDOAH, IA.	266 KFNF
	SHREVEPORT, LA.	360 KFDX
	SHREVEPORT, LA.	252 WGAQ
	SIOUX CITY, IA.	275 WEAU
	SIOUX CITY, IA.	261 KFMR
	SORRS, CONN.	283 WABL
	SOUTH BEND, IND.	360 WGAZ
	SPOKANE, WASH.	252 KFIO
	SPOKANE, WASH.	283 KFPY
	SPRINGFIELD, MASS.	333 WBZ
	SPRINGFIELD, MO.	252 WFUV
	SPRINGFIELD, O.	271 WNAP
	SPRINGFIELD, VT.	275 WQAE
	SPRING VALLEY, ILL.	212 WGBW
	ST. CLOUD, MINN.	273 WFAM
	ST. LOUIS, MO.	264 KFQA
	ST. LOUIS, MO.	549 KFUO
280	Norfolk, Va.	WTAR
280	Peoria, Ill.	WJAN
280	San Diego, Cal.	KDYM
280	Santa Ana, Cal.	KFAW
280	Scranton, Pa.	WQAN
280	St. Louis, Mo.	WEW
280	St. Louis, Mo.	WMAY
280	Wichita, Kan.	WEAH
283	Agricultural Col., N. D.	WPAK
283	Beloit, Wis.	WEBW
283	Burlington, Ia.	WIAS
283	Butte, Mont.	KFKV
283	Butte, Mont.	KFLA
283	Dayton, O.	WDBS
283	Denver, Col.	KLZ
283	Joplin, Mo.	WHAH
283	Kalamazoo, Mich	WLAQ
283	Lambertville, N. J.	WTAZ
283	Laramie, Wyo.	KFBU
283	Miami, Fla.	WQAM
283	Norfolk, Neb.	WJAG
283	Oak Park, Ill.	WTAY
283	Portland, Ore.	KFQN
283	Rochester, N. Y.	WABO
283	Sacramento, Cal.	KFBK
283	Seattle, Wash.	KFHR
283	Sorrs, Conn.	WABL
283	Spokane, Wash.	KFPY
283	State College, Pa.	WPAB
283	University Pl., Neb.	WCAJ
283	Vermilion, S. D.	WEAJ
283	West Lafayette, Ind.	WBAA
284	Boston, Mass.	WNAC
284	Iowa City, Ia.	KFQP
285	Berrien Springs, Mich.	WEMC
285	East Lansing, Mich.	WKAR
285	Omaha, Neb.	WAAW
286	Butler, Pa.	WBR
286	Chicago, Ill.	WAAF
286	Columbus, O.	WCAH
286	Columbus, O.	WMAN
286	Columbus, O.	WPAL
286	Cranston, R. I.	WKBF
286	Detroit, Mich.	KOP
286	Ithaca, N. Y.	WEAI
286	Lansing, Mich.	WREO
286	Louisville, Ky.	WLAP
286	Milford, Kan.	KFKB
286	Moorehead, Minn.	WPAU
286	North Plainfield, N. J.	WEAM
286	Pittsburgh, Pa.	WJAS
288	Hastings, Neb.	KFKX
292	Columbus, O.	WBAV
293	Columbus, O.	WEAO
293	Los Angeles, Cal.	KJS
299	Fayetteville, Ark.	KFMQ
299	Salt Lake City, Utah	KSL
300	Atlantic City, N. J.	WPG
303	Elgin, Ill.	WTAS
303	Mooseheart, Ill.	WJJD
305	Providence, R. I.	WJAR
309	Cincinnati, O.	WFBW
309	East Pittsburgh, Pa.	KDKA
315	Beaumont, Tex.	KFIM
315	New York, N. Y.	WGBS
315	Richmond, Hill, N. Y.	WAHG
315	Youngstown, O.	WDBF
319	Buffalo, N. Y.	WGR
319	New Orleans, La.	WSMB
321	Cincinnati, O.	WMH
323	Denver, Col.	KOA
323	Hartford, Conn.	WTIC
325	Cincinnati, O.	WSAI
331	Clemson College, S. C.	WBAC
333	Springfield, Mass.	WBZ
336	Clemson College, S. C.	WSAC
336	Northfield, Minn.	KFMX
336	Northfield, Minn.	WCAL
337	Los Angeles, Cal.	KNX
340	New York, N. Y.	WAMC
340	San Juan, P. R.	WKAQ
341	Manhattan, Kan.	KSAC
344	Chicago, Ill.	WLS
344	Zion, Ill.	WCBD
348	Pullman, Wash	KFAE
348	State College, N. M.	KOB
352	Detroit, Mich.	WWJ
352	Waco, Tex	WJAD

Call Letters	Location	Wave-length
WOAX	Trenton, N. J.	240
WOC	Davenport, Ia.	484
WOCL	Jamestown, N. Y.	275
WOI	Ames, Ia.	207
WOO	Philadelphia, Pa.	509
WOR	Newark, N. J.	405
WORD	Batavia, Ill.	275
WOS	Jefferson City, Mo.	440
WOWL	New Orleans, La.	270
WPAB	State College, Pa.	283
WPAC	Okmulgee, Okla.	360
WPAJ	New Haven, Conn.	268
WPAK	Agricultural Col., N. D.	283
WPAL	Columbus, O.	286
WPAU	Moorehead, Minn.	286
WPAZ	Charleston, W. Va.	273
WPG	Atlantic City, N. J.	300
WQAA	Parkersburg, Pa.	270
WQAC	Amarillo, Tex.	234
WQAE	Springfield, Vt.	275
WQAM	Miami, Fla.	283
WQAN	Scranton, Pa.	280
WQAO	New York, N. Y.	360
WQAS	Lowell, Mass.	266
WQJ	Chicago, Ill.	447
WRAA	Houston, Tex.	256
WRAF	Laporte, Ind.	224
WRAK	Escanaba, Mich.	256
WRAM	Galesburg, Ill.	244
WRAN	Waterloo, Ia.	236
WRAO	St. Louis, Mo.	263
WRAV	Yellow Springs, O.	242
WRAW	Reading, Pa.	238
WRAX	Gloucester City, N. J.	268
WRBC	Valparaiso, Ind.	278
WRC	Washington, D. C.	468
WREO	Lansing, Mich.	286
WRHF	Washington, D. C.	256
WRK	Hamilton, O.	360
WRL	Schenectady, N. Y.	270
WRM	Urbana, Ill.	273
WRR	Dallas, Tex.	261
WRW	Tarrytown, N. Y.	273
WSAB	Cape Girardeau, Mo.	275
WSAC	Clemson College, S. C.	336
WSAD	Providence, R. I.	261
WSAG	St. Petersburg, Fla.	264
WSAI	Cincinnati, O.	325
WSAJ	Grove City, Pa.	258
WSAN	Allentown, Pa.	229
WSAP	New York, N. Y.	263
WSAR	Fall River, Mass.	254
WSAV	Houston, Tex.	360
WSAY	Port Chester, N. Y.	233
WSAZ	Pomeroy, O.	258
WSB	Atlanta, Ga.	428
WSL	Utica, N. Y.	273
WSMB	New Orleans, La.	319
WSMH	Owosso, Mich.	240
WSOE	Milwaukee, Wis.	246
WSRF	Broadlands, Ill.	233
WSUI	Iowa City, Ia.	498
WTAB	Fall River, Mass.	248
WTAC	Johnstown, Pa.	360
WTAL	Toledo, O.	252
WTAM	Cleveland, O.	389
WTAP	Cambridge, Ill	242
WTAQ	Osseo, Wis.	220
WTAR	Norfolk, Va.	280
WTAS	Elgin, Ill.	303
WTAT	Boston, Portable	244
WTAU	Tecumseh, Neb.	242
WTAW	College Station, Tex.	280
WTAX	Streator, Ill.	231
WTAY	Oak Park, Ill.	283
WTAZ	Lambertville, N. J.	283
WTHS	Flint, Mich.	218
WTG	Manhattan, Kan.	273
WTIC	Hartford, Conn.	323
WTX	Chicago, Ill.	268
WWAD	Philadelphia, Pa.	360
WWAE	Joliet, Ill.	242
WWI	Dearborn, Mich.	273
WWJ	Detroit, Mich.	352
WWL	New Orleans, La.	260
WWOA	Houghton, Mich.	244
ST. LOUIS, MO.		214	KFWF
ST. LOUIS, MO.		545	KSD
ST. LOUIS, MO.		275	WCK
ST. LOUIS, MO.		273	WEB
ST. LOUIS, MO.		280	WEW
ST. LOUIS, MO.		280	WMAY
ST. LOUIS, MO.		263	WRAO
ST. PAUL, MINN.		226	KFOY
ST. PETERSBURG, FLA.		226	WDBI
ST. PETERSBURG, FLA.		258	WHBN
ST. PETERSBURG, FLA.		222	WIBC
ST. PETERSBURG, FLA.		264	WSAG
STANFORD U., CAL.		273	KFGH
STATE COLLEGE, N. M.		266	KFRY
STATE COLLEGE, N. M.		348	KOB
STATE COLLEGE, PA.		283	WPAB
STEVENSVILLE, MONT.		258	KFJR
STEVENSPOINT, WIS.		278	WDBL
STEVENS POINT, WIS.		240	WHBB
STEVENS POINT, WIS.		278	WLBL
STOCKTON, CAL.		360	KWG
STREATOR, ILL.		231	WTAX
SUPERIOR, WIS.		261	WDBP
SUPERIOR, WIS.		242	WEBC
TACOMA, WASH.		250	KFBG
TACOMA, WASH.		252	KGB
TACOMA, WASH.		250	KMO
TACOMA PK., MD.		222	WBES
TAFT, CAL.		258	KFQC
TAMPA, FLA.		365	WDAE
TAMPA, FLA.		250	WGBP
TARRYTOWN, N. Y.		273	WRW
TAUNTON, MASS.		229	WDBB
TECUMSEH, NEB.		242	WTAU
THRIFTON, VA.		226	WGBG
TOLEDO, OHIO		270	WABR
TOLEDO, O.		252	WTAL
TRENTON, N. J.		256	WMAL
TRENTON, N. J.		240	WOAX
TROY, N. Y.		385	WHAZ
TULSA, OKLA.		250	WLAL
TULLAHOMA, TENN.		252	WCBV
TUSCOLA, ILL.		278	WDZ
TUSCON, ARIZ.		368	KFDH
TWIN CITIES, MINN.		416	WCCO
UNIVERSITY PL., NEB.		283	WCAJ
UPLAND, CAL.		211	KFWC
URBANA, ILL.		273	WRM
UTICA, NEB.		224	KFGB
UTICA, N. Y.		273	WSL
VANCOUVER, WASH.		231	KFVL
VALPARAISO, IND.		278	WRBC
VERMILLION, S. D.		283	WEAJ
VIRGINIA, MINN.		248	KFUZ
WACO, TEX.		352	WJAD
WALLACE, IDA.		224	KFOD
WALLA WALLA, WASH.		256	KFCF
WARRENSBURG, MO.		234	KFNJ
WASHINGTON, D. C.		468	WCAP
WASHINGTON, D. C.		234	WDM
WASHINGTON, D. C.		360	WIL
WASHINGTON, D. C.		260	WMU
WASHINGTON, D. C.		468	WRC
WASHINGTON, D. C.		256	WRHF
WATERLOO, IA.		236	WRAN
WEBSTER, MASS.		231	WKBE
WENATCHEE, WASH.		360	KDZI
W. LAFAYETTE, IND.		283	WBAA
WHEATLAND, WIS.		231	WIBF
WHITTIER, CAL.		236	KFOC
WICHITA, KAN.		231	KFQT
WICHITA, KAN.		280	WEAH
WILKES-BARRE, PA.		254	WBAX
WILKES-BARRE, PA.		231	WBRE
WILMINGTON, DEL.		360	WHAV
WILMINGTON, DEL.		360	WOAT
WILMINGTON, N. C.		275	WBBN
WINTER PARK, FLA.		240	WDBO
WOOSTER, O.		234	WABW
WORCESTER, MASS.		238	WCBT
WORCESTER, MASS.		268	WDBH
YAKIMA, WASH.		242	KFIQ
YANKTON, S. D.		248	WNAX
YELLOW SPRINGS, O.		242	WRAV
YOUNGSTOWN, O.		315	WDBF
ZION, ILL.		344	WCBD
360	Boulder, Col.	KFAJ
260	Brookings, S. D.	KFDY
360	Dartmouth, Mass.	WMAF
360	Decatur, Ill.	WBAO
360	Hamilton, O.	WRK
360	Havre, Mont.	KFBB
360	Honolulu, Hawaii	KGU
360	Houston, Tex.	WEAY
360	Houston, Tex.	WSAV
360	Johnstown, Pa.	WTAC
360	Los Angeles, Cal.	KWH
360	New York, N. Y.	WHN
360	New York, N. Y.	WQAO
360	Oakland, Cal.	KZM
360	Ogden, Utah	KFCP
360	Okmulgee, Okla.	WPAC
360	Phoenix, Ariz.	KFAD
360	Philadelphia, Pa.	WWAD
360	Shreveport, La.	KFDX
360	South Bend, Ind.	WGAZ
360	Stockton, Cal.	KWG
360	Washington, D. C.	WIL
360	Wenatchee, Wash.	KDZI
360	Wilmington, Del.	WHAV
360	Wilmington, Del.	WOAT
361	Oakland, Cal.	KGO
365	Kansas City, Mo.	WDAF
365	Kansas City, Mo.	WHB
365	Tampa, Fla.	WDAE
368	Tuscon, Ariz.	KFDH
369	Mishawaka, Ind.	WOAO
370	Chicago, Ill.	WEBH
370	Chicago, Ill.	WGN
375	Hot Springs, Ark.	KTHS
379	Schenectady, N. Y.	WGY
384	Miami Beach, Fla.	WMBF
384	Seattle, Wash.	KFOA
384	Seattle, Wash.	KJR
385	Troy, N. Y.	WHAZ
389	Cleveland, O.	WEAR
389	Cleveland, O.	WTAM
392	San Antonio, Tex.	WOAI
394	Bristow, Okla.	KFRU
394	Philadelphia, Pa.	WDAR
394	Philadelphia, Pa.	WFI
399	Louisville, Ky.	WHAS
405	Los Angeles, Cal.	KHJ
405	Newark, N. J.	WOR
416	Twin Cities, Minn.	WCCO
417	Minneapolis, Minn.	WBAH
417	Minneapolis, Minn.	WLAG
422	Cincinnati, O.	WLW
428	Atlanta, Ga.	WSB
428	San Francisco, Cal.	KPO
440	Cranston, R. I.	WDWF
440	Jefferson City, Mo.	WOS
447	Chicago, Ill.	WMAQ
447	Chicago, Ill.	WQJ
452	Baltimore, Md.	WFBR
454	Seattle, Wash.	KTW
455	New York, N. Y.	WJY
455	New York, N. Y.	WJZ
461	Pittsburgh, Pa.	WCAE
468	Los Angeles, Cal.	KFI
468	Washington, D. C.	WCAP
468	Washington, D. C.	WRC
472	Dallas, Tex.	WFAA
475	Boston, Mass.	WEEI
476	Fort Worth, Tex.	WBAP
484	Davenport, Ia.	WOC
485	New York, N. Y.	WEAF
491	Portland, Ore.	KGW
492	New York, N. Y.	WBAY
498	Iowa City, Ia.	WSUI
503	Memphis, Tenn.	WMC
508	Oakland, Cal.	KLX
509	Philadelphia, Pa.	WIP
509	Philadelphia, Pa.	WOO
516	Detroit, Mich.	WCX
526	Des Moines, Ia.	WHO
526	New York, N. Y.	WNYC
526	Omaha, Neb.	WOAW
535	Chicago, Ill.	KYW
535	Madison, Wis.	WHA
545	St. Louis, Mo.	KSD
549	St. Louis, Mo.	KFUO



CONDUCTED BY ALBERT G. CRAIG

How to Sharpen up a Tuned Radio-Frequency Receiver

WHEN a tuned radio-frequency receiver is located close to a powerful broadcasting station, it is often difficult to tune out the local signals and receive signals from a distance.

One way to help sharpen up reception with such a receiver is to include, directly in the antenna circuit, a small fixed condenser. It is advisable to obtain four condensers to make a try-out. The sizes for these condensers should be .0001 mfd., .00015 mfd., .00025 mfd., and .0005 mfd. Place these in the antenna circuit, one at a time, and tune to the different stations on various wavelengths, until you find the one which gives sufficient selectivity with the best volume from out-of-town stations.

The one you choose may be left "in" all the time, or it may be used with a short-circuit switch only when the local broadcasts are going full blast.

For greater distance reception, after the local broadcasting has stopped, it would be advisable to close the short-circuit switch, which would give a direct connection to the antenna.

A Tip on Soldering

WHEN soldering the several pieces of wire together in constructing an antenna, it is advisable to clean the parts of the wire to be soldered by scraping them with a knife or a file until they are bright and shiny. When this has been done, it will be much easier to make a good soldered connection that will be permanent.

This same procedure will insure good connections inside of the set itself at the time when the wiring is being done.

A Guide When Buying a Ready-made Receiver

IN DECIDING on what kind of a receiving set one might want to buy, it is recommended that the prospective purchaser consult the department in this magazine, "What Set Shall I Buy?" Every month this series illustrates a number of excellent receivers of various designs and types, and gives data showing how much they cost, what kind of ærials are used with them, how many tuning controls they contain, what kind of batteries are used and what their average distance ranges are. The sets shown in every issue vary from the less expensive to the very costly grades.

Ask your dealer to demonstrate to you one or two of the models that you pick from this series.

Do Not Use Paint

NEVER use any kind of ordinary paint on a radio receiver. Do not paint the baseboard with any regular colored paint; use some sort of a vegetable stain for this purpose and dry it out thoroughly before it is installed in the set. Never use any kind of varnish for the coils or tuning units in a receiver.

WHAT READERS ASK

CONDUCTED BY LAURENCE M. COCKADAY

IN justice to our regular subscribers a nominal fee of fifty cents per question is charged to non-subscribers to cover the cost of this service, and this sum must be inclosed with the letter of inquiry. Subscribers' inquiries should be limited to one question or one subject.

Audio-frequency Transformer Leads

QUESTION: I have been experimenting in making my own audio-frequency transformers, and I have had a lot of fun in varying the different constants and then testing them out to see just what difference the various changes made. What is the proper way to connect the coils, primary and secondary? I have the secondary coil wound outside of the primary coil with a shell type core. Please tell me the best way to bring out the leads to the grid, filament, plate and B (+)?

F. LINDSAY

ANSWER: The outside end of the secondary winding should go to the grid of the vacuum tube. The inside end of this winding should go to the negative filament or to the negative (—) "C" battery (when one is used).

The outside end of the primary winding should go to the "B" battery (+) and the inside end of the primary winding should go to the plate of the tube. This gives the lowest capacity between the grid and plate ends of the windings, which lowers the effective capacity across the coils.

A By-pass for First Audio Transformer

QUESTION: Is it a good practice to use a by-pass condenser across the primary of the first audio transformer in a radio receiving set? In some sets I noticed that it makes little difference—in other sets it makes a whole lot of difference. Just why is this and what size would you prescribe for ordinary receivers?

F. THIELE

ANSWER: A by-pass condenser in this position usually is of considerable benefit in a radio receiving set.

Some transformers have a large enough distributed capacity between the turns of the primary winding, so that the by-pass condenser is not necessary. However, it is usually good practice to include across the primary of the transformer, a condenser varying between .0001 mfd. and .0005 mfd. Larger sizes than this may tend to by-pass some of the audio-frequencies, especially the high ones that help so much in reproducing the consonants in speech.

Soldered Connections Inside Receivers

QUESTION: Do you recommend soldering connections inside a home-built receiver or just attaching the wire under the binding posts with which the instruments are equipped? I notice that the larger manufacturers are equipping their instruments with soldered lugs. Is this an indication that the soldered connection is better?

M. H. WEINTZ

ANSWER: We recommend using the soldering method throughout, as it insures better and more lasting contact. We also have been recommending to manufacturers that they include soldered lugs on all of the terminals of their parts and instruments, whether or not they equip them with binding posts.

When to Use Straightline Condensers

QUESTION: Do you advise changing the condensers I have in my present four-circuit tuner from the straightline capacity type to the straightline wavelength type, or the more recent development—the straightline frequency type of condenser? On my present set I do not find any trouble when separating the lower wavelength stations, but a friend tells me that I would get much better signal strength if I were to change to the straightline-frequency type of variable condenser. Is this true?

V. REUSCHER

ANSWER: We do not recommend changing the condensers you are using. It is true that straightline-wavelength and more especially straightline-frequency condensers will give less crowding of stations on the dial at the lower wavelengths, but if the capacity and inductance ranges of the receiver are properly proportioned, the trouble of crowding in tuning over the regular broadcast range will not be severe.

The most compact type of condenser, of course, is the straightline-capacity condenser, with the straightline-wavelength type running second and the straightline-frequency condenser finishing up a bad third in regard to space they take up in a receiving set.

As the signal strength in a receiver is dependent upon the electromagnetic and electrostatic fields inside of the receiver, it is always advisable to keep coils and condensers as small as possible in order to limit the size of both of these fields, so that they will not induce currents in other parts of the circuit where the energy might be wasted.

For this reason, we recommend the more compact apparatus and this includes the use of the straightline capacity condenser.

The Water Meter

QUESTION: I notice that my cold-water pipe is not as good a ground as the radiator system in our house. I always understood that the cold-water pipe as a ground was the best of any of them. Can you tell me why this is and how to overcome it?

M. PILAT

ANSWER: There is sometimes a considerable amount of resistance across the water meter in the cellar.

Procure two ground clamps and attach them, one on each side of the meter, to the incoming and the outgoing pipes and connect the two ground clamps together by a No. 14 copper wire. This will reduce the resistance of your ground circuit and probably will make reception on the water pipe even better than it is at present on your radiator system.

The Use of the Power Amplifier

QUESTION: Is it possible to use a power amplifier in connection with my Freed-Eisemann receiver? I have a Western Electric amplifier and horn, but I do not know how to connect it to the receiver.

L. MILLER

ANSWER: Connect the two "input" binding posts of your amplifier to a plug which should be inserted in the detector or first-stage jack of your receiver. Never use the second-stage jack or the quality will be very poor. Use separate "A" and "B" batteries for the power amplifier and keep the horn placed in a location as far away as possible from the receiving set itself.

How to Reduce Excessive Plate Current in an Amplifier

QUESTION: I have a three-stage transformer-coupled audio-frequency amplifier using two UV-201-a tubes and one 216-a tube with 90 volts on the plates of the first two tubes and 135 volts on the plate of the 216-a tube. My "B" batteries lasted me less than a month. I borrowed a milliammeter and found that the total plate current was more than 30 milliamperes. Is there any way in which I can reduce the drain on the "B" batteries without decreasing the volume of the signals?

C. ROVER

ANSWER: What you need is a "C" battery. The "C" battery voltage on the grids of the first two tubes should be about 4½ volts. The "C" battery voltage on the grid of the last tube (the 216-a tube) should be 9 volts with the plate voltages that you are using. To connect the "C" batteries break the wire running from the filament to the terminal marked F on each of the transformers. Then connect the positive of the "A" battery to the filament wire and connect the 4½-volt tap to the terminals marked F on each of the first two transformers. Then connect a 9-volt tap which, of course, would be 9 volts negative, to the terminal marked F on the third transformer.

This will give a negative bias of 4½ volts on the first two tubes and 9 volts on the last tube.

CONDUCTED BY DR. E. E. FREE

Earth Screens for Radio Reception

THE use of an earth screen, composed of wires stretched along the ground under the antenna, is already usual in transmitting stations and it has been proved that a considerable lowering of the antenna resistance can be accomplished in this way. The theory is a little complicated but what happens essentially is that the wires of the screen serve as an attachment for the lower ends of the lines of electric force the upper ends of which arise from the antenna.

Another way of looking at it is to consider the antenna-to-earth's-surface system as a condenser. The antenna is one plate; the earth's surface is another plate. A metallic-wire screen placed underneath the antenna acts as a substitute for the earth's surface. The screen becomes the lower plate of the condenser. Naturally a set of highly-conductive wires has a lower resistance than the earth. Also it is more perfectly attached, electrically, to the transmitting apparatus. The net effect, then, is as if you substituted a good, metallic condenser, with its two plates exactly opposite to each other, for an imperfect condenser one plate of which was made of poorly conducting material.

