

Tower's

Tower's Scientific

\$2.95

THE MOST POPULAR HEADSET in the World

Sales prove it

Every set tested and approved by government licensed radio operators

The Reason

Out of the jungle of yesterday, leaving behind the maze of inaccurate, uncertain apparatus, TOWER'S Scientific phones have blazed a trail to undisputed leadership, being recognized as the

World's Greatest Headset Value

Millions today enjoy music and entertainment reproduced in those clear, mellow tones so characteristic of TOWER'S Scientifics.

TOWER'S Scientific Headsets are guaranteed to be made of the best materials money can buy — highest test enamel, insulated magnet wire, best grade five-foot tinsel cord, unbreakable caps, polished aluminum cases, using the famous scientific head-band constructed for maximum comfort.



If your dealer cannot supply you order direct

THE TOWER MANUFACTURING CORPORATION
98 BROOKLINE AVENUE Dept. Q BOSTON MASSACHUSETTS

Scientific

"Quality Goods for Quality Readers"

Wireless Age

The Radio Magazine

Vol. XII

No. 6

March, 1925—Contents

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WILLIAM WEST WINTER (The Lodge on Baldtop) was born in the Middle West, in the Corn Belt region, and received his early education in the classic atmosphere of New England. His literary career began while in his teens with the publication of some light verse. A fairly close contact with certain phases of the West as it is said to have once been, an acquaintance with the middle section of the "Old Rustler's" trail and "Brown's Park," and other contacts has led him generally to write of the West. He has written "Louisiana Lou," "Quemado," "The O'Donoiu" and others.

MISS C. SMELKER (Does Your Radio=X?) is well known as the author of many articles dealing with the feminine world. She has been a contributor to "Beauty," "Woman's Home Companion," and other women's magazines, and "The Independent." With a broad perspective based upon practical contacts and the intuitive feminine viewpoint, Miss Smelker evaluates faithfully and practically, and it is because her articles carry a sense of conviction and helpfulness that her readers increasingly look forward with eager anticipation to read the most recent products of her pen.

J. C. GILBERT (Rural Life Modernized) is officially connected as marketing specialist of the Bureau of Agricultural Economics with the United States Department of Agriculture. His article presents interesting facts and figures to show how the Government is availing itself of the advantages of radio communication to make public reports and advice that are of material interest to the rural dweller. Mr. Gilbert has done a good job; never before has such a complete picture been presented of the Government's interest and activities along practical lines to help advance the welfare and economic and social life of the country dweller.

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James G. Harbord, Pres. Pierre Boucheron, Vice-Pres. and Gen'l Mgr. L. MacConnach, Sec'y. George S. DeSousa, Treas. H. H. Reber, Bus. Mgr. C. F. Boag, Adv. Mgr. C. S. Anderson, Managing Editor R. A. Bradley, Technical Editor

Because certain statements and expressions of opinion from correspondents and others, appearing in these columns from time to time may be found to be the subject of controversy in scientific circles and in the courts either now or in the future and to sometimes involve questions of priority of invention and the comparative merits of apparatus employed in wireless signaling, the owners and publishers of this magazine positively and emphatically disclaim any priority or responsibility for any statements of opinion or partisan expression if such should at any time appear herein.

THE WIRELESS AGE is a member of the Audit Bureau of Circulations



You Like it Better When You Build it Yourself

THE 5-TUBE THOMPSON NEUTRODYNE KNOCK-DOWN SET LICENSED TYPE K-40

THE American boy is a natural-born builder. His imagination—his inherited constructive spirit—craves a worthy objective.

There is nothing that so satisfies the natural creative ability of American boys—young and old—as the building of a radio set; for when a radio is finished it brings to the boy the world's best entertainment and education from far and near.

Many of the achievements in modern radio reception have been made by young men who a few years ago built radio sets, listened to code messages, and were the first to listen in when speech and music were first broadcast.

Building a radio receiver is a happy event in *any* boy's life.

The Thompson Knockdown Licensed Neutrodyne Set contains parts that have been developed by famous radio engineers of many years experience. The perfectly designed and perfectly matched Thompson parts are in no way similar to ordinary parts. Thompson neutroformers and audio transformers, that have made the Thompson quality of tone reproduction famous, cannot be bought separately.

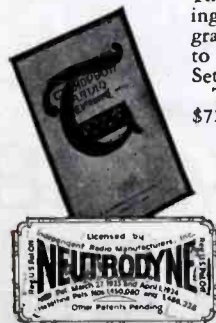
The Neutrodyne circuit, which was designed since present-day broadcasting was perfected, plus Thompson experience of many years in radio, make the results from Thompson Knockdown Set superior to any Knockdown Set on the market. It is easy to assemble.

All Parts included in Case No drilling necessary

All parts, (except batteries and tubes) needed to assemble the Thompson 5-tube Neutrodyne Knockdown Set are packed in a case with the Thompson 16 page instruction booklet.

This booklet contains easily understood building directions together with photographs, diagrams and actual size blueprints—everything to make building a Thompson Knockdown Set about the easiest thing you have ever tried.

The Thompson Knockdown Set is only \$72 at good radio stores.



**R. E. THOMPSON
MANUFACTURING CO.**