In the case of transmitting systems all this has been well-known for two or three years. Recently, however, two scientists at the British National Physical Laboratory, at Teddington, England, have completed a series of experiments on the application of this same earth-screen idea to receiving antennas, including antennas used in ordinary broadcast reception.*

There is no theoretical reason why this should give any especial improvement of reception. The problems of transmitting antennas are very different from those encountered when the antenna is to be used for reception only. Nevertheless, actual tests proved that an earth screen really does give a considerable advantage in reception as well as in transmission. With three of four wires arranged a few feet above the ground, underneath the antenna and parallel to it, the received current was found to be approximately twice as great and the antenna resistance approximately one-half that found when a water-system ground of usual type was used.

In order to make use of as many as three or four such wires in an earth screen it is necessary to fence off the land under the antenna, a procedure which is seldom possible to the ordinary radio fan either in England or in America. But what can be done, in many instances, is to provide *two* wires stretched parallel to the antenna and more or less underneath it. For example, if the antenna wire runs the length of a long narrow lot or garden like the usual city "backyard," it is possible to stretch the two wires along the tops of the two side fences of the yard.

This procedure was tested by Dr. Smith Rose and Mr. Colebrook and was found to be almost as satisfactory as the three or four parallel wires with which the main experiments were made. In one test the two-wire screen system gave an antenna resistance of 13.5 ohms as against 10 ohms for the four-wire screen. In contrast with these low values, the antenna resistance when a water-system ground was employed was in the neighborhood of 25 ohms.

It is apparent, of course, that the advantage of low antenna resistance is of much greater practical importance with crystal sets or other sets having no great amplification and no source of local energy than it is in the multi-tube, high amplification sets now common in the United States. Nevertheless there are many circumstances under which the two-wire, garden fence screen device of Dr. Smith Rose and Mr. Colebrook is well worth trying.

In the same paper these gentlemen report, also, some experiments on the effect of the height, length and wire spacing of the antenna on the strength of the received signal and on the antenna resistance. The signal strength increased with the antenna height up to 25 feet above the earth screen, which was the greatest height tested. The signal strength also in-

* "Some Experiments with Aerial and Earth Systems for Reception." by R. L. Smith Rose and F. M. Colebrook. *Experimental Wireless* (London), vol. 2, pages 207-217 (January, 1925).

creased steadily with increasing length of the (single) antenna wire up to 60 feet. Between 60 and 90 feet there was some increase of signal strength, but much less in proportion than occurred with length increases up to 60 feet. With two-wire antennas the spacing made comparatively little difference in the signal strength, although there was some increase as the spacing was increased, between the limits of one foot and eight feet.

The entire investigation marks what may prove, it is to be hoped, the beginning of the application to broadcast reception problems of the same precise and careful methods of investigation which have been used with so much success in the design of transmitting equipment for the larger stations.

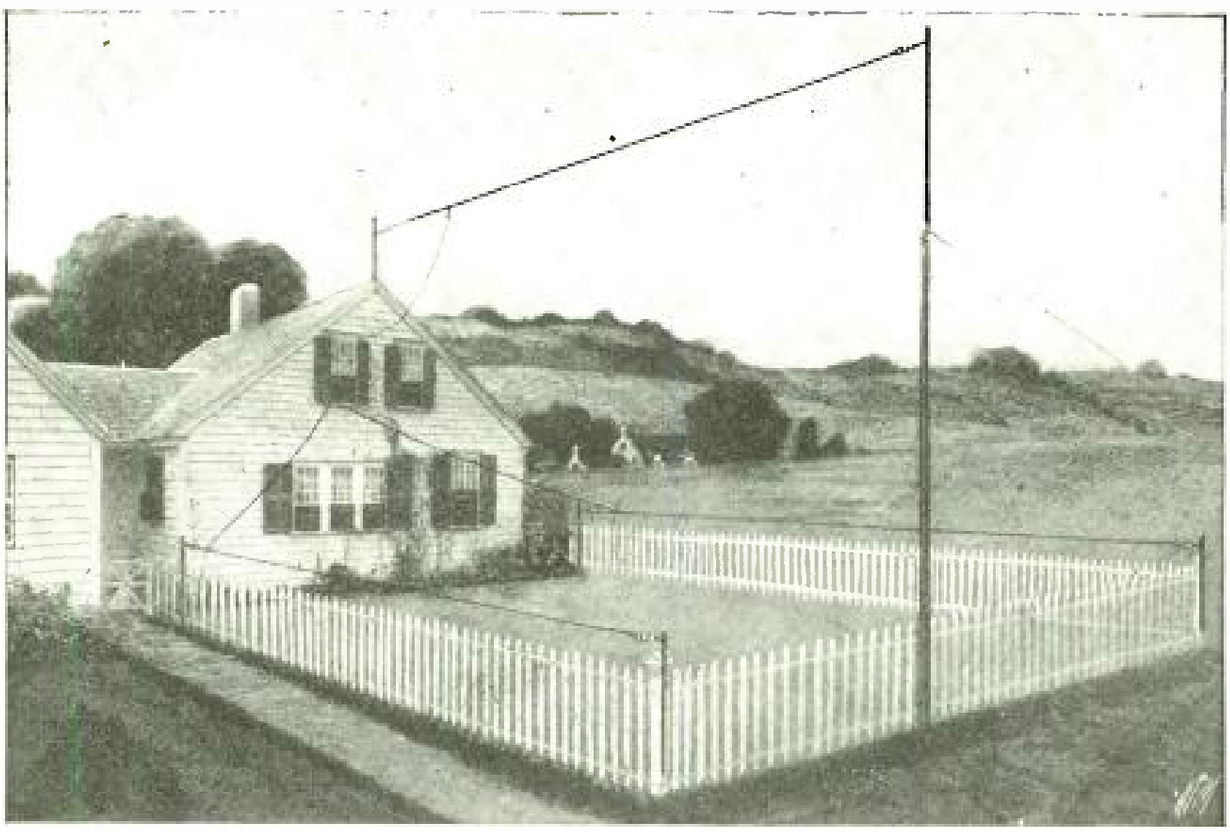
Musical Echoes from Iron Railings

A CURIOUS phenomenon of sound waves, not without interest to the student of radio reproduction troubles, was described recently in a London weekly by Sir R. A. S. Paget, the distinguished British physicist.* Sir Richard is discussing the multiplicity and interest of the London echoes; how the busses go sh-sh as they go past the posts of a gateway, how you can "hear" the open spaces of a side street that you pass, and the like. It is possible, he continues, to produce a musical tone, in the character of a thin, reedy whistle, merely by walking past a length of iron railing, a series of vertical iron bars erected as a fence.

The cause is a selective echo of the claps of your feet on the pavement. "Your footfall made," he says, "but a single explosive sound, but the wave of sound which was then produced traveled out in all directions, and some of it hit the railings. As it reached each upright rod in turn a little of the sound (no doubt some of the very short waves which formed part of the original 'clap') was reflected back, and so reached your ear. The sound takes time to travel, and, therefore, the original sound reaches each succeeding upright of the railings a little later than the last. In the same way the echoes each take a little longer to get back, according as they come from uprights which are farther and farther away. The consequence is that the echo of the original clap comes back to our ears not as a single clap, but as a rapid succession of infinitesimal claps, reflected by the succession of upright rods which form the fence."

The interval of time between each tiny, reflected sound impulse depends upon the distance between the upright bars of the fence. This, of course, determines the pitch of the musical note produced by their combination.

* "'Listening-In' to London's Echoes." by Sir R. A. S. Paget. *The Graphic* (London), February 14, 1925, page 232.



From a drawing by Arthur Merrick for POPULAR RADIO

HOW TWO WIRES MAY BE USED FOR AN EARTH SCREEN

The wires strung along the top of the two fences make an earth screen like those tested by Dr. Smith Rose and Mr. Colebrook. There is said to be a considerable improvement for reception as well as for transmission.

Sir Richard's casual observation has more to it than a mere curious incident. It is unlikely, it is true, that gangs of men tramping past rows of iron railings will ever be used to constitute an orchestra. But this phenomenon of repeated echoes, combining or reinforcing each other, is already of considerable importance in the science of acoustics. A year or two ago some one patented an anti-static device based on this principle. Rows of slats reflected the desired sounds, letting the others pass through. Other anti-static sound filters have been suggested.

Good quality radio involves problems of sound production and distribution as well as problems in electricity. We have gone farther with the electrical problems than we have with the acoustic ones. The sound experts must catch up. It is quite possible that difficulties with this or that broadcasting studio or receiving room may be due to reflections of sound waves, rather than to bad tuning or poor modulation. The Editor of this department has heard a dozen chairbacks, all set up in a row, make a most disturbing echo, not unlike that of Sir Richard's musical fence.

Helium Yields to Chemical Combination

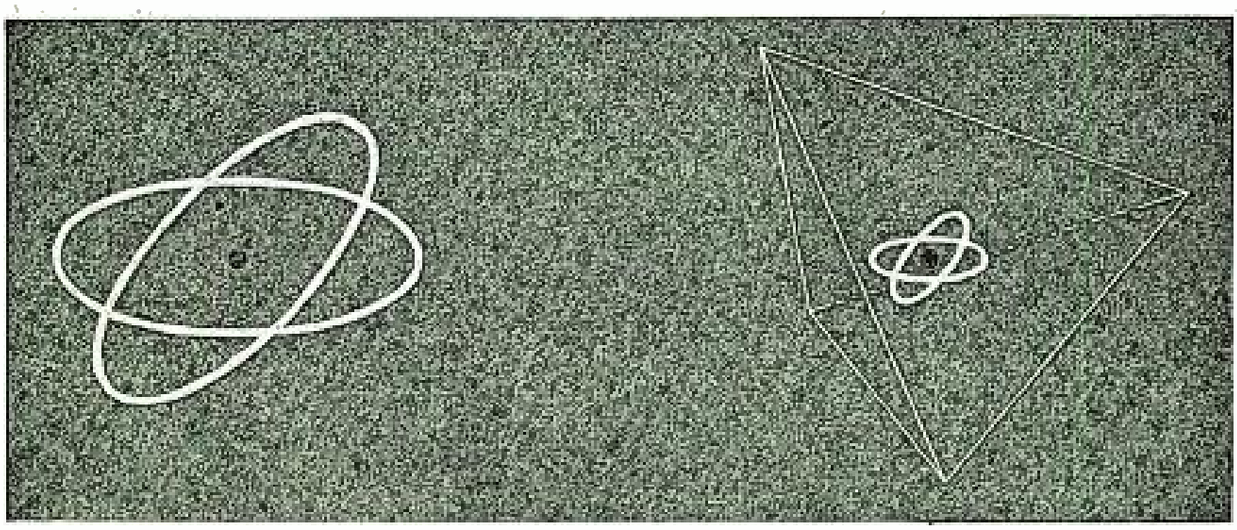
STUDENTS of modern atomic theory have been accustomed to regard helium as the invincible spinster among the chemical elements. While most of the elements in the list combine readily with each other to form the long list of known chemical compounds, the helium atom, together with the atoms of the other so-called "inert" group—argon, neon, krypton, xenon and niton—remain stubbornly resistant to any kind of chemical union. It is exactly this chemical inertness which has made helium so valuable for airship use, as it does not possess that avidity for oxygen, which makes hydrogen so inflammable and so dangerous.

Now, however, we have the most revolutionary announcement that helium can be made to enter into chemical combination after all. Last December Dr. J. J. Manley reported the apparent formation of a chemical compound between the mercury atom and the helium atom.* Now Dr. E. H. Boomer, of the famous Cavendish Laboratory of Cambridge University, England, believes that he has succeeded in producing compounds of helium with mercury, iodine, sulphur and phosphorus.† These compounds are relatively stable at the temperature of liquid air.

The importance of these results, should they be confirmed, will not lie so much in the mere conquest of the aloofness of helium. It will lie in the fact that one of the atoms believed, on grounds of modern atomic theory to be completely "satisfied," so that no attractive power remained for chemical combination, turns out not to be completely satisfied after all.

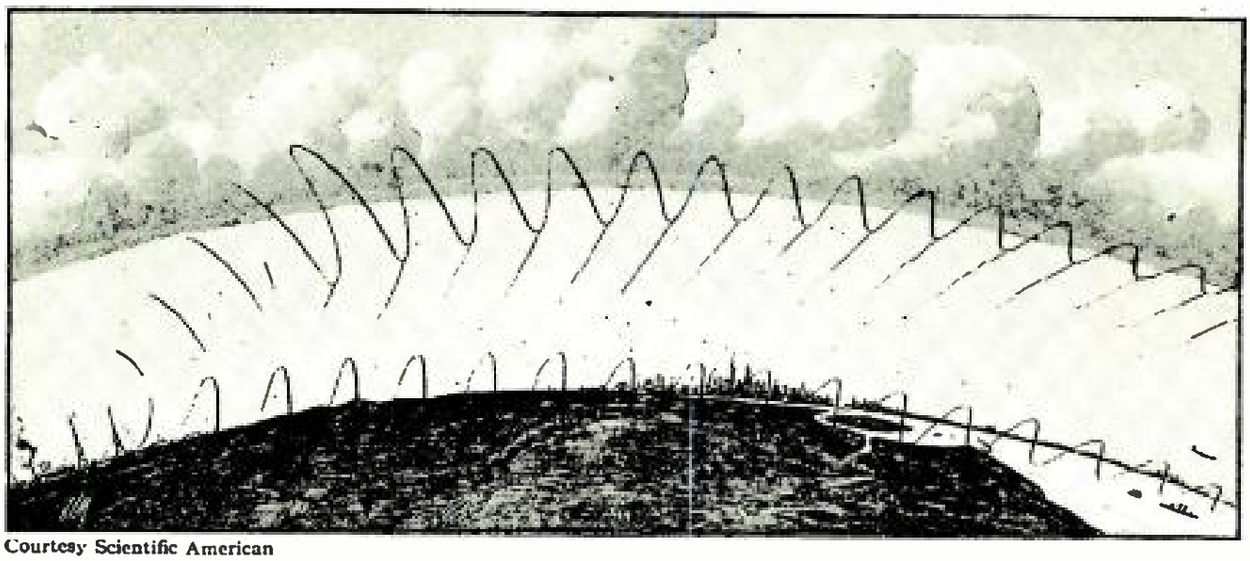
Fortunately, no atomic theories will need to be abandoned. It has already been suggested by the distinguished German physicist, Professor Franck, that there are *two* varieties of helium atoms, differing from each other in having slightly different arrangements of the orbits in which the two electrons of helium revolve. It is assumed by both Dr. Manley and Dr. Boomer that the apparent helium compounds which have been obtained are produced, in reality, by the one of the two varieties of helium in which the arrangement of the electron orbits does permit the retention of a very slight residual attraction; that is, a very slight chemical affinity.

* *Nature* (London), vol. 114, page 861 (December 13, 1924).
† *Nature* (London), vol. 115, page 16 (January 3, 1925).



ONE OF THE MOST INERT OF ATOMS

The diagram at the left shows the two electron orbits in an atom of helium—an element always supposed to be virtually incapable of chemical combination. This same group of two electron orbits exists inside many other atoms; as, for example, in the carbon atom shown in outline at the right.



Courtesy Scientific American

THE NEW DOUBLE-PATH IDEA OF RADIO TRANSMISSION

Evidence obtained at the time of the recent eclipse of the sun indicates that radio waves move simultaneously along two paths; one close to the ground surface, the other in the higher levels of the atmosphere.

New Ideas of the Heaviside Layer

READERS of POPULAR RADIO cannot have forgotten the discussion which was carried on so vigorously some months ago concerning the relative accuracy of two theories of the transmission of radio waves around the earth, the Gliding Wave Theory and the Heaviside Layer Theory.* There was much to be said for each side to this controversy and it now appears, as happens so often in scientific controversies, that both sides were right. The actual transmission of radio waves along the curved surface of the earth appears to involve *both* a gliding wave along the ground (or the sea) and a second part of the wave which passes through the upper part of the atmosphere in the region commonly set aside for the supposed Heaviside Layer.

It has been necessary, however, to modify somewhat the supposed properties of this famous Layer. In the earlier theories the Layer was thought of as a kind of mirror for the radio waves. The waves were supposed to be reflected from the under surface of the Layer. Thus, by a succession of such reflections, the train of waves was curved to correspond with the curvature of the earth. The newer idea contemplates a bending of the waves rather than a reflection. The upper part of the air is more highly ionized. Therefore it is slightly conducting. This makes the upper part of the wavefront move a little faster than the lower part. The result is that the wave bends.

This conclusion was forecast, quite clearly, in Dr. Fessenden's article in POPULAR RADIO referred to in the footnote. It was again emphasized last winter in an important paper by Sir Joseph Larmor† Important contributions have been made, also, by the distinguished British radio expert, Dr. W. H. Eccles, and the most cogent evidence of all has been secured, quite recently, as a result of the radio investigations made by the well-known American experimenter, Mr. Greenleaf W. Pickard,‡ during the eclipse of the sun.

Actual radio transmission, Mr. Pickard has shown, is probably accomplished by two paths. First is a wave that travels close to the ground. This corresponds to the "gliding wave" of the older hypotheses. It is especially effective close to the transmitting station. Second, there is another wave which travels along the upper levels of the atmosphere and is bent around the earth as described by Dr. Eccles and Sir Joseph Larmor. This upper wave is responsible for most of the reception at a distance.

The reason why reception at great distances is possible with such low power—as has been evidenced by so many amateur records—is

*"Is the Heaviside Theory Valid," by Elihu Thomson, POPULAR RADIO for December, 1922, pages 231-235; "What Bends Radio Waves," by Sir Oliver Lodge, POPULAR RADIO for January, 1923, pages 3-9; "What Really Guides Radio Waves," by Major General George O. Squier, POPULAR RADIO for March, 1923, pages 184-187; "How Ether Waves Really Move," by Reginald A. Fessenden, POPULAR RADIO for November, 1923, pages 337-346.

†"Why Electric Rays Can Bend Round the Earth," by Sir Joseph Larmor, *Philosophical Magazine* (London), vol. 48, pages 1025-1036 (December, 1924). The paper was presented originally at the Cambridge Philosophical Society on October 27, 1924, and an abstract was published in *Nature* (London), vol. 114, pages 650-651 (November 1, 1924). There is a brief additional note in *Nature* for April 18, 1925 (vol. 115, pages 566-567).

‡Mr. Pickard's results were reported to the Institute of Radio Engineers (New York) on April 1, 1925, in a paper entitled "Effects of the Solar Eclipse on Radio Reception," which paper will be published in the *Proceedings* of that institute. Another brief report by Mr. Pickard is given in *QST* X (Hartford, Conn.), vol. 9, number 4, pages 24-25 (April, 1925). Additional reports of the eclipse observations are presented in an article entitled "The Effects of the Eclipse on Radio," by Alfred P. Lane and F. X. Walsh, *Scientific American* (New York), vol. 132, pages 224-226 (April, 1925).

that the transmission of this upper part of the wave is very nearly without loss. Once the wave sent out by a transmitter has penetrated the lower levels of the atmosphere and reached this upper, conducting layer, its further progress depletes its strength very little.

Why this is so is a story too long for this brief note. It is one result of the fact that the air atoms at that height are relatively very far apart and are considerably electrified. A full account of these facts, as well as of the details and implications of these newer theories of tradio transmission, will be presented in a special article in an early issue of POPULAR RADIO.

A Promising Static Eliminator

AN anti-static device which seems much more promising than most is announced as the invention of Dr. Galen McCaa.* It is not, strictly speaking, a static eliminator, for the static is not entirely eliminated. What the device does do, it is reported, is to reduce the static to the signal level, both static and signal having the same intensity in the receiver and in the headphones.

The device begins with the familiar principle of two primary coils in the antenna circuit, these being coupled in opposite fashion to the secondary and thence to the receiver. With proper adjustment of the coupling, these two primary coils may be made to balance out each other so that nothing—neither signal nor static—gets through into the secondary. The practical problem is to balance out the static and let the signal through.

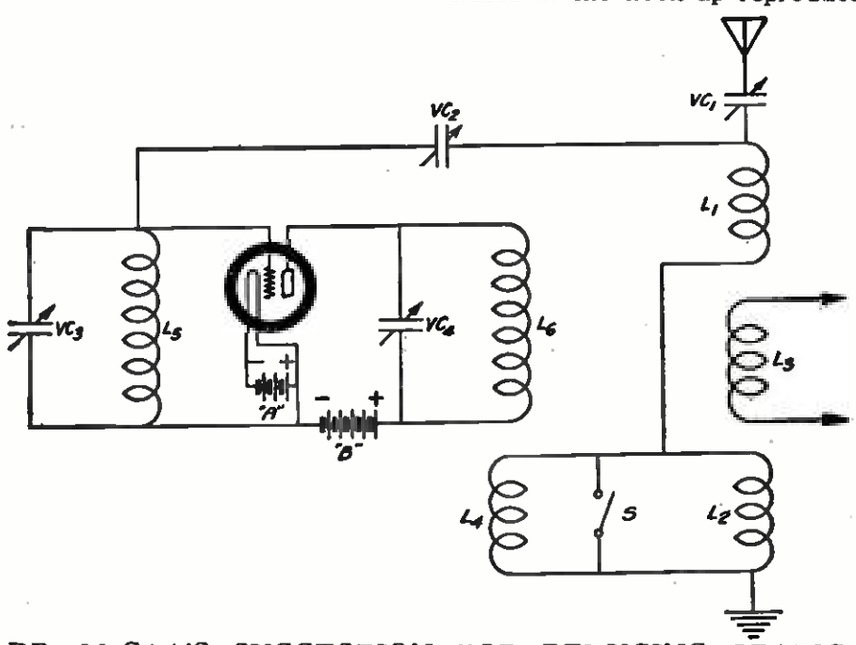
*"The McCaa Anti-Static Devices," by S. Kruse. *QST* (Hartford, Conn.), vol. 9, number 2, pages 8-12 (February, 1925); number 3, pages 18-23 (March, 1925). The second article contains constructional details.

Dr. McCaa accomplishes this by adding another coil of somewhat high inductance in parallel with one of the two primaries. In addition, there is a special control circuit containing a vacuum tube oscillator and coupled inductively to the added, high-inductance coil. The hook-up will be clear from the diagram herewith.

The action of this control circuit on the high-inductance coil is to alternately increase and decrease the effective impedance of the latter; in step, of course, with the oscillation of the control circuit. By adjusting the coupling this can be so arranged that the impedance of the inductance coil becomes periodically almost zero, thus shorting the primary coil with which this inductance is in parallel. The result is that the other primary coil is then able to affect the secondary coil, so that a signal (or static) impulse is heard in the receiver.

It is one of the characteristics of static that it produces, in general, a greater voltage in the antenna circuit than does the signal. Accordingly, the couplings of the McCaa circuits can be so arranged that this excess voltage due to static prevents, while it lasts, the shorting of the second primary by the inductance coil and the control circuit. Thus any static impulse stronger than the signal impulse for which the coupling is adjusted will not be passed into the secondary. The device is essentially one for the limiting of strays of any kind to the same intensity as that of the received signal. It is said that this produces, in practice, much the same impression as though the static were eliminated altogether.

For radio telegraphy the control circuit may be driven without reference to the frequency of the incoming signal. For telephony, however, the signal itself is made to operate the driving tube of the control circuit, as is illustrated in the hook-up reproduced herewith.



DR. McCAA'S SUGGESTION FOR REDUCING STATIC

The coil L3 is the secondary, connected to the receiving circuit. Of the two primaries, L1 and L2, the latter is connected in parallel with a fairly high inductance, L4, the impedance of which is periodically canceled by the central circuit connected to L6. The theory of the device is described above.

Radio Interference from Clouds of Steam

PHYSICISTS have long known that visible clouds of water particles, such as the "steam" given off by a puffing locomotive, are electrified. The electricity seems to be produced merely by the separation of the water into the tiny droplets, although the exact mechanism of this electrification is still imperfectly understood.

Recently two authors have suggested independently that such electrified clouds may cause, in special circumstances, local interference with radio.* It has been observed that the electrified clouds show perceptible attractions and repulsions when they approach high-voltage transmission lines. In one instance the cloud has been observed to pulsate at a rapid frequency, an effect caused, perhaps, by an alternating potential on the nearby charged lines.

Radio interference thus caused might be of two kinds. One is the creation of strays, which would appear in nearby receivers as a variety of static. The other is a possible effect of such charged clouds in absorbing or deflecting incoming waves. It is well known that the radio interference of both kinds is much greater in factory towns than in the country and is far greater in the daytime (in cities) than it is at night. This has usually been ascribed to the operation of electric motors and no doubt that is where most of the blame belongs. But it may be that we will need, also, to look into the radio effects of the continuous steam clouds from locomotive yards and from factory chimneys.

* "The Positive Electrical Drift in the Air," by William C. Reynolds, *Nature* (London), vol. 115, page 531 (April 11, 1925); "High Tension Electric Lines and the Discharges of Steam Locomotives" (in French), by P. L. Mercanton, *La Nature* (Paris), number 2,663, page 255 (April 18, 1925).

A New Record for Pictures by Radio

ON May 6, 1925, a new record was established for the sending of pictures—in this instance photographs—by radio. Practice war maneuvers were in progress off the Hawaiian Islands. The officers of the War and Navy Departments wished to report the results as fully and completely as possible to their superiors in the United States. By the aid of the facilities of the Radio Corporation of America illustrative photographs to accompany the report were sent by radio, traversing a distance of over five thousand miles in approximately twenty minutes.*

The route followed included three land-wire links and two radio links. First the signals corresponding to the pictures were sent by wire to station KIE in the Hawaiian Islands.

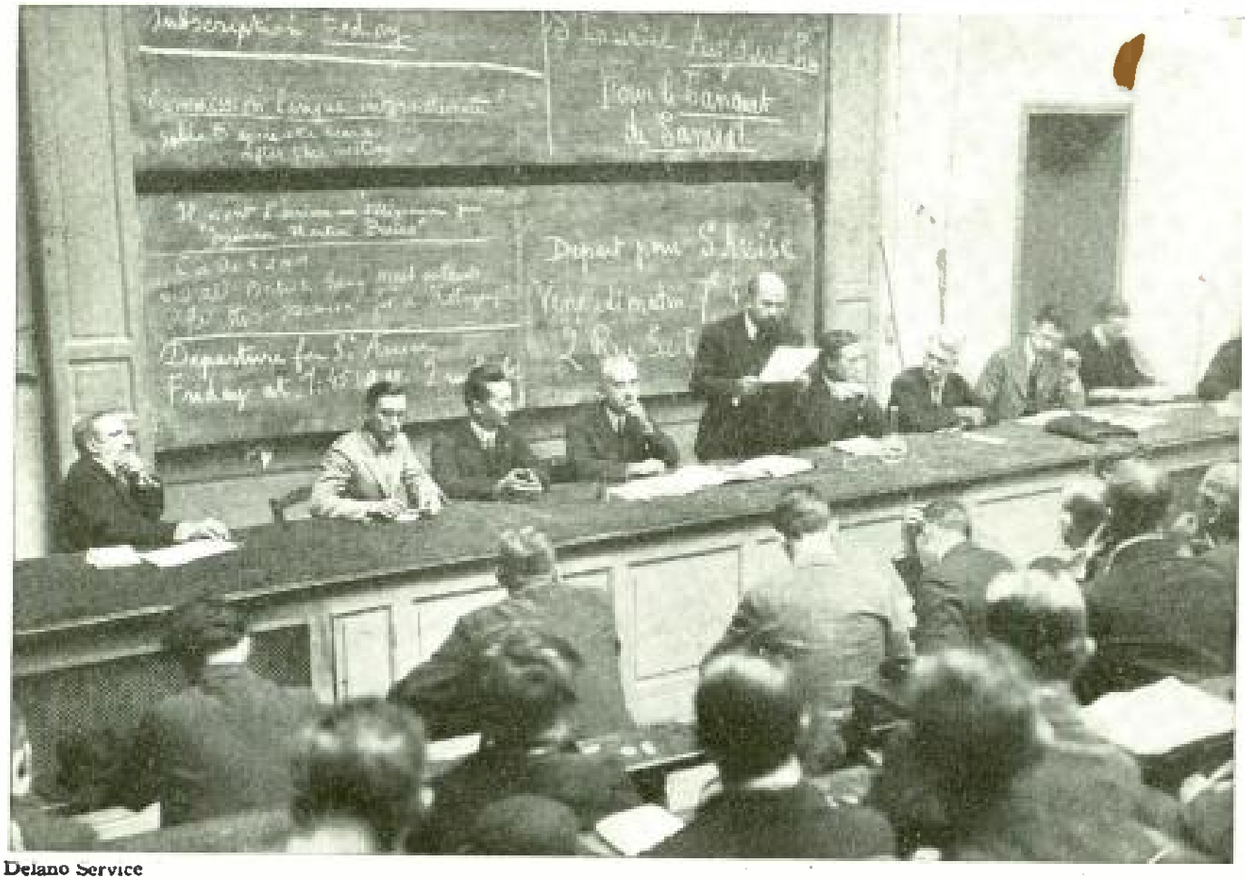
*Details are given in an account, credited to Captain R. H. Ranger, of the Radio Corporation of America, in the *New York Times* for May 10, 1925.

Brown Bros.

DOES SMOKE CAUSE INTERFERENCE?

Smoke and steam are electrified. It is possible that the clouds produced may interfere in several ways with nearby radio reception.

From here a 16.975-meter wave carried them to a receiver at Marshall, Cal. Thence a second land wire took them to KET, at Bolinas, Cal., which station again put them on the air on a wavelength of 13,100 meters. This wave was picked up at the receiving station of the Radio Corporation at Riverhead, L. I., where the signals were again put on a land wire to the picture-reproducing apparatus in New York City. The system used was substantially the same as has been employed for some months in the well-known experiments of the Radio Corporation in the radio transmission of pictures. It is already apparent that this system might prove of the greatest value in case of war or other national emergency.



Delano Service

AMATEURS FORMALLY ADOPT A "UNIVERSAL RADIO LANGUAGE"

One of the actions of the First International Radio Congress (which was recently held in Paris) that is of interest to radio fans everywhere was the adoption of Esperanto as the official "internationally-understood" language of radio. Twenty-one broadcasting stations abroad are now using it.

The BROADCAST LISTENER

Comments on radio programs, methods and technique —from the point of view of the average fan

By RAYMOND FRANCIS YATES

The Waning "Art of Jazz"

For three years now we have been ranting semi-frantically about the unmitigated employment by the studios of the zoölogical brand of music. Go to the radio any evening and you will find anywhere from five to ten jazz orchestras within the reach of your contraption. And the tragedy of it is the growing number of "fox-trot versions." If it is not the mangled body of a Wagner aria it is a Strauss waltz or a Chopin prelude. This simply goes to show that jazz is a bankrupt art and that syncopation is a musical parasite feasting on the luxurious fiber of creations far beyond the capabilities of its own masters. It is just as easy to syncopate the Flower Song as it is to sit down at the piano and rag Moritz Moszkowski's Serenata Opus 15, No. 1. Yet to hear our jazz mongers talk, one would think that jazz was a great, big, healthy, artistic invention that must be fed from the deepest wells of human emotion.

Radio has made jazz so hopelessly common that it is hurting both itself and broadcasting. Still, we have only a few studio managers in this big country of ours who are able to put their minds around this simple fact. We do not mean to say that jazz should not be allowed a place on the air or that all of its practitioners should be given a long rest at the Bide-a-Wee Sanitarium, for, after all, some of its supporters have been able to lift it, not to an art, but to a sort of craftsmanship that deserves some kind of recognition. No one can listen to the gentle playing of Paul Whiteman

and his original band without feeling kindly toward this drooling infant of the musical world. Lopez, too, has given more to radio than radio has given to him. Fortunately for jazz and the radio, Lopez is not what we call a "musical smarty." He does not take pride in trying to crush music into an unrecognizable pulp with the newer devices and methods. There is a charm, a warmth, a gentle flavor to his playing that one, even though hostile to jazz, must sympathize with. That Lopez is spending his time in the development of a hopeless musical protégé makes little difference; he is responsible for a vast source of entertainment.

It would be unfair to Ben Bernie (another WEAF feature) not to mention him along with the precious few. Bernie has an enjoyable technique all his very own and it seems to us that he has supplied jazz with some real originality.

* * *

Politicians Take the Air

If there is one thing that is hurting broadcasting in these great United States, it is stations like WNYC, the "Municipal Voice of Greater New York." WNYC, we are sorry to report, is a political station operated by politicians for politicians. Perhaps it would be wiser to feel charitable toward this experiment, for the gentleman who thinks that he can increase his popularity by filling the air with the raucous voices of his henchmen has yet to learn the resentful nature of the radio audience. If we were king we should never risk our kingship with the fickle radio listeners.

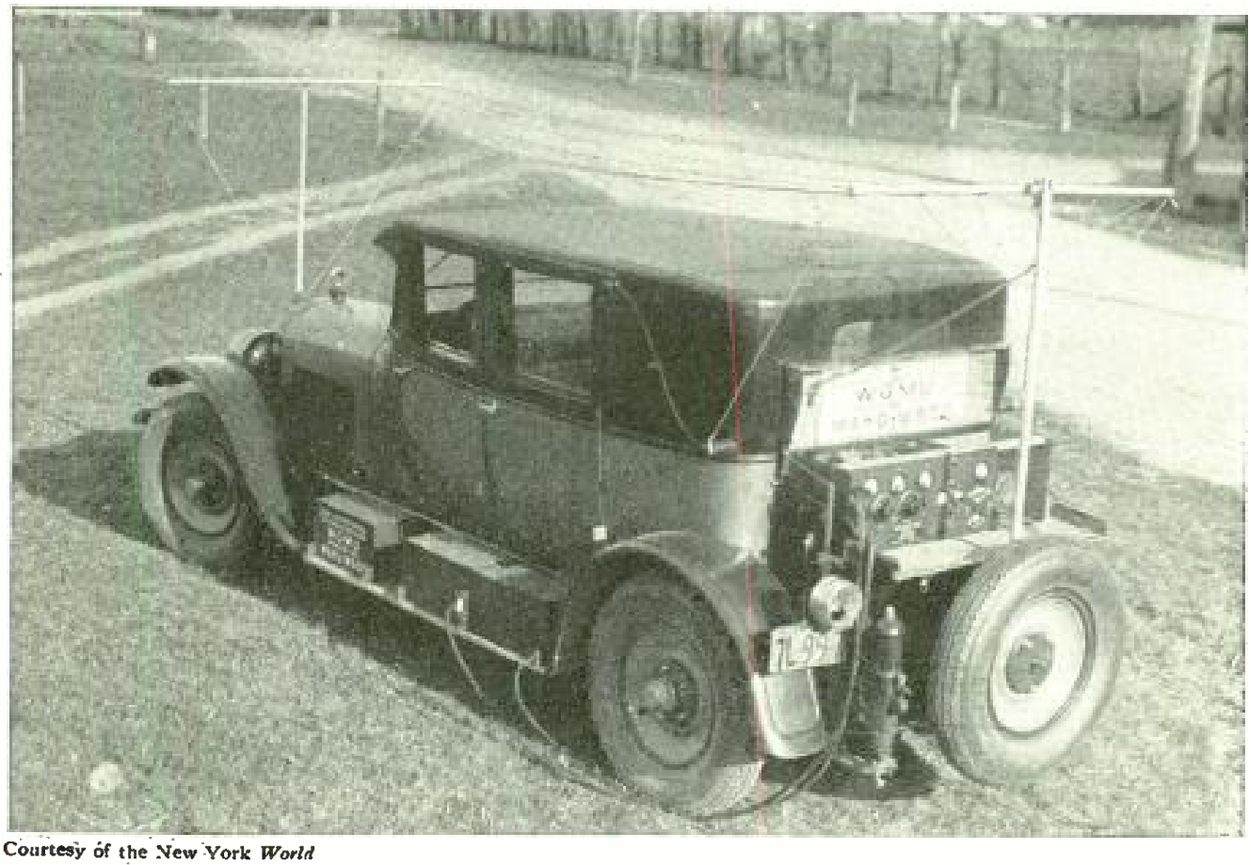
We can only hope for one thing in connection with Mr. Hylan and his broadcasting, and that is that someone is gathering data on the project so some sort of a scientific treatise on "Why Mayors Should not Broadcast" may be prepared after Mr. Hylan has retired to the quiet of his Brooklyn home in 1926.

* * *

How to Read Publicity Notices About Radio Artists

If you want to keep good friends with your radio and avoid those little disappointments that may eventually make you a "radio bolshevist," don't believe all you read in the newspapers about the radio programs. The studio publicity man is a guileless exploiter and he can, with his Smith Premier No. 9, make a third-rate violinist the pet of the Continent or a Chautauqua lecturer the 1925 model of Mark Antony.

The job of a publicity man, whether at the theater or in the studio, is that of making big people out of little ones and great stars out



Courtesy of the New York *World*

A BROADCASTING STATION THAT GOES TO THE SOURCE OF NEWS

This portable transmitter, sent out from the Grebe station WAHG, has been used successfully to send news to the editorial rooms of the New York World. As the machine speeds along the reporter sends his story to the main office. The movement of the car does not interfere with the smoothness of transmission.

Underwood & Underwood

"PRESENTING THE CATHOLIC POINT OF VIEW ON THE VARIOUS FIELDS OF HUMAN ACTIVITY"

Unlike the Protestant churches, which make extensive use of the independent broadcasting stations for transmitting sermons, hymns and debates on religious topics, the Paulist Fathers are establishing a chain of stations of their own for the frankly avowed purpose of disseminating Roman Catholic propaganda. Father John Handby, the Paulist missionary, is here shown before the microphone of station WPL, conducted for the Paulist League of New York.

of mere fireflies. The laying on of words is usually so thick and so heavy (anywhere from 3 to 47-ply) that the subjects of the notices do not believe them. Indeed, there is a rule to the game (any publicity man will tell you) that states: "Stars are not 'made' until they begin to believe the flattery in their press notices."

If you want to be a good radio listener, it is part of the game to learn to read the press notices about the "stars." Some alertness must be displayed in skimming the buncombe from the surface of the truth and it often happens that the buncombe is so thick that its complete removal leaves nothing for examination.

* * *

Repetitions on Broadcast Programs

It seems that there should be some simple way for overcoming repetition in radio programs. How annoying it is to hear the same number played from several local studios during the course of a single evening. With a little co-operation and by asking the assistance of the people who broadcast, it could be an easy matter for broadcasters to prevent the radiation of much monotonous material. If the program managers of all of the large centers like Chicago, New York, Philadelphia and Boston would meet weekly for the avowed purpose of comparing notes, the repetition tangle soon would be ironed out and this department would be saved a lot of cussing. At times it does seem as though co-operation is the one thing that our studio managers care least about and yet little thought is required to show that the lack of it is one of the things that is hurting broadcasting and hurting it badly.

* * *

The Broadcasting of Advertising

We often hear fear expressed over the fact that our best studios may sooner or later be operated by advertising agencies and that radio broadcasting will become an out and out advertising medium. We don't know what could be more out and out advertising than radio is at the present time. If there is any station on the air that does not have a little advertising axe to grind, we shall be glad to set our intelligence department on its trail, and, if it should be found, to award its sponsor the Nobel Prize or something as good as the Nobel Prize for having taken the rôle of an honest-to-goodness public benefactor.

The Passing of Bedtime Stories

It is encouraging to note that the bedtime story, once such an important part of every station's equipment, and one of the most solidly entrenched traditions of the art, is rolling down the skids of forgotten events just as fast as anything so old and hopeless should roll. The bedtime story was invented in the early days of WJZ and it hung on for a long time eating up a half or three-quarters of an hour with more propitious program material standing by.

WEAF abandoned its juvenile story way back in 1924 and there was barely a ripple of disapproval. Another fond theory of every standardized studio manager exploded quietly.

* * *

Why Is Roxy?

For the first time in our long and colorful career we are going to come out flat-footed and tell this old world that Roxy is still unmatched as a broadcaster and that he will remain unmatched as long as he wants to reserve the little finger on his left hand to direct his broadcasting work while he uses the rest of his fingers to do in the art of presenting movies what no other man in the country has been able to do. Furthermore, we are going to let the world in on his secret; a secret that he told us many times in our inspiring association with him.

Those who are a bit envious of Roxy's standing as the only broadcaster in the United States with a full measure of dramatic imagination, usually account for his success with a faint derogatory smile and "Yes, he is a pretty clever showman." While Roxy is obviously a man of the theater, with a keen theatrical sense of theatrical values, it is superficial and stupid to grant him nothing more substantial than mere showmanship. A dozen and one showmen have tried to emulate him on the air only to find that their success in the theater did not follow them to the microphone and that broadcasting demanded a technique much more intriguing than they had expected.

Roxy is a sanguine person. There is nothing more mysterious about him than simplicity, but mere simplicity can be mysterious enough to baffle the efforts of those who overlook its virtues. Roxy is completely human and anti-artificial. Certainly no one could accuse him of putting on a pseudo-elegance before the microphone. He is just a plain, warm-hearted citizen obeying to the letter the natural impulses from a peculiar grouping of brain cells that we call personality. That he is able to transmit real personality to his audience and that he is at the same time a discreet eighteen-hour-a-day showman with a truly remarkable sense of the things in life that interest other human beings, is a mere act of Providence. Roxy is as safe from emulation as John Sargent, Sir Isaac Newton or any other great genius.

* * *

1882 Pianos

Microphones do work miracles. Have you ever been exposed to the musical slander emitted by the rusty, loose strings of what may have been a piano back in 1882? Perhaps the thing had been made in Peoria or Cincinnati by a manufacturer long since extinct. Such instruments have usually withstood the punishment of four generations of a non-musical family and they are not uncommonly found standing with the trinkets in the parlors of the rural districts. Even the moths have abandoned them for want of more substantial sustenance.

What agony to disturb their repose! They stab the heart of the musically sensitive with a knife so keen that it cuts clear to the soul. Yes, microphones certainly can work miracles. How efficiently they can transform the modern creations of the piano makers into those instruments that were once the pride of Cincinnati and Peoria! And what a complete and deceiving metamorphosis it is!

The piano. due to its wide range of sound frequency, is a most difficult instrument to broadcast. About 70 percent of our studios make a bad job of it and this department is usually carried back to the days when pianos were made with gingerbread fronts and revolving stools with gingerbread feet—usually a nice brass eagle's claw holding a glass ball. What we need is a commission for the study of piano transmission and if such a commission is formed we shall instantly suggest that it visit the studio of WEAF where perfection may be studied to the heart's content.

* * *

Why Not "Curtain Music" for Radio Programs?

If there is one thing necessary for a good entertainment on the radio, it is good curtain music. A few of our broadcasting novitiates appear to agree with us on this point, but how often the curtain rises on an act with an entertainment value comparable with the third-grade graduation exercises of Public School No. 4! We may be old-fashioned, but we have always felt that studios would bring their audiences to an agreeable and acceptable mood by starting off their programs with the right kind of music. Yet in the face of this, we find many of our best broadcasters leading off with the weather report or the financial developments of the day.

How to Build a 5-Tube Receiver with Simplified Control

This next product of the Popular Radio *Laboratory will be described in the next issue of this magazine—for August.*

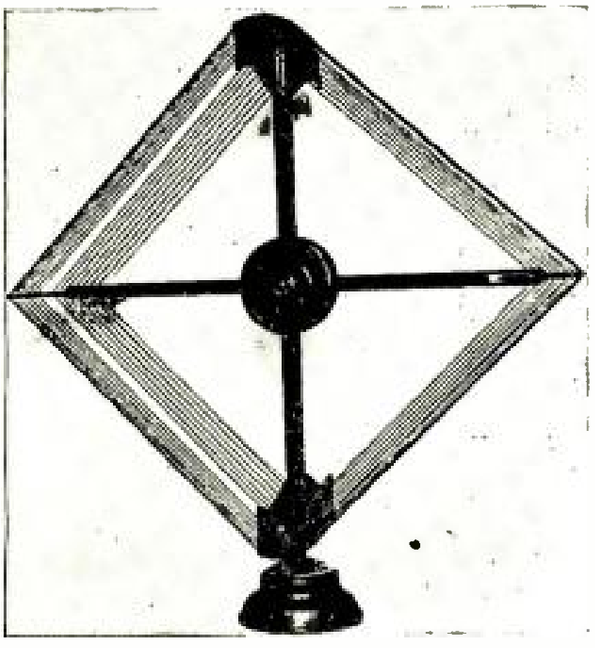
THIS *department is conducted by* POPULAR RADIO LABORATORY *for the purpose of keeping the radio experimenter and the broadcast listener informed concerning the newest inventions and the approved developments in radio equipment. Only such apparatus as has been tested and endorsed by the Laboratory is noted in these columns.*

MISCELLANEOUS ACCESSORIES

Mahogany binding post; King Quality Products, Inc.
Mahogany switch lever; King Quality Products, Inc.
K-B adjustable bearing; Koelmel Bros.
Korker combination tool; Korker Products Co.
"Lenk" alcohol blow torch; Lenk Mfg. Co.
"Liberty" terminals; Liberty Transformer Co., Inc.

RADIO-FREQUENCY TRANSFORMERS

"Kellogg" low-loss R. F. transformer No. 602; Kellogg Switchboard & Supply Co.
Vario-transformers; Langbein & Kaufman.
Special air core R. F. transformer; Liberty Transformer Co., Inc.



A collapsible loop antenna.

TUNING INDUCTANCE UNITS

"Kellogg" choke coils; Kellogg Switchboard & Supply Co.
"Kellogg" variometer; Kellogg Switchboard & Supply Co.
"Kellogg" variocoupler; Kellogg Switchboard & Supply Co.
"Universal" variometer; Langbein & Kaufman.
Variable clarifying selector; Langbein & Kaufman.
"Lincoln" oscillascope; Lincoln Radio Corp.
"Lincoln" "Long-45" tuner; Lincoln Radio Corp.
"Lopez" low-loss tuner; A. C. Lopez & Co.

KITS

"Kellogg" kit; Kellogg Switchboard & Supply Co.
"King Quality" kit; King Quality Products, Inc.
"Liberty" Superheterodyne kit; Liberty Electric Corp.
"Lincoln" kit; Lincoln Radio Corp.

GRID-LEAKS AND RESISTANCES

"Kellogg" resistance; Kellogg Switchboard & Supply Co.

AN EFFICIENT LOOP

Name of instrument: Loop antenna.
Description: A really well-made loop of unique design. Four mahogany arms for supporting the wire are fastened to a non-magnetic metal centerpiece, which may be taken apart so that the loop may be folded up into a very small space. Instead of the regular box shape, the wire is formed in a curve. The assembly is mounted on a rotatable shaft with a dial which is calibrated in degrees and equipped with a pointer. The leads are brought out to two terminals in the non-magnetic metal base.
Usage: As a pick-up device for a radio-frequency receiver.
Outstanding features: Portability. Directional efficiency. Good workmanship. Neat appearance.
Maker: The Gowanda Co.

A NOVEL POTENTIOMETER

Name of instrument: Potentiometer.
Description: This instrument is made in accordance with the latest design of the "Bradley" resistance control apparatus. It contains a small rotatable knob at one end with a special lever arrangement for increasing the resistance of one set of carbon discs while at the same time decreasing the resistance of the other set. This gives a very smooth potentiometer arrangement. The three terminals are brought out to screw binding posts.
Usage: Any place where a potentiometer is needed in a radio receiver.
Outstanding features: Compactness. Ease of mounting. Simplicity of connections. Smooth adjustment.
Maker: Allen Bradley Co.

SOCKETS AND ADAPTERS

"Kellogg" adapter, No. 501; Kellogg Switchboard & Supply Co.
"Kellogg" V. T. socket; Kellogg Switchboard & Supply Co.
"Keystone" V. T. socket; Keystone Radio Co.
Mahogany panel-mounting tube socket; King Quality Products, Inc.
Adapters; King Quality Products, Inc.
Caldwell socket (type 201); Knox Corp.
"Leich" Improved radio socket; Leich Electric Co.

VARIABLE CONDENSERS

"Kellogg" No. 704 low-loss variable condenser; Kellogg Switchboard & Supply Co.
Variable condensers; King Quality Products, Inc.
"Lincoln" low-loss condenser; Lincoln Radio Corp.
"Lombardi" condensers; Lombardi Radio Mfg. Co.

An attractive new type loudspeaker.

A carbon disc potentiometer.

RECEIVING SETS

Kompentrol receiver; Kardon Products Co., Inc.
"Kennedy" receivers; Colin B. Kennedy Co.
"King Quality" neutrodyne receiver; King Quality Products, Inc.
"Kodel" receivers; Kodel Mfg. Co.
Monarch receiving set; Krasco Mfg. Co.
"Elkay" Super-Selector; Langbein & Kaufman.
"Liberty" Sealed Five receiver; Liberty Transformer Co., Inc.

BATTERIES

Storage "B" batteries; Kelman Electric Co.
"Kic-O" storage "B" batteries; Kimley Electric Co., Inc.
"Kic-O" "B" Multi-Power Unit; Kimley Electric Co., Inc.

"B" BATTERY ELIMINATORS

"Kellogg" Trans-B-Former; Kellogg Switchboard & Supply Co.

CRYSTAL DETECTORS

Atomite crystal; Keystone Products Co.
"Lego" Wonder fixed detector; Lego Corp.

BATTERY CHARGERS AND RECTIFIERS

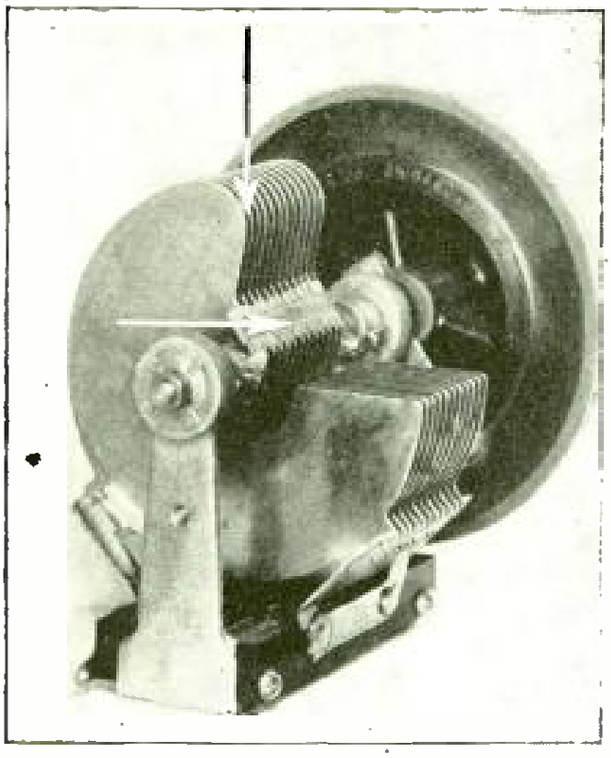
"Kic-O" Rectifier; Kimley Electric Co., Inc.
"Kic-O" double potential charger; Kimley Electric Co., Inc.

POTENTIOMETERS

Mahogany potentiometer; King Quality Products, Inc.

A CONE TYPE LOUDSPEAKER

Name of instrument: Loudspeaker.
Description: A medium size loudspeaker which consists of a magnetic unit attached to the frame of the device with a moving element that actuates a small push rod attached to the center of a special paper cone. The outer edge of the cone is supported lightly but freely between two circular strips of felt held in a circular panel of metal. The appearance is very attractive.
Usage: With any radio receiving set as a reproducer.
Outstanding features: Tone quality. Volume. Neat appearance.
Maker: Crosley Radio Corp.



Unique design for a variable condenser that embodies cut-away plates that are securely soldered together.

AUDIO-FREQUENCY TRANSFORMERS

"Kellogg" audio-frequency transformer; Kellogg Switchboard & Supply Co.
Karas "Harmonik" audio-frequency transformers; Karas Electric Co.
Audio-frequency transformer; Killark Electric Mfg. Co.
"Liberty" audio-frequency transformer; Liberty Transformer Co., Inc.

JACKS

"Kellogg" jacks; Kellogg Switchboard & Supply Co.
Jacks; King Quality Products, Inc.
"Kings" double-circuit jack; Kings Mfg. Co., Inc.
Duo-stage jacks; Leich Electric Co.

DIALS

"Kellogg" bakelite dial; Kellogg Switchboard & Supply Co.
Knobs and dials; King Quality Products, Inc.
Knobs and dials; Kurz-Kasch Co.

A CABINET MADE ENTIRELY OF PANEL MATERIAL

Name of instrument: Radio cabinet.
Description: A complete cabinet that is supplied by the maker in knockdown form with screws, brackets, hinges and base. The front panel is of celeron and the sides, back and top are of vulcawood, which is vulcanized fibre covered with a thin sheet of bakelite. The vulcawood is finished with a mahogany grain, which is very attractive in appearance.
Usage: As a container for a radio receiving set.
Outstanding features: Simple to set up. Neat in appearance. Light weight.
Maker: Diamond State Fibre Co.

A NEW VARIABLE CONDENSER

Name of instrument: A variable condenser.
Description: Here is an instrument with a new method for mounting the plates. The shaft of the instrument which holds the rotor plates is mounted on a "U" shaped aluminum casting with suitable bearings at each end. Also mounted on this casting are two strips of insulating material which carry the metal form that holds the stator plates. All the plates are soldered together so that connection will be firm and conductivity will be high. The instrument is equipped with soldering lugs and a special vernier.
Usage: In any radio-frequency circuit for tuning.
Outstanding features: Efficiency. Novel design. Approximate straightline wavelength curve.
Maker: Kellogg Switchboard & Supply Co.

CABINETS

Radio cabinet; Kellogg Switchboard & Supply Co.

LOUDSPEAKERS

"Kellogg" Symphony Reproducer; Kellogg Switchboard & Supply Co.
K.-E. loudspeaker; Kirkman Engineering Corp.

HEADPHONES

"Kellogg" headset; Kellogg Switchboard & Supply Co.
Lark headphone; Leich Electric Co.

PHONE PLUGS

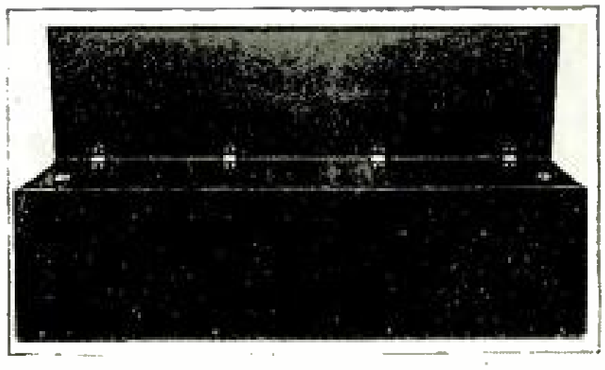
Snap plug, No. 501; Kellogg Switchboard & Supply Co.
Plug No. 502; Kellogg Switchboard & Supply Co.
Plug; King Quality Products, Inc.
Lark plug; Leich Electric Co.

RHEOSTATS

Rheostat; Kellogg Switchboard & Supply Co.
"Keystone" filament rheostat; Keystone Radio Co.
Mahogany rheostat; King Quality Products, Inc.

SWITCHES

Tuner switch; Kellogg Switchboard & Supply Co.
Back-mounting inductance switch; Keystone Radio Co.
Mahogany inductance switch; King Quality Products, Inc.



A complete cabinet supplied in knockdown form.

A FINE TRANSFORMER

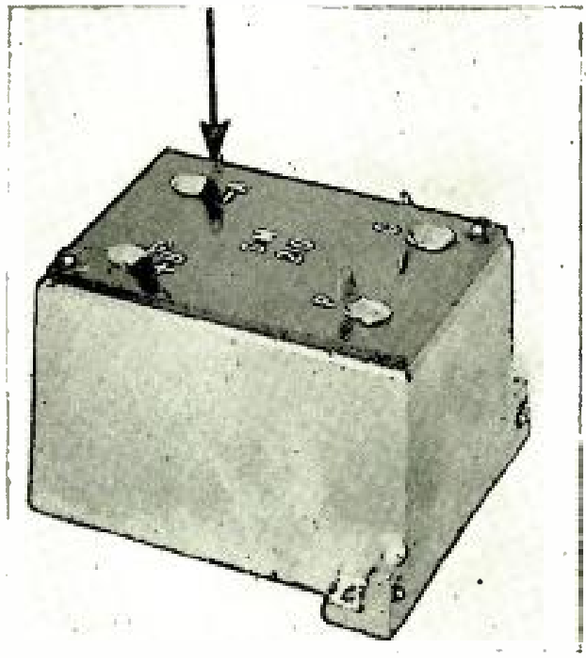
Name of instrument: Intermediate-frequency transformer.

Description: This new instrument may be used as a coupling unit in the intermediate stages of a superheterodyne receiver. The coils are wound on a special bobbin with a small amount of iron placed so that the resonance curve will just include the side bands necessary for complete reproduction. The terminals are brought out to soldering lugs mounted on a bakelite panel. The whole instrument is built up in a small aluminum case with a novel means for attaching in either of one or two positions—vertically or horizontally.

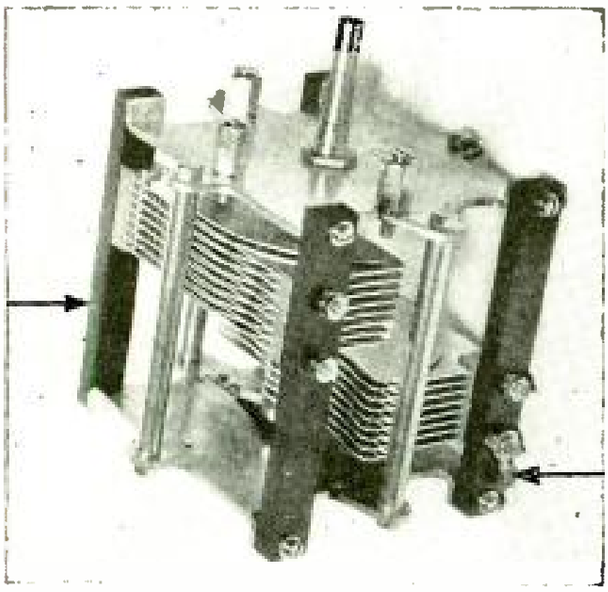
Usage: In a superheterodyne receiver as a coupling unit.

Outstanding features: High efficiency. Selectivity. Small size. Stable operation.

Maker: Silver-Marshall, Inc.



A transformer equipped with soldering lugs.



Radion separators are used on this condenser with soldering lugs for connections.

A NEW TRANSFORMER WITH SELF-SUPPORTED WINDING

Name of instrument: Radio-frequency transformer.

Description: This instrument consists of two coils, a primary and a secondary which are wound in an octagonal form and fastened by means of two gummed strips of paper. The two coils are supported on two strips of bakelite with suitable brass angles for mounting on a baseboard or for attaching directly to a variable condenser.

Usage: In any radio-frequency circuit for coupling between stages.

Outstanding features: High efficiency. Low distributed capacity.

Maker: Eastern Coil Corp.

A DOUBLE TUNING UNIT

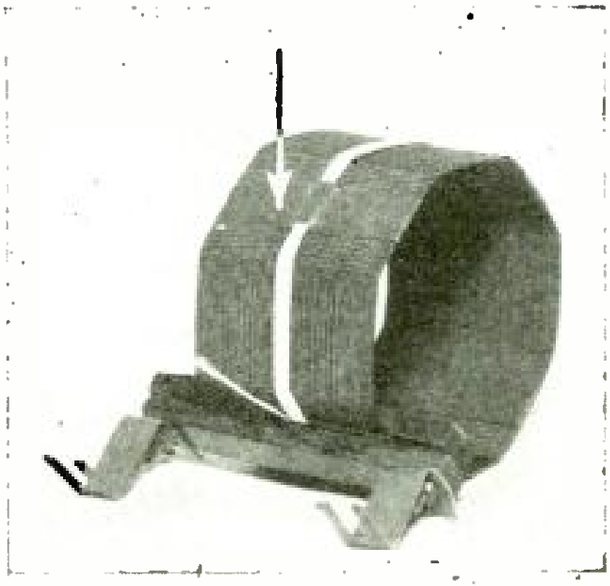
Name of instrument: A unit variable condenser.

Description: This instrument contains two variable condenser units mounted on a single shaft. The two units are placed diagonally in relation to the shaft. The end-plates are similar to the regular Cardwell construction except that the design is doubled up. Four rubber insulating segments are used; two to each unit. Both rotors are grounded on the same shaft and the two stators are separately insulated. All connections are brought out to soldering lugs.

Usage: In any radio-frequency circuit for tuning.

Outstanding features: High efficiency. Compactness. Simplicity in tuning.

Maker: Allen D. Cardwell Mfg. Corp.



Coils supported with gummed strips.

CONDUCTED BY DAVID LAY

ITEMS *of general interest that you ought to know; bits of useful information that every radio fan ought to know.*

Inter-Continental Communication Between Amateurs

TWO-WAY daylight communication between Australia and England was established for the first time on May 2, 1925, between Mr. E. J. Simmonds (20D), the well-known amateur of Gerrard's Cross, Bucks, transmitting on a new wavelength of 20 meters, and Mr. H. Maclurcan of Sydney.

* * *

How Radio Is Growing

EXPORTS of radio apparatus increased from approximately $2,900,000 in 1922 to $3,500,000 in 1923 and to over $6,000,000 in 1924. Radio exports during the first months of this year have been more than twice those during the same period last year. Canada is our best customer, with Mexico second and Brazil third.

* * *

The Best U. S. Amateur Station

THE highest honor in amateur radio, the 1924 Hoover Cup, has been awarded to B. Molinari of 653 Union Street, San Francisco. This cup is given annually by Secretary Hoover to the operator of the best amateur radio station in the United States in which the bulk of the apparatus is the handiwork of the operator himself. The station for which the award is made, 6AWT, has been unusually efficient in communication with foreign countries; its signals have been reported by amateurs in Asia, Australia, South Sea Islands, Europe, Africa, South America, Central America and Danish America. 6AWT was one of seven stations selected to transmit press reports to Captain Donald B. MacMillan in the arctic. The station has also been in two-way communication with New Zealand and Australia. The station has the familiar Hartley circuit for the transmitter, which employs one 250-watt tube. The receiver is of the conventional amateur low-loss type, the tuning of which is accomplished by a glass insulated condenser across the low-loss secondary coil. The antenna is a semi-vertical parachute type, 15 feet long and 80 feet high at the free end. The counterpoise is a nine-wire fan-shaped area 40 feet in length.

* * *

A World Conference on Radio

A RADIO conference will be held at Washington, D. C. this September when the representatives of about fifty nations will assemble to discuss international problems in radio communication and broadcasting. The necessity for calling the International Radio Conference is due to the fact that the old regulations comprised in the London Convention of 1912 are inadequate to cope with communciation problems brought out by broadcasting and the modern radio apparatus. Originally, the London pact dealt with the shore to ship and ship to ship radio-telegraphy.

* * *

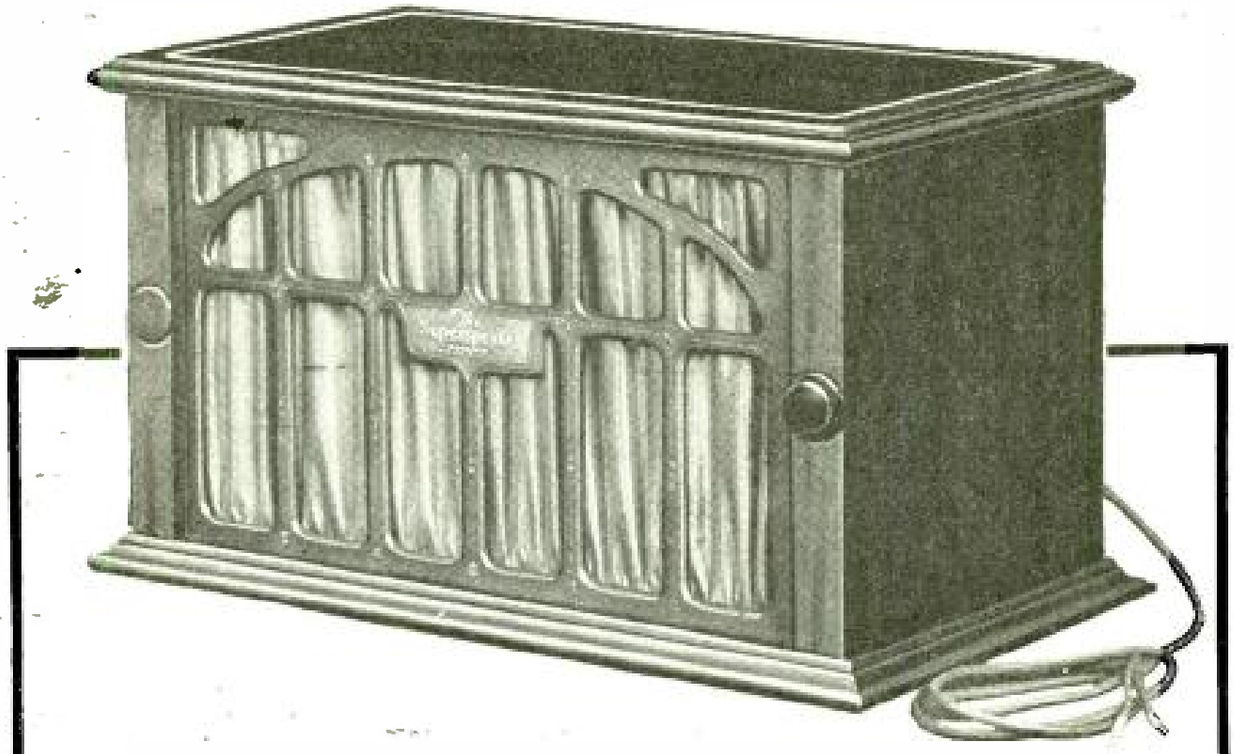
The Costs of Publicity by Radio

THE following rates for broadcasting have been established by the principal stations: New York, WEAF, $500 an hour; Philadelphia, WFI or WOO, $200 an hour; Pittsburgh, WCAE, $200; Washington, WCAP, $150; Buffalo, WGR, $200; Boston, WEEI, $250; Providence, WFAR, $250; Cleveland, WEAR, $150; Cincinnati, WSAI, $200; Detroit, WWJ, $200; Davenport, WOC, $150; Minneapolis, WCCO, $250. The gross charge an hour for one group of eleven stations is $2,600. Talks are limited to ten minutes and are assessed at half the hourly charge. Broadcasting music or entertainment for a half-hour is one-half the hourly charge, plus 25 percent.

* * *

Sorbonnne Broadcasts Courses

THE success last year in broadcasting courses from the Sorbonne University in France was so great that the service is being extended this year, when four complete courses will be given by eminent French scholars. This is the first time in France that men of high academic standing have lectured regularly over the ether.



And Now— The Superspeaker Console

In performance, it's a Superspeaker—enough said.

In Appearance, it's the finest piece of Radio cabinet work you have ever seen.

Just what you'd expect from two years' experiment and development by an organization with a record of leadership in the field of loudspeakers.

See it! Listen to it! Enjoy its ability to improve the appearance and performance of your set.

Of finest American Walnut or the new Clairemount Mahogany—Top inlaid with Arlington Ivory—Leather composition grill, richly draped with silk—Volume controlled by ebony knob—Superspeaker-Vemco Reproducing unit—Superspeaker-material concealed horn with full floating mounting. Overall size 10¾ x 17¾ inches, 10 inches high. Ask any Jewett dealer. Price $40.00; west of the Rockies, $42.50.

JEWETT RADIO & PHONOGRAPH COMPANY
5668 TELEGRAPH ROAD PONTIAC, MICHIGAN

Factories: Allegan, Michigan—Detroit, Michigan—Pontiac, Michigan

Canadian Sales Offices: Walkerville, Ontario

Export Sales Offices: 116 Broad St., New York City

The Jewett Superspeaker—All that the name implies. Recommended by experts everywhere. Price $30.00.

The Jewett Superspeaker Console—A handsome cabinet with Superspeaker performance. Enough said. Price $40.00. West of the Rockies, $42.50.

The Jewett Parkay Cabinet—With parquetry top. Puts the amateur on a par with the most exclusive cabinet worker All sizes, prices to correspond.

The Jewett Micro-Dial—Makes tuning 50 times as accurate. Fits any set. Needs only a screwdriver to install. Price $3.50.

The Jewett Vemco Unit—Makes a loud speaker out of your phonograph. The Reproducer used in the Superspeaker. Price $12.00.

The Jewett Superspeaker Highboy—Houses Radio set and allbatteries. Superspeaker built in. Takes Radio into the realm of fine furniture. Price $130.00.

Jewett Quality Products

The McCULLOUGH A/C RADIO TUBE

—the Tube that Eliminates A Batteries From Radio—

The elimination of the storage A battery with its periodic recharging—

The elimination of battery chargers—

Elimination of rheostats—

Lower impedance; greater electron emission and increased signal response—

No alternating current hum—

No microphonic action—

Low operating cost—

The longer life tube—no filament to burn out—

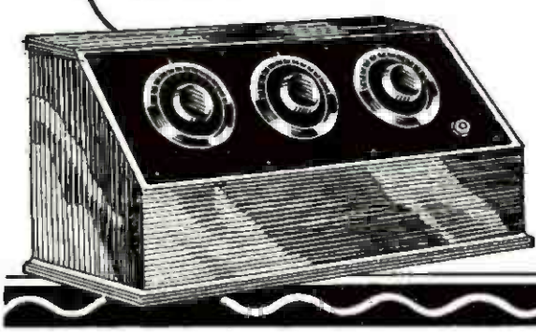
THE RUGGED TUBE OF LONGER LIFE, GREATER EFFICIENCY AND BETTER QUALITY—

List Price $6

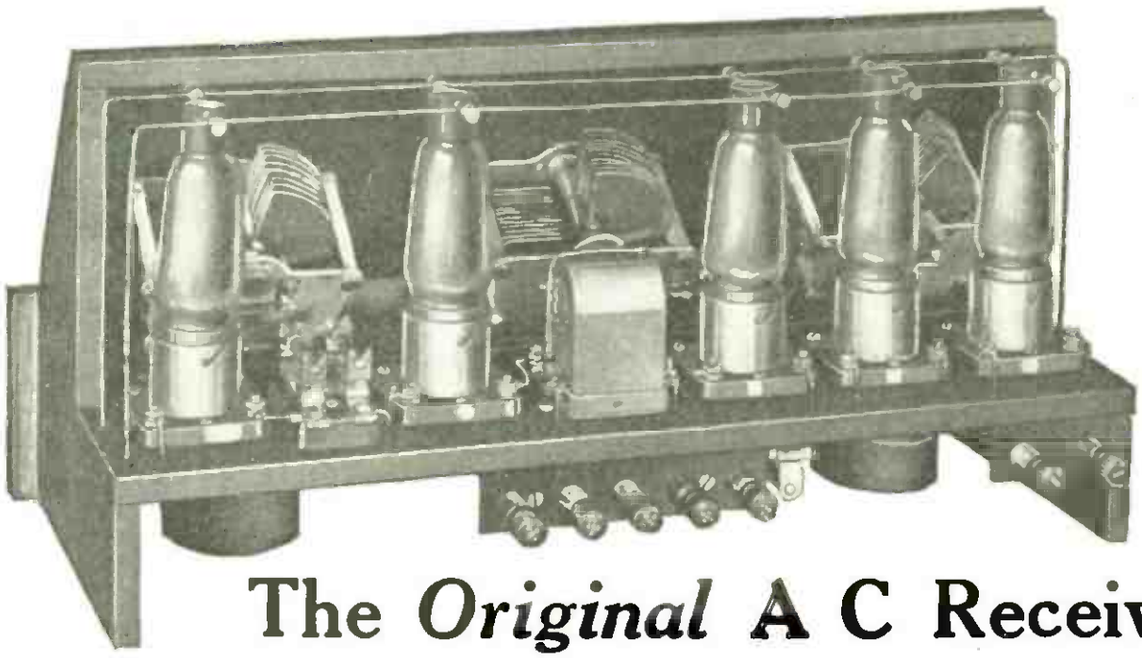
Jobbers—

WRITE FOR PROPOSITION

SIMPLY PLUG INTO THE A-C LIGHTING SOCKET (through small step-down transformer) and Set is ready to operate.



McCullough Sales Company
Distributors McCullough A-C Tubes
963 Liberty Avenue
Pittsburgh, Pa.

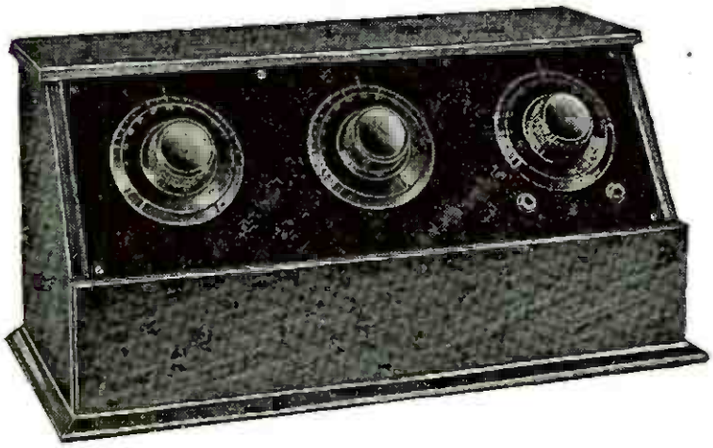


The *Original* A C Receiver—

McCULLOUGH A C

The Receiver built EXPRESSLY for the McCullough A C Tube.

The Receiver that "came along" with the A C Tube — evolved step by step with the A C Tube to ultimate perfection. Not an overnight makeshift, but the result of the same ingenuity, research and effort that created the McCullough A C Tube.



Great distance range—
Exceptional selectivity—
Easily logged—

Economically priced and economical to operate.

THE GREATEST THING IN RADIO! JOBBERS, WRITE FOR PROPOSITION

PITTSBURGH RADIO SUPPLY HOUSE

Manufacturers of the McCullough A C Receiver

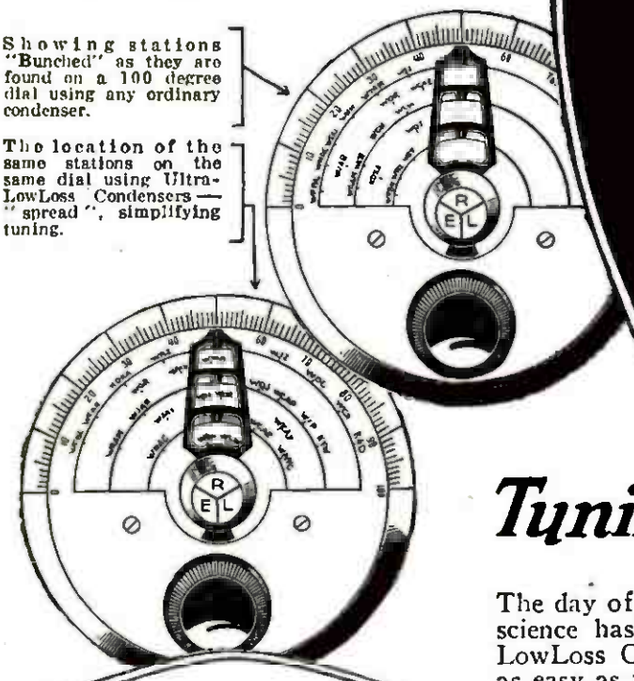
963 Liberty Avenue, Pittsburgh, Pa.

Also manufacturers of "PRS" A C Leads for the McCullough A C Tube

Stations Don't "Bunch" On the Dials

Showing stations "Bunched" as they are found on a 100 degree dial using any ordinary condenser.

The location of the same stations on the same dial using Ultra-LowLoss Condensers — "spread", simplifying tuning.



ULTRA-LOWLOSS CONDENSERS

PATENT PENDING

ULTRA-VERNIER TUNING CONTROL

Simplifies radio tuning. Pencil record a station on the dial—thereafter, simply turn the finder to your pencil mark and you get that station instantly. Easy — quick to mount. Eliminates fumbling, guessing. A single vernier control, gear ratio 20 to 1. Furnished clockwise or anti-clockwise in gold or silver finish.

Silver $2.50
Gold $3.50

This seal on a radio product is your assurance of satisfaction and a guarantee of Lacault design.

Tuning Simplified Now!

The day of tedious fumbling about for your stations is past—science has been brought into play. Now, with the Ultra-LowLoss Condenser you can instantly tune in on any station as easy as turning the hands of a clock to the hour.

With one station of known wavelength located on the dial, all others can be found instantly. Each degree on a 100 degree dial represents approximately 3½ meters difference in wave length. This applies to both high and low wavelengths. Other than 100 degree dials vary accordingly.

This simplification of tuning is made possible by the new Cutless Stator Plates to be found only in the Ultra-LowLoss Condensers. Every feature of the Ultra-LowLoss Condenser was developed with one predominating purpose—to overcome losses common in other condensers. Designed by R. E. Lacault, originator of the famous Ultradyne Receivers and Ultra-Vernier Tuning Controls.

At your dealers, otherwise send purchase price and you will be supplied postpaid.

Design of lowloss coils furnished with each condenser for amateur and broadcast wavelengths showing which will function most efficiently with the condenser.

TO MANUFACTURERS WHO WISH TO IMPROVE THEIR SETS

Mr. Lacault will gladly consult with any manufacturer regarding the application of this condenser to his circuit for obtaining best possible efficiency.

ULTRA-LOWLOSS CONDENSER

PHENIX RADIO CORPORATION 116 East 25th Street, New York City

for ALTERNATING CURRENT TUBES

The NEW

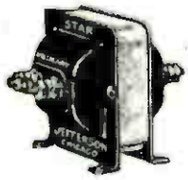
JEFFERSON

A-C TUBE TRANSFORMER

This Jefferson Transformer makes possible the most remarkable results, with McCullough A. C. Tubes. Attached to any A. C. lamp socket, it will supply the correct voltage for perfect operation.

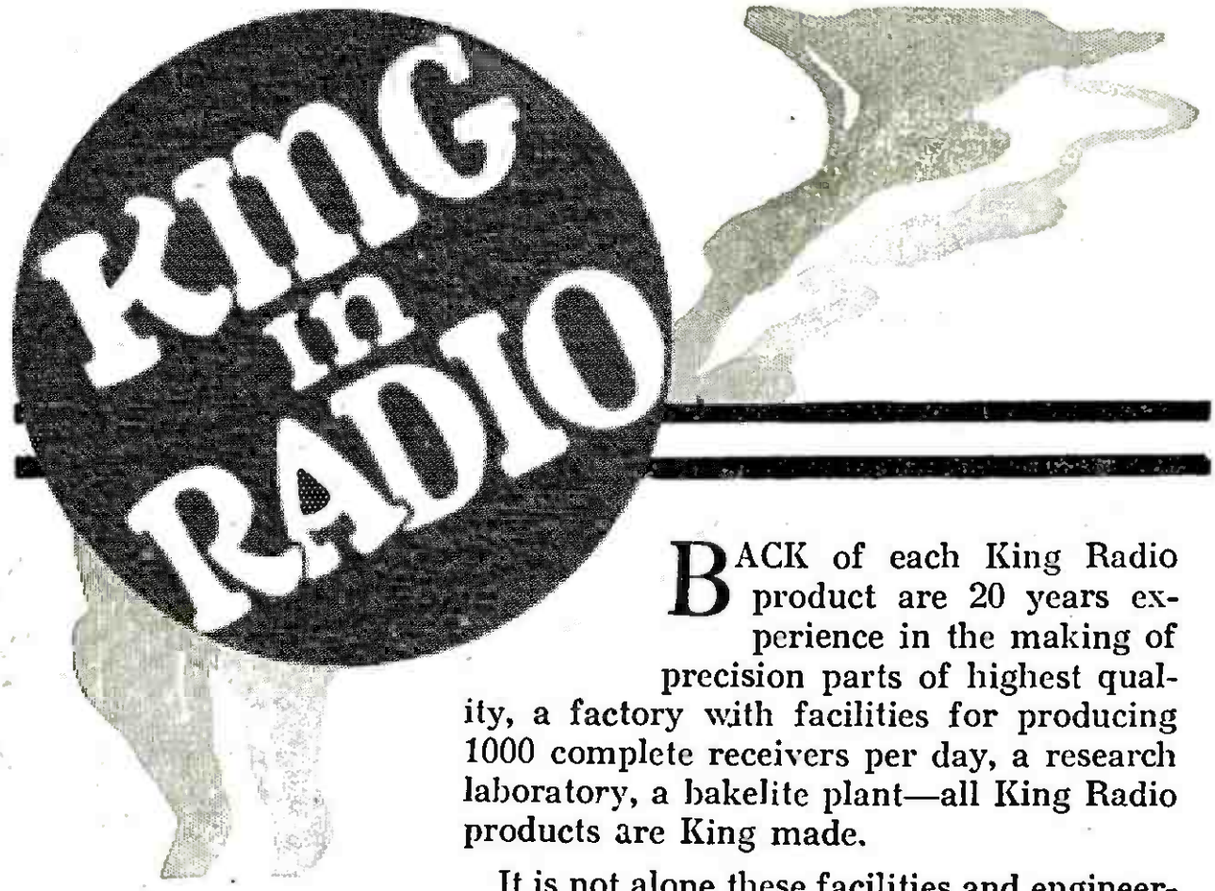
Close voltage adjustment of the Tubes is made through a regulating switch that offers a flexible control ranging from 3½ to 6 volts, so that it may be operated with equally good results on lighting circuits varying from 100 to 130 volts. It is designed so that it may be permanently mounted beside your set, if you wish. The Jefferson Special is built part by part by the world's largest manufacturers of small transformers. That means that the best brains of the industry stand back of its design.

JEFFERSON ELECTRIC MFG. CO.
501 South Green St., Chicago, Ill.



Twelve models of Jefferson Radio Transformers are famous for the fidelity of their reproduction. From the lowest notes of the bass drum to the highest notes of the violin, there is clarity and amplification without distortion.

Makers of Jefferson Radio Tube Rejuvenators; Radio, Bell Ringing and Toy Transformers; Jefferson Spark Coils for Automobile, Stationary and Marine Engines; Jefferson Oil Burner Ignition Coils and Transformers.



BACK of each King Radio product are 20 years experience in the making of precision parts of highest quality, a factory with facilities for producing 1000 complete receivers per day, a research laboratory, a bakelite plant—all King Radio products are King made.

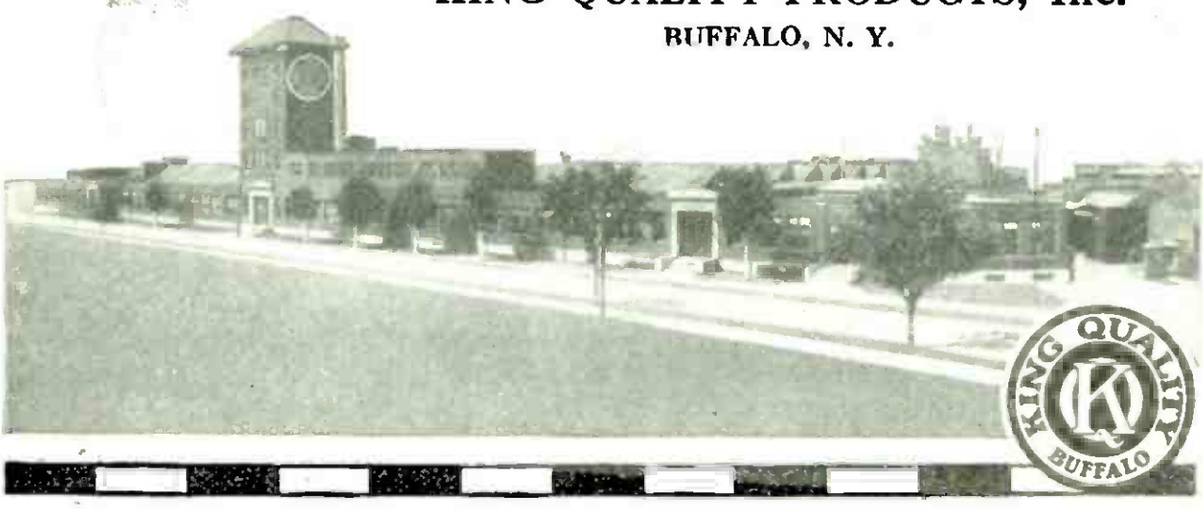
It is not alone these facilities and engineering skill which have given King a place of leadership—but the fact that when King products are put to actual test by radio users their performance is outstanding.

"King In Radio" stands not alone for a line of radio products—it stands for leadership, the very best, a complete line of King-Hinners Neutrodyne Receivers, King Five Tube Receivers, knock-down kits and a full line of radio parts.

Eight out of every ten families are prospects for Radio. The line you handle will determine your share. Let us tell you the story of "King in Radio"

KING QUALITY PRODUCTS, Inc.

BUFFALO, N. Y.



Summer Care of Batteries

WHETHER you use your radio much or little, test your batteries frequently. Unless the solution is kept just right, batteries may wear out even quicker than when worked constantly. Use a

FREAS BATTERY TESTER

Known everywhere for its absolute precision. Made to U. S. Bureau of Standards specifications. Gauged to 1/5000 of an inch. Easy to read. Airtight joints. Acid-proof container prevents electrolyte damaging clothes or rugs.

Major J. S. Hatcher, U. S. A., well-known radio authority, tells how to care for batteries. Send postcard today.

Free Booklet

FRANCIS L. FREAS GLASS WORKS

America's Largest Hydrometer Manufacturers

Conshohocken • Pennsylvania

SIMPLEX

Efficient devices bearing this name have made it one of the best known in radio. For instance—

Simplex SR-5 Receiver—a distance getter of full volume and clear tone.

Simplex 180° DX Tuner—much sharper than 90° coils. Spiral wound molded rotor.

Simplex 180° Variocoupler—especially well adapted to radio frequency circuits.

It's Lightning Arrester Time

$1.50

The Simplex gives complete safety. Air gap sealed in glazed porcelain housing. Weather proof. Approved by National Board of Underwriters.

At your Dealer's

SIMPLEX RADIO CO., Mfrs.

1013-15 Ridge Ave., Philadelphia, Pa.

ZENITH RADIO

Trade Mark Reg.

Tunes straight through the locals, gets distance. Brings in more stations—clearly and with volume—in a given length of time than any other set. Direct comparisons invited. Zenith receiving sets *cost* more, but they *do* more.—The exclusive choice of MacMillan for his North Polar Expedition.

***Seven Models*—$100 to $475**

Models 4R and 3R licensed under Armstrong U.S. Patent No. 1,113,149. They are NON-RADIATING.

Zenith 4R - - $100
Zenith 3R - - $175

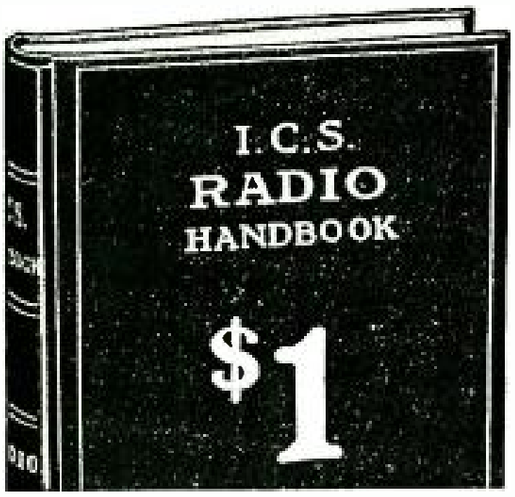
Super-Zenith VII - - $240
Super-Zenith VIII - - $260
Super-Zenith IX - - $355
Super-Zenith X - - - $475

Only dealers who are equipped to give service handle Zenith. Ask your nearest Zenith dealer for a demonstration.

Zenith Radio Corporation

332 S. Michigan Avenue, Chicago

N4



Do you understand Super-Regeneration?

This unique book shows the way to work out practical circuits

514 PAGES—100,000 SOLD—ONLY $1

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**

SUPER-REGENERATION! Do you know that big money will be made by the first one to design a practical Super-Regenerative set? This marvelous circuit can be made to do with two tubes as much as a six or eight tube super-heterodyne. But it's not yet commercialized. It's where the super-heterodyne was until recently. Why don't *you* find out how to make Super-Regeneration practical? See pages 377 to 383, I. C. S. Radio Handbook, for details of the circuit and how to attack its problems.

This I. C. S. *Radio Handbook* explains electricity, electrical terms and formulas, antennas, batteries, motors and generators, vacuum tubes, transmitting and receiving principles and practice, radio and audio frequency amplification, condensers, battery chargers, filters, codes, license rules. Many other features.

Just mail the coupon with a dollar bill and your name and address, and we will send you this 514-page I. C. S. Radio Handbook by return mail. Note the other good books listed below and the low prices.

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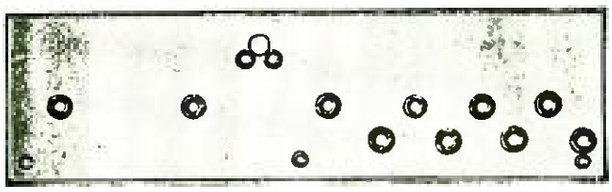
Enclose $1.50 for each book if you want the Leatheroid binding. All of the above books can be had in this binding except two—Traffic and Building Trades.

Now Here { Practical Glass Panels and Cabinets

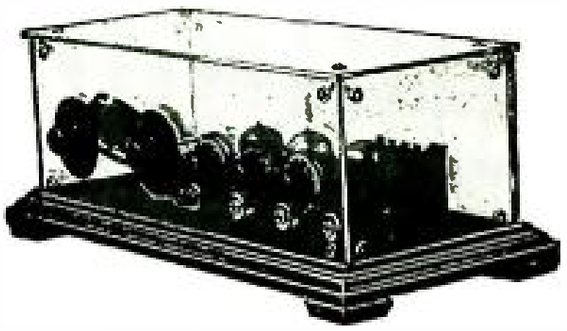


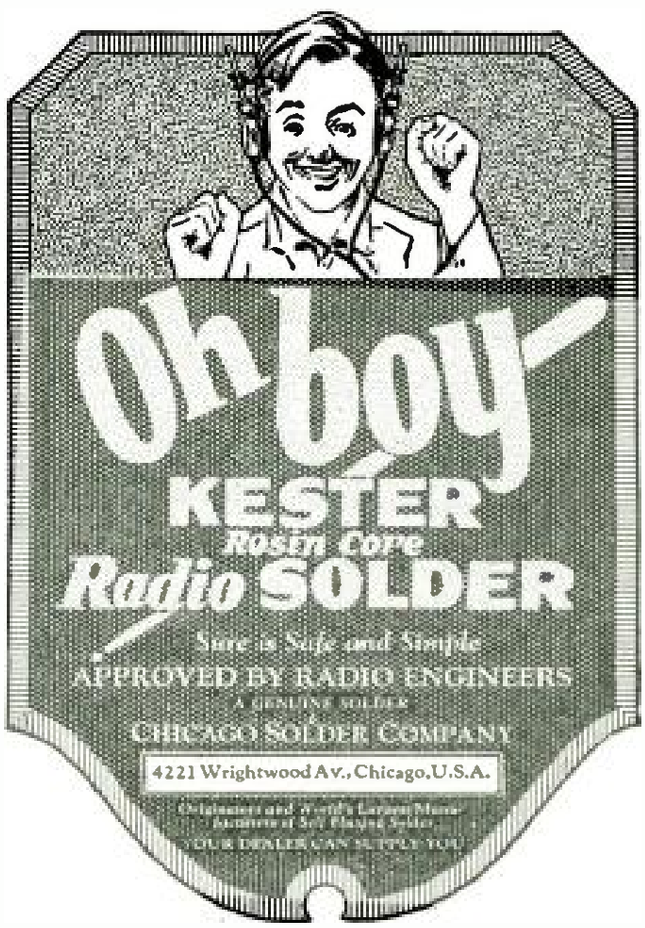
7" x 21" Clear Panel *only*, drilled for B. T. 3 tube hook-up. $7.50 list.
7" x 26" Clear Panel *only*, drilled for B. T. 5 tube hook-up. $10.00 list.
May be drilled for any hook-up. All equipped with Hornig Safety Bushings (Pat. App.).

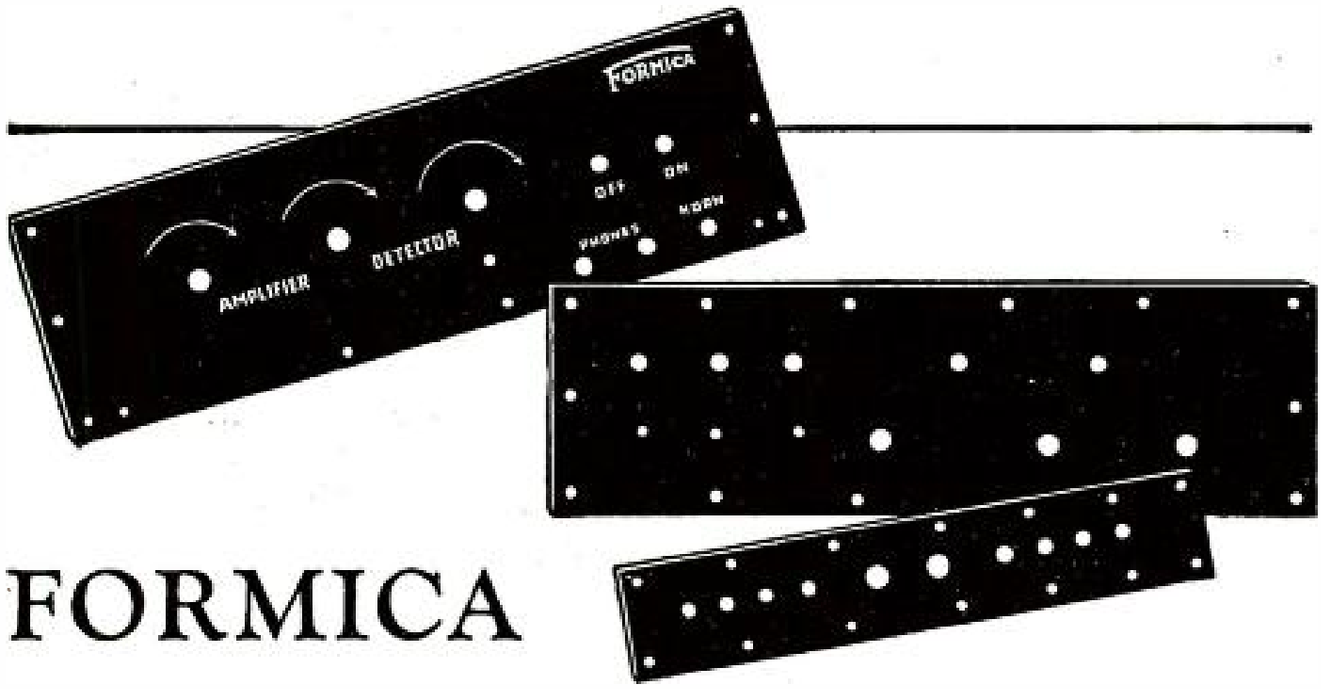
Manufacturers or Jobbers of sets or kits, let us make up a panel or two or a cabinet for display purposes.

Ask for New Catalog. For full information address

AUGUST W. HORNIG, *Manufacturer*
3921-3931 Dickens Avenue, Chicago
Tel. Spaulding 3156







FORMICA

means permanent good performance!

WATCH out for the reaction against cheaply constructed radio sets. Every dealer has felt it on parts at one time or another. And radio sets cannot be built cheaper and cheaper without running into it.

Formica panels and base panels are a sure indication of quality in a radio set—of an intention on the part of the manufacturer to build for permanence and lasting good performance.

Formica base panels shorten and simplify the wiring and make the job a hundred times neater. Many sets built for real quality will have both front and base panels this year.

The better finish, greater uniformity, and greater freedom from warping that is characteristic of Formica have made it the preferred insulation of more than 125 leading set makers.

Dealers and jobbers find it the best known and most popular line of radio panels.

THE FORMICA INSULATION COMPANY

4641 Spring Grove Avenue, Cincinnati, Ohio

SALES OFFICES

50 Church Street.....New York, N. Y.
9 South Clinton St.....Chicago, Ill.
516 Caxton Bldg.....Cleveland, Ohio
327 Cutler Bldg.....Rochester, N. Y.
422 First Avenue.....Pittsburg, Pa.
6 Beacon Street.....Boston, Mass.
55 Calle Obispo.....Habana, Cuba
1026 Second Avenue.....Minneapolis, Minn.
725 Bulletin Bldg.....Philadelphia, Pa.
708 Title Building.....Baltimore, Md.
585 Mission Street.....San Francisco, Cal.
419 Ohio Building.....Toledo, Ohio
309 Plymouth Bldg.....New Haven, Conn.
Whitney Central Bldg.....New Orleans, La.

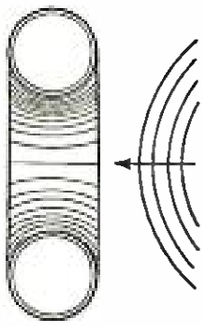
FORMICA

Made from Anhydrous Bakelite Resins

SHEETS TUBES RODS

Hear the Formica Orchestra over WLW every Tuesday evening from 9 to 10 Central Standard Time.

"A" is a stray field or wave, traveling toward the coil. Due to the winding all induced currents oppose each other so no current can flow. Hence no pick-up.



The wave front here moves at right angles to the coil plane. Again opposing currents are set up in opposite sides of the coil, preventing interference.

New kind of coil

Instantly brings four amazing improvements to your present set—greater distance, more volume, increased selectivity, finer tone quality. Send for remarkable new book, *Better Radio Reception.*

SCIENCE has discovered a new inductance principle that is bringing astounding results. Now you can apply it to your present set through new type coils known as Erla *Balloon *Circloids.

Thousands of tests and experiments were necessary before the circloid was finally perfected. Leading radio engineers worked night and day in order to develop a coil that would correct the four vital weaknesses of present sets. At last they were successful.

When circloids are used, results you think impossible are obtained with surprising ease. Note especially the four that follow:

1. ***Greater distance.*** Circloids have no measurable external field to affect adjacent coils or wiring circuits. This makes possible higher amplification in each stage with increased sensitivity and greater range.

2. ***More volume.*** Higher r. f. amplification enables circloids to bring in distant stations scarcely audible in ordinary sets with volume enough on the loud speaker to fill an auditorium.

3. ***Increased selectivity.*** Circloids have absolutely no pick-up qualities of their own. Only signals flowing in the antenna circuit are built up. (See diagram above.) This explains the almost total absence of static.

4. ***Finer tone quality.*** The self-enclosed field positively prevents stray feed-backs between coils. Hence no blurring or distortion. Tones are crystal clear.

Write for new book, "Better Radio Reception"

You will be amazed at the difference circloids will make in your present receiver. Get a set and test them out today. Go to your Erla dealer or write direct.

Also send for remarkable new book just published. It explains the Circloid principle with diagrams and drawings and tells you many things you ought to know about reception. Send 10c to cover postage and cost of mailing.

ELECTRICAL RESEARCH LABORATORIES
2522 Cottage Grove Ave., Chicago, U. S. A.

*Trade Mark Registered.

Dealers—Exclusive franchises are available to high-class dealers in localities still open. Write or wire immediately.

ELECTRICAL RESEARCH LABORATORIES,
2522 Cottage Grove Ave.,
Chicago, U. S. A.

☐ Send me free information on the Circloid. I enclose 10c for postage ☐ for book, "Better Radio Reception."

ERLA

This sign identifies authorized Erla distributors. All are equipped to give complete radio service.

Name .....

Address .....

City ..... State .....

The Receiver—
The Designer—
and

The CONDENSER

WE haven't asked, so we do not know why Laurence M. Cockaday chose Hammarlund Condensers for his new sensation, the McCullough A C Receiver.

But we suppose it was for the same reasons that so many other experts choose the Hammarlund—that he didn't wish to take any chances when presenting a new idea to the radio public—that he must use the best to *insure* success.

You, too, would be wise to use Hammarlund Condensers for the McCullough, or any other receiver from which you expect to obtain maximum efficiency.

All capacities, plain and vernier; single, dual and triple models; also "Hammarlund, Jr."—the precision midget.

Write for Descriptive Folder

HAMMARLUND MANUFACTURING CO.
424-438 West 33rd Street, New York
Export Offices: 375 Broadway, New York

For Better Radio
Hammarlund
PRECISION
CONDENSER

Copyright March 17, 1925

Patent Applied For

KORACH

Tuned Loop

Tuning Feature
Directional
Can Be Logged
Collapsible

Approved! Recommended and used by L. M. COCKADAY to bring in the following Foreign Stations: 2BD, Aberdeen; 5NO, Newcastle; 2PY, Plymouth; ESP, Paris; 2LO, London; and PTT, Madrid. Positively the last word in loop construction. Exclusive features give you selectivity and distance unheard of before with loop aerials. *Operates successfully on all sets designed for loop reception.* PARTICULARLY ADAPTABLE FOR PORTABLE LOOP SETS. If your dealer cannot supply you, order direct from us. Price $16.50. Send $2.00 as good faith deposit with your order, balance C. O. D. Satisfaction guaranteed.

KORACH RADIO COMPANY
309 So. LaSalle St. Dept. 10 Chicago, Ill.

Full Particulars on Request

Dealers and Jobbers: Write at once for attractive proposition.

Summer Static

Now Diminished by Volume

Static is diminished in proportion to the amount of volume which a radio set delivers, experts agree.

Kellogg transformers give volume with added clarity of tone.

The Kellogg radio frequency transformer is of the low loss type, having many important features. It will operate at all wavelengths with .00035 to .0005 variable condensers. For best results, use the Kellogg .0005 low loss variable condenser. Kellogg R. F. Transformers at all dealers—$2.35.

Kellogg audio frequency transformers give greater volume with clearer reproduction, due to the high quality materials and expert workmanship, used in the Kellogg process of manufacture. Kellogg audio frequency transformers are made in both shielded and unshielded types ranging in price from $3.50 to $4.50.

Kellogg transformers can be obtained at all radio dealers.

Kellogg Switchboard & Supply Co.
1066 W. Adams St., Chicago, Ill.

WJS Brazil on *One* BRIGHTSON True Blue Tube!

BRIGHTSON LABORATORIES, Inc.
Waldorf Astoria Hotel, New York City

Gentlemen:—

This is to advise you that I have tested the True Blue Tube which was submitted to me and that I am pleased to be able to praise it most highly.

At my station I am able to receive the signals from the Rice Expedition, WJS, in Brazil, on a single tube, and changing to the True Blue Tube gave it an excellent chance to make good.

It did. If anything the signals were louder. Keep up the good work.

Yours very truly,
P. C. OSCANYAN, Jr.,
Managing Editor, Amateur Radio.

All True Blue Tubes are alike; all sold on approval.

10 Day Return Privilege

Unless True Blue Tubes prove interchangeably uniform, noiseless, crystal clear in tone and the handsomest, finest quality tubes you have ever seen, you can return them in ten days for refund.

60 Day Guarantee

Whether you buy one True Blue Tube or a set of three, five, six or eight in a safety case, each individual tube is covered by its own Brightson guarantee. If within sixty days a mechanical defect prevents any True Blue Tube from operating perfectly, you can return it for replacement.

BRIGHTSON LABORATORIES, Inc., 16 W. 34th St., NEW YORK, N. Y.
Philadelphia Office: 50 N. Eleventh St., Philadelphia, Pa.

Boston Representative: Wm. C. Oakes
832 Park Square Bldg., Boston Mass.

Jersey City Representative: Triad Sales Co.
Trust Co. of N. J. Bldg., Jersey City, N. J.

Detroit Representative: H. C. Schultz
2831 Gratiot Ave., Detroit, Mich.

Milwaukee Representative: Yahr & Lange
207 E. Water St., Milwaukee, Wis.

BRIGHTSON *True Blue* TUBES

"That's right, Mike—talk back at him"

There are two sides to radio—active and passive. The active radio enthusiast is creative—building, experimenting, improving. To this class belong the boys. The passive radio lover concentrates on enjoyment of the finished creation. As a rule, grown people are radio-passives. Boys build and build—they experiment and improve, each move requiring purchases from radio dealers. Their activity arouses the interests of their elders, swelling the ranks of radio devotees which have been largely recruited by boys. Knowing little of radio, these converts depend on boys for guidance in their purchases and instruction in radio practice. When you consider that 1925 radio sales will probably exceed 350 million dollars, you realize the tremendous buying control of boys.

THE AMERICAN BOY is the radio oracle of 500,000 boys, averaging 15½ to 16 years old. In it they find thrilling stories of radio adventures—authoritative information on radio development and perfection—helpful suggestions for increasing their radio knowledge and improving their sets. In such an environment, the radio advertisement meets eager, interested readers who are able and anxious to buy.

You cannot find a quicker, surer, more direct way of reaching the source of radio purchases than by advertising to boys in THE AMERICAN BOY. You will not only augment your present customers and your sales to each, but you will also build up a vast army of steady buyers who will stick to you through thick and thin. Copy reaching us by July 10th will appear in September.

The American Boy
The Biggest, Brightest, Best Magazine for Boys in All the World

Detroit Michigan

You can do this best with Sangamo Mica Condensers

You can use the new Sangamo Mica Condenser to support long busbars, instead of using the busbar to support the condenser. Simply slip the bus through condenser terminals and solder. No cutting of leads. This is merely one feature demonstrating the wide flexibility of connections possible with Sangamo Mica Condensers.

You can rely upon the capacity of this condenser being within ten per cent of marked value and remaining permanently at that value. Temperature or humidity changes, or even rough usage will not change it. You can freeze it in ice or boil it; keep it immersed in water for days, and the capacity will remain constant. Soldering has no effect whatever upon the capacity—there is nothing to melt or burn.

This feature of permanent accuracy is necessary to bring out the highest efficiency of any circuit—especially in reflex hook-ups.

Solidly molded in smooth brown bakelite, the Sangamo Mica Condenser sets a new standard of neat compactness. It looks *finished* and actually improves the appearance of the set.

Made in all standard capacities with or without resistor clips. Prices are very reasonable.

SANGAMO *Accurate* Radio Parts

Sangamo Electric Company

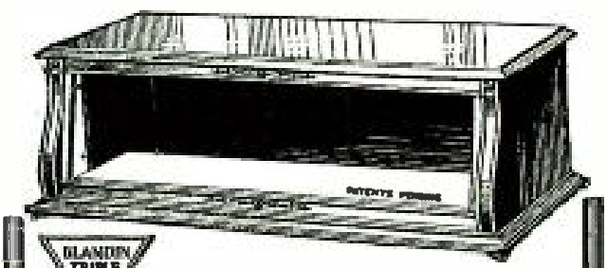
Springfield, Illinois

RADIO DIVISION, *50 Church Street, New York*

SALES OFFICES—PRINCIPAL CITIES

For Canada — Sangamo Electric Co. of Canada, Ltd., Toronto.
For Europe—British Sangamo Co., Ponders End, Middlesex, Eng.
For Far East—Ashida Engineering Co., Osaka, Japan

1320-1



BLANDIN TRIPLE A

You'll Like This Duplex

One cabinet—

Any panel size, 7x26, 7x24, 7x21 or 7x18". Depth 11".

Either straight or sloping panel—grooves, no screws.

Solid mahogany. Latest lacquer hand-rubbed finish. Entire lid raises. Full length piano hinge. Folding lid supports. Felt covered feet. Extra ½" mounting board.

Same quality as the Blandin 35-D super-cabinet with built-in spruce horn.

Write for Duplex and 35-D price lists. Dealers, write your jobber.

Blandin *Radio Cabinets*

Built by BLANDIN 1500-16th St. Racine, Wis.

PROFESSIONAL SET BUILDERS!

and dealers who build sets

WE will shortly begin a series of newspaper advertisements, featuring the work of individuals and dealers who build sets using Cardwell Condensers.

If you build to specification or from original design, it will be to your interest to communicate with us immediately.

Ask for details of plan. Be sure to give name of your jobber.

ALLEN D. CARDWELL MANUFACTURING CORP.

81 Prospect Street, Brooklyn, N.Y.

SHOCKPROOF *right under the guns!*

A modern battleship stripped for action is hardly a safe place for a radio tube! The terrific recoils of heavy guns jar and sway the whole ship, often breaking the incandescent lamps left in their sockets.

When Lt. Hill, on board the U. S. S. Medusa, installed Cle-Ra-Tone Sockets in his radio set, he was testing their shock absorbing qualities in the extreme. And his letter, reproduced at the right, proves that Benjamin Cle-Ra-Tone Sockets were worthy of his confidence.

Radio sets in your community may never be subjected to such nerve-shattering, lamp-breaking bombardment—but rumbling street traffic, indoor footsteps, mechanical and human activities set up vibrations to a surprising extent and cause microphonic distortions in radio sets by disturbing the tube filaments.

Cle-Ra-Tone Sockets prevent the transmission of this outside vibration to the filaments by "floating" the radio tube above all jars and shocks. Delicately adjusted springs do this! There are no soft rubber parts to deteriorate. The Bakelite construction assures high insulation and sturdiness. Contact points to tube terminals are perfect and permanent. Handy soldering lugs simplify wiring. Stiff bus wiring does not affect the flexibility of the supporting springs.

Benjamin Electric Mfg. Co.,
Chicago, Ill.

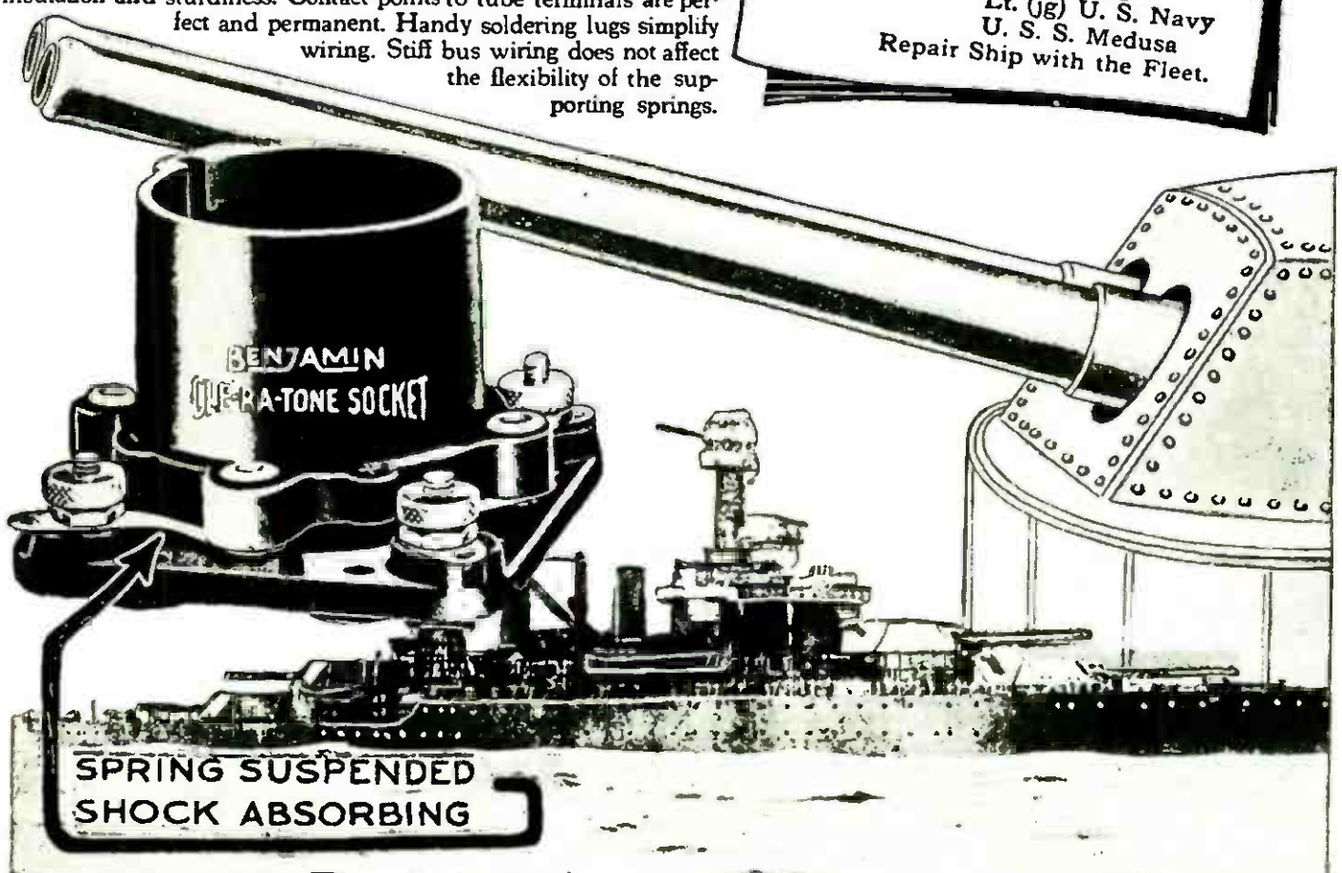
Dear Sir:

Recently my ship conducted a test firing of its five inch guns, one of which is just outside and below my stateroom.

During gun firing all lamps are removed from their sockets, as the shock can be counted upon to break the filament and frequently the glass itself.

During the firing I placed trust in the five Benjamin Cle-Ra-Tone Sockets in my radio, leaving the tubes in during the test. And although no more than thirty feet from the muzzle of a 5-inch naval rifle, the tubes were uninjured and are in perfect condition.

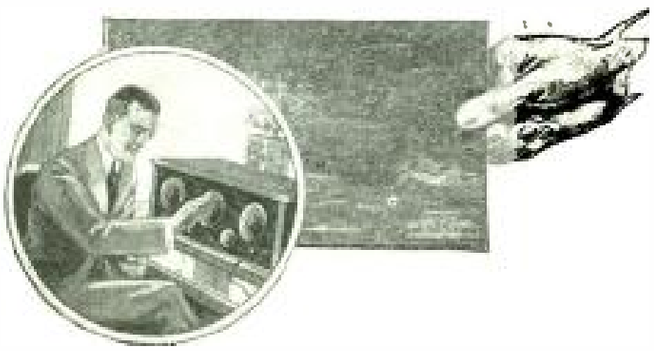
(Signed) C. E. Hill, Jr.
Lt. (jg) U. S. Navy
U. S. S. Medusa
Repair Ship with the Fleet.



Benjamin Electric Mfg. Co.

247 W. 17th St., New York — 126-128 So. Sangamon St., Chicago — 448 Bryant St., San Francisco

Manufactured in Canada by the Benjamin Electric Mfg. Co. of Canada, Ltd., Toronto, Ontario



A safeguard against *current leakage*

THOSE faint electrical impulses picked out of the ether by your antennae must be led along through the circuit of your set with the least possible chance of escape. To guard this path is the prime function of insulation.

Any leakage due to poor insulation has a marked effect on the character and volume of the current delivered to the phone or loud speaker. The insulating material proved most efficient in guarding against such leakage is Radion—made to order exclusively for radio purposes.

Radion Panels are the easiest to work with simple home tools and are regarded as the best-looking, best-finished panels made. There are 18 standard sizes in black and mahoganite. *Radion* Dials (in all regular sizes) match Radion Panels.

Send for Booklet, "Building Your Own Set." It contains complete, clear directions for building the most popular circuits; gives wiring diagrams, front and rear views, shows a new set with slanting panel, etc. Mailed for ten cents. Use coupon.

AMERICAN HARD RUBBER COMPANY
Dept. B-7, 11 Mercer St., New York City

RADION

The Supreme Insulation

PANELS

Dials, Sockets, Binding Post Panels, etc.

AMERICAN HARD RUBBER COMPANY
Dept. B7, 11 Mercer St.. New York City.

Please send me your new booklet. "Building Your Own Set," for which I enclose 10 cents (stamps or coin).

Name.....

Address.....

.....

HOW ABOUT YOUR JOBBER ?

Does he wholesale exclusively?

Does he refer all customers' inquiries to his dealers?

Does he carry reputable apparatus that is nationally advertised and in demand?

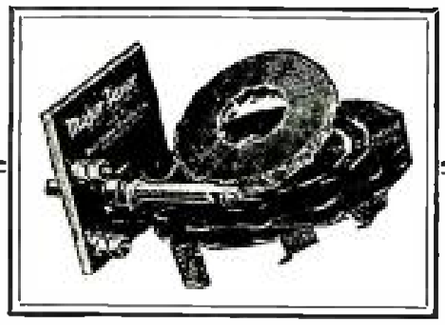
Does he carry ample stock to insure prompt delivery?

Does he sell all his stock to dealers—even when material is scarce?

HOMMEL DOES!

Write today for Hommel's Encyclopedia of Radio Apparatus 266-P. It's free and will help you.

LUDWIG HOMMEL & CO
929 PENN AVENUE — PITTSBURGH, PA.



Have you met

Major Tuner

Reg. U. S. Pat. Office.

MAJOR TUNER will end those "interference blues." A set built with the MAJOR TUNER gets only one station at a time—the one you want to get and no other.

MAJOR TUNER is the most advanced form of three circuit Low-Loss tuner. It is packed with complete picture wiring diagrams and full instructions.

(If your dealer cannot supply you, write us.) **$4**

BEL-TONE RADIO CO.
161 Jamaica Ave., Brooklyn, N. Y.

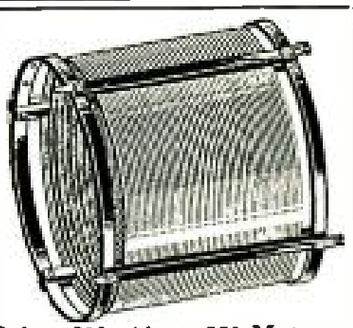
Build with AERO COILS

For Greater Power, Range, ... SELECTIVITY

The inductance unit which has set new performance standards for tuned radio frequency.

Far more SELECTIVE, because its extremely low high frequency resistance loss enables it to tune **every** wavelength **sharply** into resonance.

Much more POWERFUL, because of its lower distributed capacity and absence of dielectric absorptions. Actually gives **loudspeaker** reproduction of signals otherwise too weak to be heard on headphones when other types R. F. Transformers are used.



Below 200, Above 550 Meters with a .00035 Condenser Gives Greatest Amplification per stage in tuned circuits because:

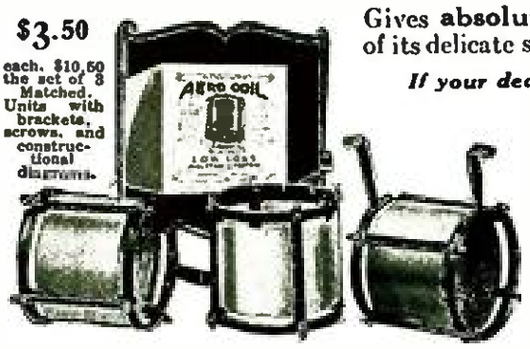
95% Air Dielectric.

Dopeless, air-spaced windings.

Very low distributed capacity.

Low high frequency resistance losses.

$3.50 each. $10.50 the set of 3 Matched. Units with brackets, screws, and constructional diagrams.



Gives **absolute tonal fidelity** because of its delicate sensitiveness to all modifications of the radio frequencies.

If your dealer has not yet stocked Aero Coils—order direct from us

Write for circular H, which gives full information and circuit diagrams

DEALERS: Write for our proposition. The greater efficiency of this new inductance system has earned for it a steady, profit-making demand everywhere.

HENNINGER RADIO MFG. CO.
1772 Wilson Avenue Dept. 34 CHICAGO, ILL.

Representatives:
S. A. WINSOR, 1221 W. 16th St., Los Angeles, Calf.

Steinite LOW LOSS
Interference Eliminator

What Every Radio Owner Needs

Tested and approved by the Popular Radio Laboratory

Over 36,000 Sold First 6 Weeks. Now you can select stations at will, cut out interference and undesired stations—tune in loud and clear. **Wonderful results with tube or crystal sets** of any make using any kind of aerial except loop antenna.

Reduces Static

$1 Postpaid

Amazing satisfaction. Better reception guaranteed or your money cheerfully refunded.

Select Stations At Will

Put this interference eliminator on your set—that's the test—no tools—attached in two minutes to aerial. Doesn't disturb present log. Directions easy to follow. No additional tubes or batteries. Two big banks testify to our reliability. Order today—dollar bill will do—we take the risk—money back if you say so.

STEINITE LABORATORIES
Manufacturers
134 Radio Building, ATCHISON, KANSAS

Write for complete radio literature—it's FREE. Steinite sharp tuning summer sets. Most beautiful and least expensive radio sets in America.

Jobbers—Dealers: Write today for full description and prices Steinite nationally known popular price radio sets, interference eliminator, and long distance crystals.

New and Improved

$5.50

Authorized Cockaday Coil!

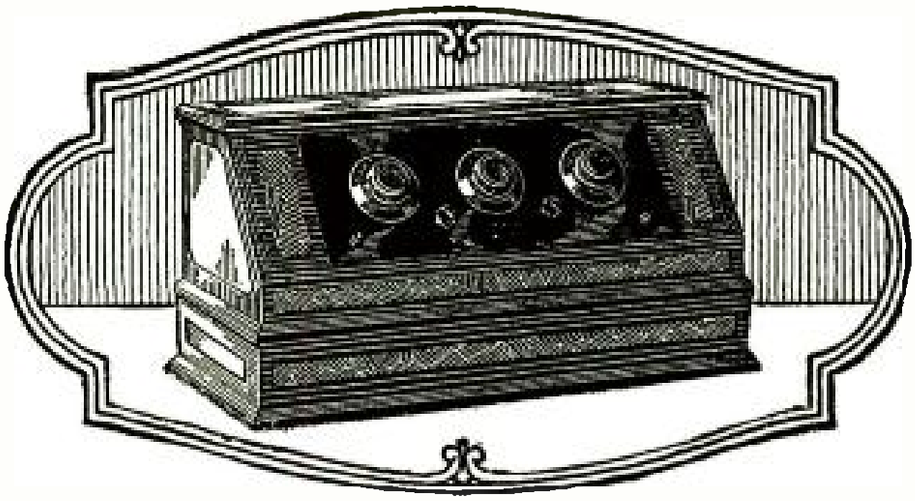
No more loose winding—special new feature holds coil windings fast. Built throughout of moulded hard rubber, not affected by atmospheric conditions. Wound with No. 18 D. S. C. copper wire.

The only coil specified by L. M. Cockaday in his New Four Circuit Tuner with Resistance Coupled Amplification because it meets all his specifications. Described in October POPULAR RADIO as Cockaday Precision Coil. Hundreds have substituted this quality coil for those of inferior make and are amazed at the improved reception, selectivity and general D-X results.

If your dealers, otherwise send purchase price and you will be supplied postpaid

In Canada $7.75. Canadian Distributor, Perkins, Ltd. Montreal—Toronto—Winnipeg

PRECISION COIL CO., Inc.
209-B Centre St., New York City



Distinguished for its Musical Excellence!

Refinements had to come before radio could make its true appeal on the basis of musical excellence.

This was the view of the Thompson engineers, who, with fifteen years' experience in manufacturing wireless equipment to their credit, set their ample resources to the task of producing a radio receiver which should be not "just a radio," but a musical instrument.

On every hand the Thompson Neutrodyne is acknowledged as the maestro of radio, a truly fine musical instrument by every standard. The recognition accorded the Thompson is due to Thompson Tone.

Tone that is versatile in its handling of every sensitive shade of music. Tone that falls pleasantly upon the ear of the most orthodox music-lover. Tone that does not and cannot offend the sensibilities of the most critical listener. Thompson Tone!

SIX TUBES GIVE DISTANCE WITH VOLUME

An unique transformer (an exclusive Thompson engineering feat) permits the use of six tubes in the Thompson Neutrodyne — an achievement heretofore confined to the experimental laboratory. Distant programs that come in faintly (if at all!) on ordinary receiving sets are delivered with the volume and brilliance of nearby broadcasts on the 6-tube Thompson.

THREE SETS FROM WHICH TO CHOOSE

The 6-tube Thompson Concert Grand, illustrated above, retails at $180. This is unquestionably the finest thing in radio today at any price. There is also the 5-tube Thompson Parlor Grand which retails at $145. Thompson quality throughout, but with one tube less than the Concert Grand. Then there is the 5-tube Thompson Grandette which retails at $125. This differs from the Parlor Grand chiefly in size and cabinet work.

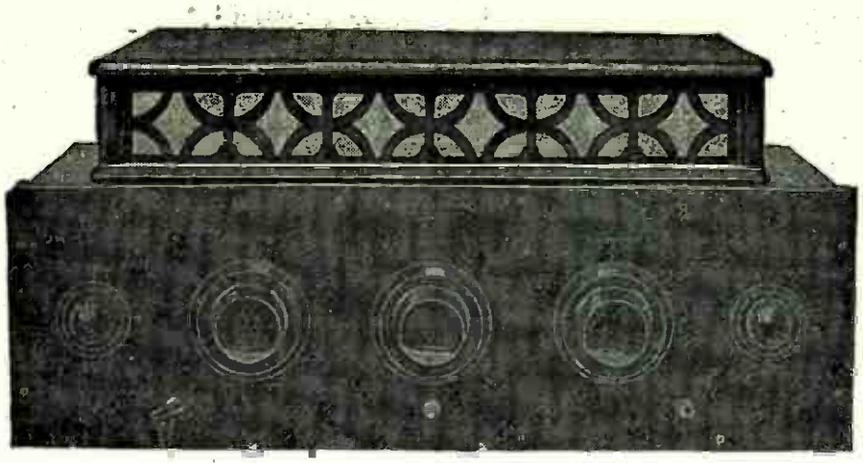
R. E. Thompson Mfg. Co., 30 Church St., N.Y.

THOMPSON RADIO

Prices slightly higher West of the Rocky Mountains

The Thompson Speaker

The Thompson Speaker contains over-size magnet and coils, amplifying armature, diaphragm in scientific cone shape. The volume regulator enables adjustment for varying strength of near and far stations. Uses no battery current. For supremely natural home radio — The Thompson Speaker — Retails at $28.



The New TIMBRETONE

REG. U.S. PAT. OFF.

A conscientious effort to meet public opinion consistent with real merit.

To bring out the real quality—the "Timbre" or "Tone" of any set, try the new TIMBRETONE

REG. U.S. PAT. OFF.

Hear it, see it, and give your ears AND your eyes a real treat.

List Price in U. S. (east of Mississippi) **$30.00**

We have an attractive proposition to offer responsible dealers and jobbers. Write for advance information.

Made in Hoosick Falls, N. Y.
by the Timbretone Mfg. Co.

DONGAN

Quality Radio

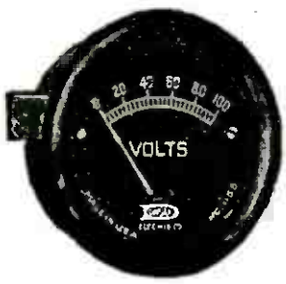
for

Jobbers and Set Manufacturers

List $6.00

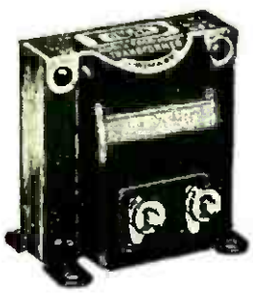
Type B AC Tube Transformer

The Standard step-down transformer for AC Tube Circuits, used by Cockaday in Popular Radio's AC Receiver. Dongan Type B is approved and endorsed by the manufacturers of McCullough AC Tubes. Equipped with lever control for convenient adjustment. Positively guaranteed by Dongan, a house of 15 years' high standing.

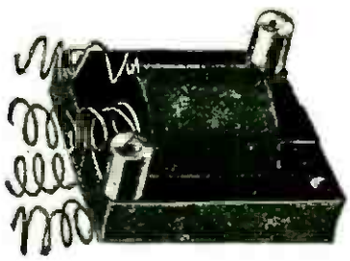


Type N Voltmeter

One of five types of Panel Voltmeters ranging from 0-7 volts to 0-100 volts. These types are built for set manufacturers and are priced very attractively considering the Dongan quality. Here is an accurate instrument you can be proud to include with your receivers.



AC Tube Receiver Manufacturers should get Dongan specifications on standard AC Tube Step-Down Transformers (first on the market) and AC Tube Audio Transformers. Complete details and prices on request.



List $4.00

Type S AC Tube Audio Transformer

A special audio transformer designed to function for the special requirements of AC Tube Circuits.

Type C S B Unmounted Audio Transformer

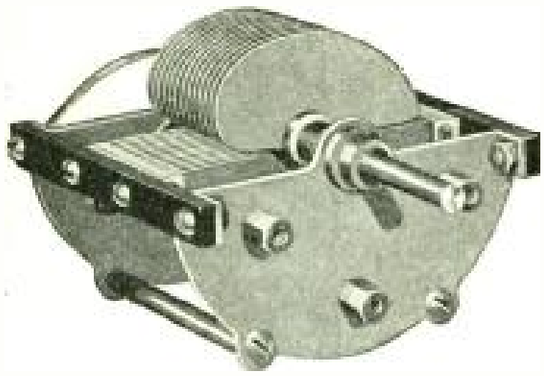
One of 35 types of Dongan Audio Transformers built to answer any possible requirement of set manufacturers. Dongan supplies 38 manufacturers with audio transformers.

Dongan Electric Manufacturing Co.

2983 Franklin Street, Detroit, Mich.

New York Office: 6 Church Street

Transformers of Merit for 15 Years



CONTINENTAL
LO LOSS

S-E-P-A-R-A-T-E-R

Having a little trouble uning in the new wave lengths? It's your condensers!

They were made when there was a wide difference between stations. Now, you need more than a condenser—you need a *Separater* to successfully cut out the overlap of two stations sending on wave-lengths only a fraction of a meter apart.

The *Continental Separater* is all that its name implies—a rigidly built low loss condenser, designed to make your set receptive over the full range of broadcast wave lengths from approximately 200 to 600 meters.

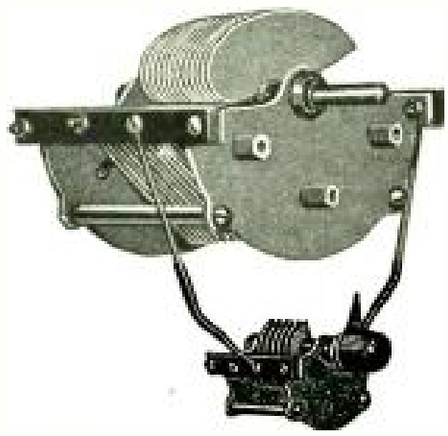
Sold *with* the new *continental junior* (the perfect vernier) at the price of any high grade condenser.

LIST PRICES:

Plate	Capacity	Price
13	.00025	$4.50
18	.00035	4.75
25	.0005	5.00
45	.001	6.00

If your dealer can't supply you, write Condenser Headquarters.

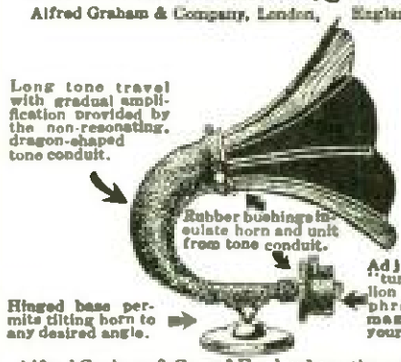
GARDINER & HEPBURN, Inc.
611 Widener Bldg., Philadelphia, Pa.



AMPLION

The World's Standard Loud Speaker

Alfred Graham & Company, London, England, Patentees.



Alfred Graham & Co., of England are the originators and oldest makers of loud speakers. The Amplion is their masterpiece. Solely through supremacy of performance, it has become the largest selling loud speaker in the world. Hear The Amplion—*in comparison!* There lies the answer. Write for literature and dealer's name.

THE AMPLION CORPORATION of AMERICA
Executive Offices: Suite X, 280 Madison Ave., New York
Canadian Distributors: Burndept of Canada, Ltd., Toronto

Thirty Years Experienced!

The Worlds Standard Loud Speaker

THE TUBE SUPERTRON WITH A SENSIBLE GUARANTEE.

PROTECTION

Public Demand Price
$2.00
All Types

An "unlimited," "unconditional," etc., guarantee with all kinds of promises is not sound—that's nonsense.

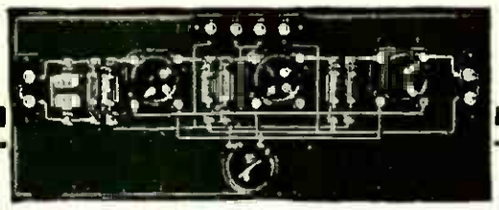
Specific limitations with means of identification is the only kind of guarantee that can be sound—that's sensible.

Each Supertron tube is serial numbered and wrapped in a guarantee certificate bearing a corresponding number for your protection.

Buy Supertron Fearless! The dealers guarantee them fearlessly!

SUPERTRON
A SERIAL NUMBERED GUARANTEE

Supertron Mfg. Co., 22 Union Square, New York
Export Div. M. Simons, 220 B'way, N. Y.



NEW!

Resistance-Coupled Amplifier Kit for only - - - $5.00

Electrad 3 stage Resistance-Coupled Amplifier Kit No. 1.

Price $5.00

Write for free diagrams and instructions

ELECTRAD, Inc.

428 Broadway **New York City**

Our King Type Cabinet

Our cabinets are made of carefully selected lumber. They are beautifully finished and hand rubbed. The workmanship is of as high grade as in the best furniture. If not entirely satisfied with cabinets received from us, money will be refunded. Black walnut cabinets have piano hinges and lid holders. Imitation walnut cabinets have regular hinges, no lid holders. Send for circular showing our De Luxe Type, also our Beauty Type.

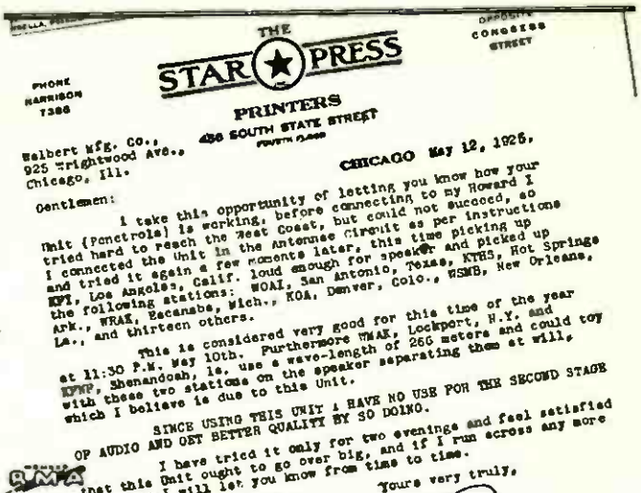
No.	For Panel	Deep, In.	Imitation Walnut	Genuine Walnut
King 621	6 x 21	7	$4.60	$6.80
King 714	7 x 14	7	4.20	6.70
King 718	7 x 18	7	4.35	6.80
King 721	7 x 21	7	4.90	7.40
King 724	7 x 24	7	5.35	8.00
King 726	7 x 26	7	5.80	8.50
King 728	7 x 28	7	6.60	10.00
King 730	7 x 30	7	7.00	11.00
King 71810	7 x 18	10	5.70	9.00
King 72110	7 x 21	10	6.25	9.50
King 72410	7 x 24	10	6.70	10.00
King 72610	7 x 26	10	7.25	10.50
King 72810	7 x 28	10	8.00	12.00
King 73010	7 x 30	10	8.20	12.50
King 836	8 x 36	10	8.75	12.00
King 840	8 x 40	10	9.25	12.50
King 921	9 x 21	10	7.50	9.25
King 924	9 x 24	10	8.50	10.50

F. O. B. WAUKESHA, WIS.

UTILITY CABINET COMPANY

Waukesha **Phone-721** **Wisconsin**

UNIVERNIER-LOCKSWITCH



THE STAR PRESS
PRINTERS
426 SOUTH STATE STREET

Walbert Mfg. Co.,
925 Wrightwood Ave.,
Chicago, Ill.

CHICAGO May 12, 1926.

Gentlemen:

I take this opportunity of letting you know how your Unit (Penetrola) is working, before connecting to my Howard I tried hard to reach the West Coast, but could not succeed, so I connected the Unit in the Antennae circuit as per instructions and tried it again a few moments later, this time picking up KFI, Los Angeles, Calif. loud enough for speaker and picked up the following stations: WOAI, San Antonio, Texas, KTHS, Hot Springs Ark., WRAE, Escanaba, Mich., KOA, Denver, Colo., WSMB, New Orleans, La., and thirteen others.

This is considered very good for this time of the year at 11:30 P.M. May 10th. Furthermore WMAK, Lockport, N.Y. and KFNF, Shenandoah, Ia. use a wave-length of 266 meters and could toy with these two stations on the speaker separating them at will, which I believe is due to this Unit.

SINCE USING THIS UNIT I HAVE NO USE FOR THE SECOND STAGE OF AUDIO AND GET BETTER QUALITY BY SO DOING.

I have tried it only for two evenings and feel satisfied that this Unit ought to go over big, and if I run across any more surprises I will let you know from time to time.

Yours very truly,

WALBERT made it first!

Already enthusiastic owners of the Penetrola are writing us their experiences—here's an interesting letter just received.

All Walbert Products protected by Pat. and Pat. Pend., U. S. and Foreign.

It's here The Penetrola

A new, remarkable Auxiliary Unit for use with all standard receiving sets to increase selectivity, range, and volume.

A BRIEF verification of this general statement may be found in the following excerpts from a series of tests made in our laboratories on April 30. Tests were made with a General Radio Co., Type 164 Audiability Meter, a precision instrument giving actual values of signal intensity. Without the Penetrola, CNRW, for example, could not be heard, while WGN had a signal intensity of 150. With the Penetrola CNRW could be heard with a signal intensity of 1,300, while WGN was inaudible. Interference entirely eliminated; a station previously unobtainable readily tuned-in with volume to operate a loud-speaker. Details of other tests on request.

Receiver	*Desired Station*	*Interfering Station*
2 tube Regenerative	WOC Davenport	WMAQ, WEBH, KYW, Chicago
Less Penetrola	0	2,000+
With Penetrola	300	0
5 tube Tuned R. F.	CNRW Winnipeg	WGN Chicago
Less Penetrola	0	150
With Penetrola	1,300	0

The Penetrola will positively stop *your* set from radiating. Reduces static by permitting use of shorter aerial while actually *increasing* signal intensity. Readily attached to any set. Made in 3 types (a) for outdoor antenna sets, (b) loop sets, (c) where it is desired to replace outdoor antenna with loop. Equipped with standard Walbert parts. Price, $35.00.

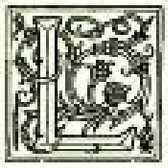
At your dealer or sent postpaid on receipt of purchase price. Performance is guaranteed or your money refunded. Jobbers and dealers write for discounts.

WALBERT
MANUFACTURING COMPANY

933 Wrightwood Ave., **Chicago**

PANELITE-SOCKET

BUILD A 5-TUBE A-C RECEIVER OR Portable Town and Country Set WITH SIMPLIFIED BLUEPRINTS



AURENCE M. COCKADAY has personally supervised the preparation of *Simplified Blueprints* of seven of POPULAR RADIO'S most popular circuits. Each set consists of three separate *Actual Size* Blueprints; first a Panel Pattern; second, an Instrument Layout; and third, a Picture Wiring Diagram all simplified in the fullest sense of the word ***because***

The Panel Pattern can be laid on the panel and all holes drilled as indicated. No scaling to do and so accurate there is no danger of ruining the panel through faulty calculation.

The Instrument Layout placed on the sub-base permits you to indicate by pinpricks the exact location of every screw.

The Picture Wiring Diagram gives every instrument in exact size and position with every wire clearly indicated from one contact to the other. With no knowledge of radio symbols you can assemble every part and complete your wiring with no chance of error.

Priced at $1.10 per Set of Three Prints

Set No. 3—"*Cockaday Distortionless Audio-Frequency Amplifier*" (four tubes, combination of resistance-coupled and push-pull amplification, as described in the May 1924 issue of POPULAR RADIO).

Set No. 4—"*Cockaday Four-Circuit Tuner with Resistance-Coupled Amplifier*" (five tubes, distortionless, two dials, automatic vacuum tube control, as described in the October 1924 issue of POPULAR RADIO).

Set No. 6—"*The Cockaday 8-tube Super-heterodyne Reflex Receiver*" (eight tubes, two tuning dials, loop, non-radiating, distortionless, as described in January 1925 issue of POPULAR RADIO).

Set No. 7—"*The Craig 4-Tube Reflex Receiver with the New Sodion Detector*" (four tubes, two tuning dials, short antenna, non-radiating as described in February 1925 issue of POPULAR RADIO).

Set No. 8—"*The Improved Cockaday DX Regenerative Receiver*" (four tubes, one tuning dial, one regeneration dial, short or long indoor or outdoor antenna, resistance coupled amplification as described in March 1925 issue of POPULAR RADIO.)

Set No. 9—"*Portable Town and Country Receiver*" (six tubes, three stages of transformer, coupled, radio-frequency amplification, loop antenna, tuned by variable condenser as described in May 1925 issue of POPULAR RADIO.)

Set No. 10—"*5-Tube A-C Receiver*" (five "McCullough" A-C tubes, two stages of tuned radio frequency amplification, as described in June 1925 issue of POPULAR RADIO).

Full constructional and parts details for these Receiving Sets will be found in the issue of POPULAR RADIO indicated. Back issues of POPULAR RADIO will be furnished at the rate of 35c a copy

Popular Radio

627 West 43d Street **Dept. 74** **New York City**

POPULAR RADIO, Inc., Dept. 74
627 West 43d St., New York City Date.....

Enclosed is my remittance of $....., for which kindly send me Blueprint Set (s) consisting of Panel Pattern, Instrument Layout and Wiring Diagram as checked below:

☐ Set Number 3 ☐ Set Number 7
☐ Set Number 4 ☐ Set Number 8
☐ Set Number 6 ☐ Set Number 9
☐ Set No. 10

Name.....

Address.....

City..... State.....

DEALERS

Write for terms on these fast selling Blueprints. An attractive Display Chart free with orders.

GET ADVICE FROM COCKADAY
ON HOW TO GET THE MOST OUT OF YOUR RADIO RECEIVER

POPULAR RADIO maintains for the benefit of its readers a Technical Service Bureau and Laboratory, under the personal supervision of Laurence M. Cockaday which will, without charge, answer by personal letter any question, problem or request for information submitted by a subscriber. This service is, however, also available to readers, other than subscribers, at the very nominal rate of 50 cents the inquiry.

In writing please confine your questions to one general subject, writing on one side of the paper only, and enclose a self-addressed and stamped envelope.

It is possible that your individual problem has been covered in an issue of POPULAR RADIO, and so as an aid to you we endeavor to keep a supply of back numbers in stock. The condensed index below gives a few of the subjects that have appeared recently, look this list over and if the information you want is covered, we will be pleased to supply back numbers at 35c. a copy.

October, 1922
—How to make a spider-web tuner.
—How to make your own grid condenser.
—Don'ts for Radio fans.
—How to use a Regenerative Set as a transmitter.
— How to restore worn-out crystals.

November, 1922
—Sir Oliver Lodge on ether waves.
—How to add a Vacuum Tube to your crystal set.
—The most popular transmitting aerial.
—How to make a novel variocoupler.

December, 1922 (Out of stock)

January, 1923 (Out of stock)
(A Reprint of Mr. Cockaday's article describing the DX Regenerative Receiver may be had for 25 cents.)

February, 1923 (Out of stock)

March, 1923 (Out of stock)

April, 1923 (Out of stock)

May, 1923 (Out of stock)
A reprint of Mr. Cockaday's original 4-Circuit Tuner will be found in POPULAR RADIO'S HANDBOOK. See page 60.

June, 1923
—How the Microphone Transmitter Works.
—How to Build a Good Single Tube Receiver.
—How to Make a Crystal Detector Stand.

July, 1923
—The ratio in size between your antenna and your coil.
—Useful facts about ear-phones.
—How to make a dry-cell tube Regenerative Set.
—How to keep up your storage battery.

August, 1923 (Out of stock)
A reprint of the Tuned Radio Frequency Receiver will be found in POPULAR RADIO'S HANDBOOK. See page 60.

September, 1923
—How to get a radio license.
—How weak signals are regenerated.
—How to make a battery charging rectifier.
—How to build the Haynes DX receiver.

October, 1923
—Practical hints for Coil Calculations.
—How to make a Two-stage Audio-frequency Amplifier.
—Ten good rules for Broadcast Listeners.
—How to make a simple Honeycomb Receiver.

November, 1923
—The 100 Best Hook-ups (Part 1).
—Receiving without Antennas.
—How to build the New Regenerative Super-heterodyne Receiver (Part 1).
—How to build a combination Short and Long-wave Receiver.

December, 1923
—How to Select your Radio Parts.
—The 100 Best Hook-Ups (Part 2).
—How to Read a Diagram (Part 1).
—How to build an efficient Crystal Receiver.
—How to Build the Super-heterodyne Receiver (Part 2).

January, 1924 (Out of Stock)
(A Reprint of Mr. Cockaday's article describing the DX Regenerative Receiver may be had for 25 cents.)

February, 1924
—How to add "Push and Pull" amplification to the 3 tube Cockaday 4-Circuit tuner.
—The original 4-Circuit Tuner as a Portable Set with Loop.
—The 100 Best Hook-ups (Part 4).
—How to build a 3-tube Reflex Receiver.

March, 1924
—Hoffman Transformer Measurement Chart.
—The 100 Best Hook-ups (Part 5).
—How to Build an Amateur Transmitter.
—A 3-tube Reflex Receiver (Part 2).

April, 1924
—How to Build a Simplified Neutrodyne Receiver.
—The 100 Best Hook-ups (Part 6a)
—How NOT to Tune the Single Circuit Receiver.
—A Novel Substitute for "B" Batteries.

May, 1924
—A Compact Radio Kit for a Spring Hike.
—How to Get the Maximum Radio-frequency Amplification.
—100 Best Hook-ups (Part 6b).
—Where Interference Comes In.
—How to Make an Audio-frequency Amplifier that Does Not Distort.

June, 1924
—How to Install a Receiver on your Boat.
—The 100 Best Hook-ups (Part 7).
—How to Build a Regenerative Receiver for Use with an Indoor Antenna.
—How to Make a Two-Slide Tuner.

July, 1924
—How to Avoid Local Interference.
—How "Resistance" Affects Radio Circuits.
—An Ideal Set for Summer-time Reception.
—100 Best Hook-ups (Part 8).
—How to Do Your Soldering Correctly.
—How to Build the POPULAR RADIO Portable.

August, 1924
—How to build a single dry-cell tube, four-circuit tuner.
—How to build a two tube reflex receiver.
—Helpful hints for the broadcast listener

September, 1924
—How to build a single dry-cell tube reflex receiver.
—How to build a multi-wave tuner.
—How to improve broadcast reception.

October, 1924
—How to Build the (Cockaday) Four Circuit Tuner with a Resistance-coupled Amplifier.
—How to Select a Ready-made Receiver.
—How to Build a Detector-amplifier.
—A Radio Set to Pack in Your Suitcase.
—Harnessing the Radio and the Movie.

November, 1924
—How to Locate Interference from Power Lines.
—Cockaday Article for Beginners.
—How to Build a Low-loss Tuner for Short-wave Reception.
—The New Type of Superheterodyne.

December, 1924
—How to Build a Non-radiating 7-tube Superheterodyne Receiver.
—Cockaday Article for Beginners.
—How to Get the Most Out of Your Ready-made Receiver.

January, 1925
—How to Build the Cockaday 8-tube Superheterodyne Reflex Receiver.
—How to Improve Broadcast Reception.
—Cockaday Article for Beginners.

February, 1925
—How to Get on a Radio Program.
—A Loudspeaker for a Crystal Set.
—How to Build a 4-tube Reflex Receiver with the New Sodion Detector.
—Cockaday Article for Beginners.

March, 1925
—How to Build the Improved DX Regenerative Receiver.
—Factors that Govern the Capacity of Condensers.
—What "Induction" Means to Your Set.
—A Five Meter Vacuum-tube Transmitter and Receiver.

April, 1925
—Single Control Receivers.
—How to Improve Broadcast Reception. VI: Increasing the Selecting Power of Your Receiver.
—How to get the Most out of Your Ready-made Receiver.
—Quartz Crystal as a New Wavelength Standard.

May, 1925
—Factors That Affect Antenna Capacity.
—How to Wire Your Home to Have Radio in Every Room.
—Handy Tools for Radio Fans, The Hydrometer.
—How to Build the "Portable Town and Country Receiver."

June, 1925
—New Development in Vacuum Tubes.
—How to Build a Five-tube A-C Receiver.
—How to Draw Up Your Own Tuning Chart.
—Watt's Law in a Nutshell.
—"What Set Shall I Buy?"

Popular Radio

627 West 43rd Street **Dept. 78** **New York City**

PRESSLEY

SUPER HETERODYNE KIT COMPLETE

The Last 100 Genuine SANGAMO Kits on the Market

$69.50

Patent litigation has stopped the manufacture of Sangamo Intermediate Frequency Transformers for the amazingly efficient Pressley Super Heterodyne. But—through a fortunate purchase, we have secured 100 sets of Sangamo parts and have made them up into complete kits *exactly as specified by Capt. Pressley in December* POPULAR RADIO.

YOUR LAST CHANCE

No more genuine Sangamo parts will be available after these 100 kits are sold. Therefore, *this is your last chance* to obtain a real Pressley Super with original parts built to Capt. Pressley's own specifications.

NO SUPER EQUALS The Original PRESSLEY

Unlimited range and tremendous volume on a small loop! *Tone quality* of a higher standard than ever before attained in any kind of receiver, due to *perfection* in the intermediate transformers—*the parts which will no longer be manufactured! Selectivity* far in advance of other types of Supers!

SEND YOUR ORDER TODAY

Aside from the fact that these are the last Sangamo parts that can be bought, this official complete POPULAR RADIO kit at $69.50 is a sensational value. Contains all necessary parts, including drilled panel and instructions. $12.50 solid walnut de luxe cabinet 7" x 18" furnished for only $7.00 extra. Send check or money order *at once*, as these 100 kits will be sold immediately following this announcement. Order today to be sure of yours. Also write for our big Free catalog of Radio Parts, Kits, Sets, Accessories at Bargain prices.

BARAWIK COMPANY, 102 S. Canal St., Chicago

One of Chicago's Oldest Radio Institutions.

Geared 80-1

Replaces your present dials without alterations to your set.

Patented April 21, 1925. Other Pats. Pending.

on super-hets!

-improves selectivity-

$3.50

Write for descriptive folder.

Just where you need the finest adjustment—a highly geared, absolutely accurate Tuning Control. Accuratune controls give sharper tuning and improve any set. Particularly valuable for sensitive receivers where sharp tuning is essential. Equipped with patented friction clutch. Requires no set alterations.

Your set deserves the best!

At your dealers, otherwise send purchase price and you will be supplied postpaid.

Mydar Radio Company, 9-B Campbell St., Newark, N. J.

ACCURATUNE

REGISTERED GEARED 80 to 1 U.S. PAT. OFF.

MICROMETER CONTROLS

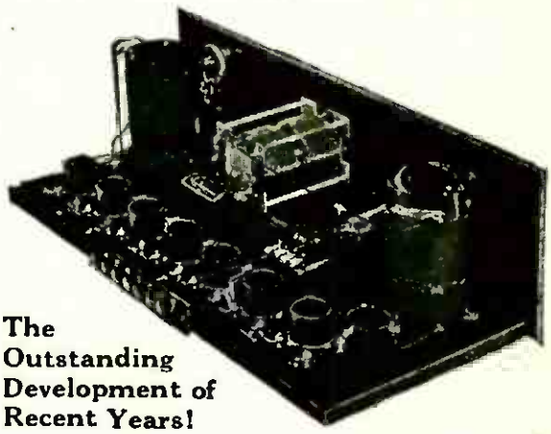
The Five Tube Set which startled the World!

FRESHMAN MASTERPIECE

The Greatest Value Ever Offered in A Radio Receiving Set

Sold by Authorized Freshman Dealers Only

McLAUGHLIN ONE-CONTROL SUPER



The Outstanding Development of Recent Years!

Now Being Built in All Parts of the World

Think of it! A real 7-tube Super having only one dial to tune over the entire broadcast range. Selectivity so sharp as to bring in two and sometimes three stations within one degree of the dial, and without a particle of interference. Powerful Precise No. 1700 Super Multiformer makes necessary only one stage of audio amplification for satisfactory loud speaker home volume. Tone quality of music absolutely life-like—no distortion. A great distance getter. Distant stations usually have about same volume as locals under normal conditions. All "official" instruments and parts are "laboratory quality" including Low Loss coils, non-microphonic socket strip, automatic filament control jacks, etc. Easily and rapidly assembled from U-Ni-Dial official McLaughlin Kit.

Descriptive Bulletin on Request

U-NI-DIAL RADIO CO.

35 Greenwood Ave. East Orange, N. J.

FREE PARTS *for* A-C RECEIVERS

NOW YOU CAN BUILD ONE OF THESE POPULAR RECEIVERS

READ THIS UNIQUE OFFER

IF you want to build your own set, here is your opportunity to secure FREE all the parts you need for any one of these three popular POPULAR RADIO Receivers. Call on all your radio friends, and on anyone who has a set and tell them of the many special features of POPULAR RADIO.

These liberal offers will make it possible for you to secure an order from every one you call upon. For each subscription with remittance you send us you will receive credits as per the following scale:

POPULAR RADIO

4	Months	for	$1.00	counts	16	credits
6	"	"	1.50	"	25	"
8	"	"	2.00	"	33	"
12	"	"	3.00	"	50	"
24	"	"	5.00	"	75	"

Send us the full amount collected with names and addresses of subscribers and tell us the parts your credits entitle you to and we will send them to you. If the subscriptions you secure do not give you enough credits for the parts you want, we will allow you to purchase credits at the rate of 3 cents each. *Example:* With (5) five 1-year subscriptions (250 credits) and 30 cents additional in cash you may have a General Radio variometer, No. 269 and a set of "PRSH" A-C leads for which you need 260 credits.

If the parts you want are not listed on this page, we are prepared to supply them. Let us know what you want and we will tell you how many credits you will need.

On page 46 are described POPULAR RADIO's Simplified Blueprints. You can have any set of prints you want for only 44 credits. You may also secure a copy of "How to Build Your Radio Receiver" for 60 credits.

CREDITS Needed for Parts Required for the Cockaday Improved DX Receiver

(Described and illustrated in POPULAR RADIO for March, 1925)

Quantity	Item	Credits
1	Primary, Secondary and tickler coils of the New York Coil Co. (DX Coupler)	200
2	Kurz-Kasch 4-inch dials @ 40	80
1	Rathbun variable condenser .0005 mfd.	180
2	Dubilier mica fixed condensers Type No. 640, .00025 mfd. @ 18	36
1	Dubilier mica fixed condenser Type No. 640, .005 mfd.	28
2	Dubilier mica fixed condensers Type No. 640, .02 mfd. @ 80	160
1	General radio type 285 amplifying transformer	280
2	Bradleyohms No. 25 @ 80	160
1	Cico double-circuit jack	16
1	Cico single-circuit jack	15
1	Cico filament battery switch	26
1	Composition panel 7 by 24 inches	120
1	Amperite No. 1A automatic filament current adjuster	44
1	General instrument filament rheostat (6 ohms) equipped with knob and dial	90
1	General instrument, filament rheostat (20 ohms) equipped with knob and dial	90
1	Fil-Ko-Leak	80
1	Benjamin Cle-ra-tone socket	40
3	Walbert sockets @ 20	60
2	Daven mountings No. 50 @ 14	28
1	Durham metallized filament grid-leak .5 meg.	20
1	Durham metallized filament grid-leak .25 meg.	20
	Total	1,773

CREDITS Needed for Parts Required for the "Portable Town and Country Receiver"

(Described and illustrated in POPULAR RADIO for May, 1925)

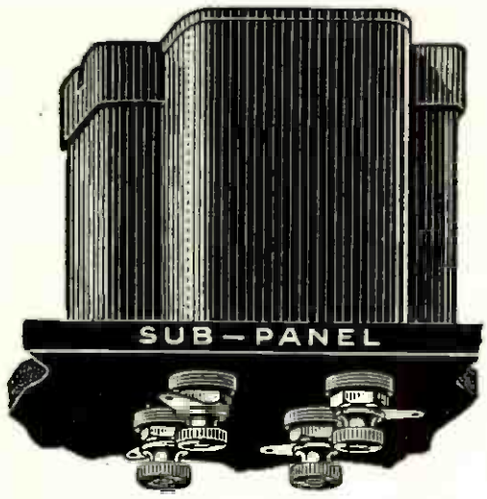
Quantity	Item	Credits
1	"Remler" square plate variable condenser Type No. 630, .00035 mfd. complete with dial and indicator	200
1	"Amsco" 20-ohm rheostat equipped with knob	50
1	"Amsco" 400-ohm potentiometer equipped with knob	60
2	Cutler-Hammer filament battery switches @ 24	48
1	"Hoyt" Bezel-Hole Mounting voltmeter, 0 to 6 volts	90
1	"Adams" jack, Type No. 502, 3-prong double circuit	28
1	"Adams" jack, Type No. 501, 2-prong, single circuit, open	24
1	"Dubilier" mica-fixed condenser, .00025 mfd., with clips for grid-leak	18
1	"Dubilier" mica-fixed condenser, .00025 mfd.	14
3	"Dubilier" Duratran radio-frequency transformers @ 160	480
1	"Daven" grid-leak, 4 megohms	20
6	"Benjamin" Cle-ra-tone sockets for UV-199 vacuum tubes @ 40	240
2	"Pacent" Audioformers, Type No. 26 audio-frequency transformers @ 200	400
1	Binding post sub-panel, 9½" x 1"	10
9	Eby binding posts @ 6	54
1	Composition panel 18" x 7"	90
	Total	1,826

CREDITS Needed for Parts Required for the New 5-Tube A-C Receiver

(Described and illustrated in POPULAR RADIO for June, 1925)

Quantity	Item	Credits
1	General Radio variometer, No. 269	200
1	General Radio a.f. transformer, No. 285	280
2	"Precision" r.f. coupling units (per pair)	200
2	Hammarlund variable condensers, .0005 mfd. @ 200	400
3	Kurz-Kasch 4" dials @ 40	120
5	Federal sockets, No. 16 @ 48	240
1	Dongan special step-down transformer Type B	240
1	Daven resisto-coupler mounting	40
1	Daven resistor, ¼" megohm	20
1	Daven resistor, ½" megohm	20
1	Daven grid-leak, 4 megohm	20
2	Dubilier mica fixed condensers, .006 mfd. @ 30	60
1	Dubilier mica fixed condenser, .00025 mfd. with grid-leak clips	18
1	Dubilier mica fixed condenser, .00015 mfd.	14
1	Dubilier mica fixed condenser, .0001 mfd.	14
1	Pacent single-circuit jack	20
1	Composition panel, 7 x 24"	120
1	Hardwood baseboard, 9⅞" x 22¾"	30
1	Antenna binding post strip	6
1	Battery binding post strip	10
4	Small brass brackets @ 2	8
1	Set "PRSH" A-C Leads	60
	Cabinet for 7" x 24" panel	500
	Total	2,640

Popular Radio Department 71, **627 West 43rd Street, New York City**



SUB-PANEL MOUNTING TYPE THORDARSONS NOW ON SALE

They permit a neater assembly, the shortening of leads and the concealing of wiring—as in factory built sets. Same ratios—same prices—as standard type Thordarsons. If dealer cannot supply, order from us.

"Best by competitive test," says Zenith

"In the early Fall of 1923 we made numerous experiments of all existing types of transformers and finally adopted Thordarsons as the best by competitive test. The immediate result was improvement in the tone quality of our sets and comparative freedom from trouble due to the uniformity of your transformers.

"A radio set is only as good as the transformers that are used therein. We can, therefore, truthfully say that the superiority of Zenith sets is due to the superiority of Thordarson Transformers. We congratulate you upon the good product you are manufacturing."

—from a letter dated February 28, 1925, written by Zenith Radio Corporation, Chicago.

ZENITH
KENNEDY
w/ Radiodyne
THERMIODYNE
ULTRADYNE
MURDOCK
AZARKA
Pfanstiehl
MICHIGAN
Deresnadyne
MALONE LEMON
MASTER RADIO
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EAGLE
GLOBE AND MANY OTHERS

Unconditionally Guaranteed

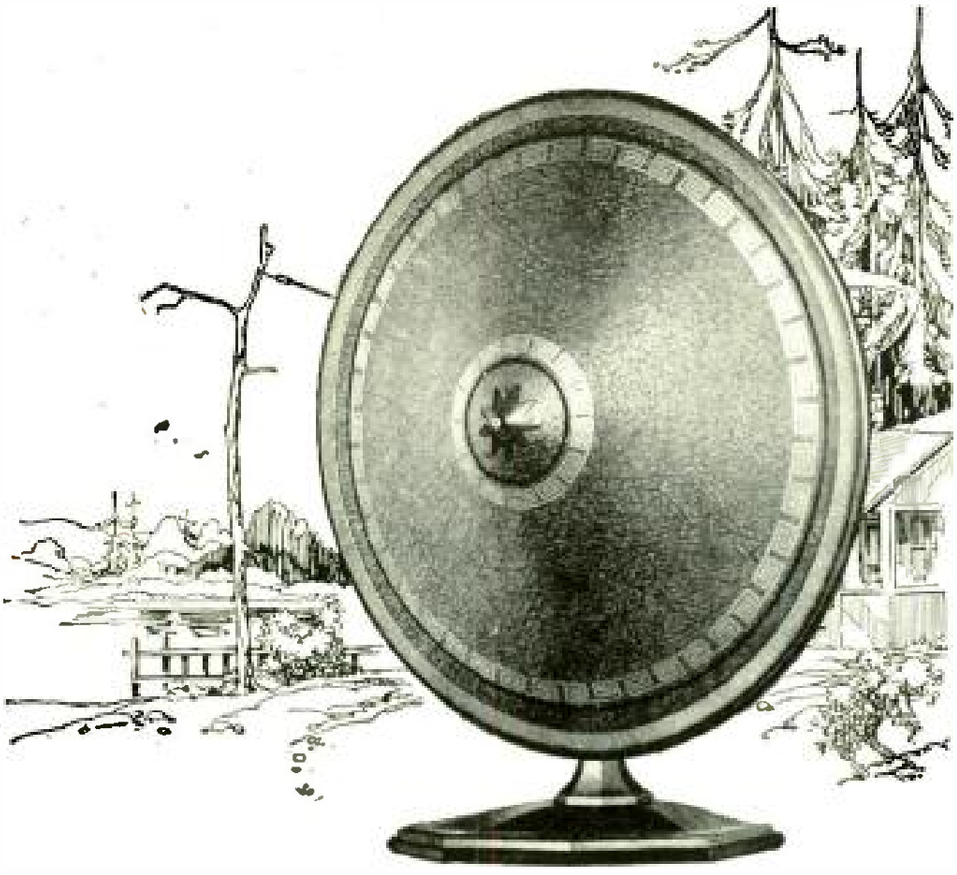
Super-Het Builders!

For the "Best" 45,000 Cycle Super-Heterodyne "Radio" and other leading authorities recommend in highest terms the Thordarson 2:1 Ratio Transformers. Take no others!

THORDARSON
Super TRANSFORMERS
Standard on majority of quality sets

TYPES AND PRICES: Thordarson "Super" Audio Frequency Transformers are to be had in three ratios: 2-1, $5; 3½-1, $4; 6-1, $4.50. Thordarson Power Amplifying Transformers are $13 the pair. Thordarson Interstage Power Amplifying Transformer, $8. Write for latest hook-up bulletins—*free.*

THORDARSON ELECTRIC MANUFACTURING CO.
Transformer specialists since 1895
WORLD'S OLDEST AND LARGEST EXCLUSIVE TRANSFORMER MAKERS
Chicago, U.S.A.



The Crosley Musicone

a startling improvement in looks and tone over loud-speakers
Already replacing thousands

In camp or home, this remarkable development of radio reproduction will greatly increase your delight in radio.

It is a new idea. It diffuses the sound. Upon hearing it for the first time one is at loss to locate the source of the music. Its perfection of reproduction is uncannily real.

Its price, like all Crosley products, is very low because of the half-million production plans under which it is being built. Hear it at all Crosley dealers now.

Crosley owns and operates station WLW, Cincinnati, the first remotely controlled super-power broadcasting station.

Crosley manufactures receiving sets which are licensed under Armstrong U. S. Patent No. 1,113,149, and priced from $14.50 to $65, without accessories.

The Crosley Radio Corporation
Powel Crosley, Jr., President
716 Sassafras Street, Cincinnati

$17.50
Add 10% West of Rocky Mountains

CROSLEY

Better~Costs Less

The Marvels of Radio!

Incredible to those who don't know!

The Crosley 1-Tube 50

Crosley's development of the famous Armstrong regenerative circuit enables you to "roam" the country and enjoy the thrill of picking up distant stations just as though you owned a multi-tube set,—all with one tube and at $14.50, without accessories.

2-Tube Crosley 51

Same as wonderful Crosley 50 with additional tube amplifier. Local and nearby stations on loud-speaker always and distance up to 1500 miles under average conditions. Much greater range with head phones. $18.50, without accessories.

3-Tube Crosley 52

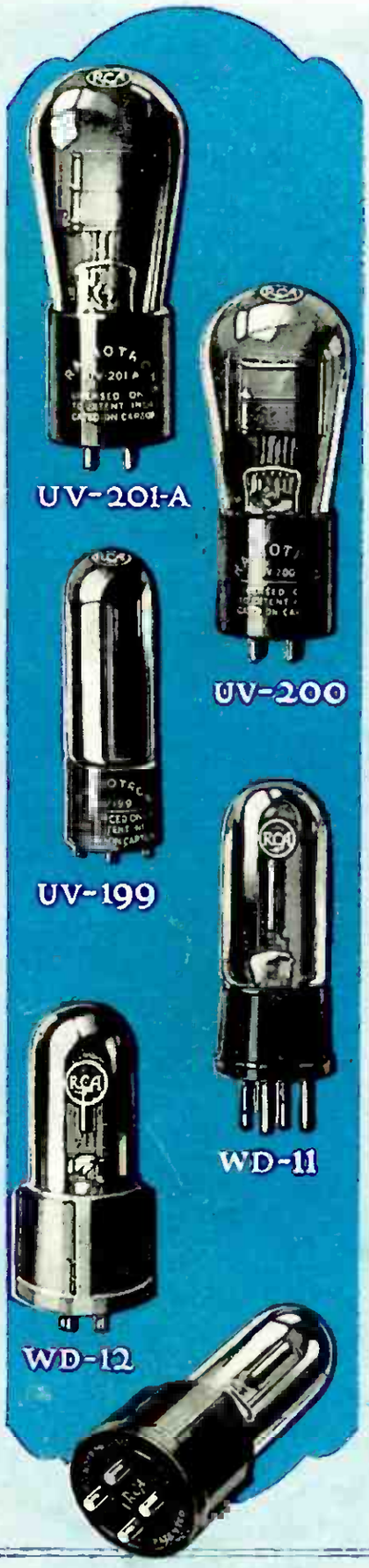
A larger set for those who want greater reception range on the loud-speaker. Operates on three tubes, using wet or dry batteries. Consistent loud-speaker range 1500 miles or more. $30, without accessories.

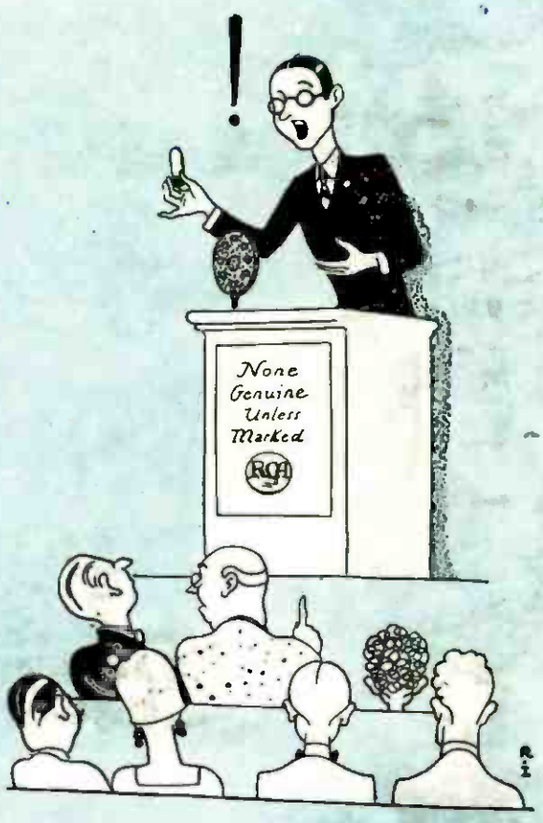
The Crosley Trirdyn Special

3 Tubes do the work of 5

A unique circuit combining tuned radio frequency, regeneration and reflexed amplification that equals in results the work of 5 and 6 tubes. None re-radiating. $65 without accessories.

PRESS OF WILLIAM GREEN, NEW YORK





Vital to every radio fan

In a radio set, it is the tube that detects the sound—that amplifies the sound—that determines in large part the quality and volume of the sound. Therefore the tube—intricate of mechanism and delicate to make—is the vital spot in every set. And it always pays to be sure you use genuine Radiotrons—made with experienced precision.

Build any circuit—simple or complex. Buy any set, plain or fancy, simply boxed or elaborately cabineted. But give it every chance to achieve its best—with genuine Radiotrons. Be just as careful when you replace tubes, too. *Always* see for yourself that each one bears the identifying marks of a Radiotron: The word Radiotron and the RCA mark.

Radio Corporation of America

Chicago New York San Francisco

Radiotron

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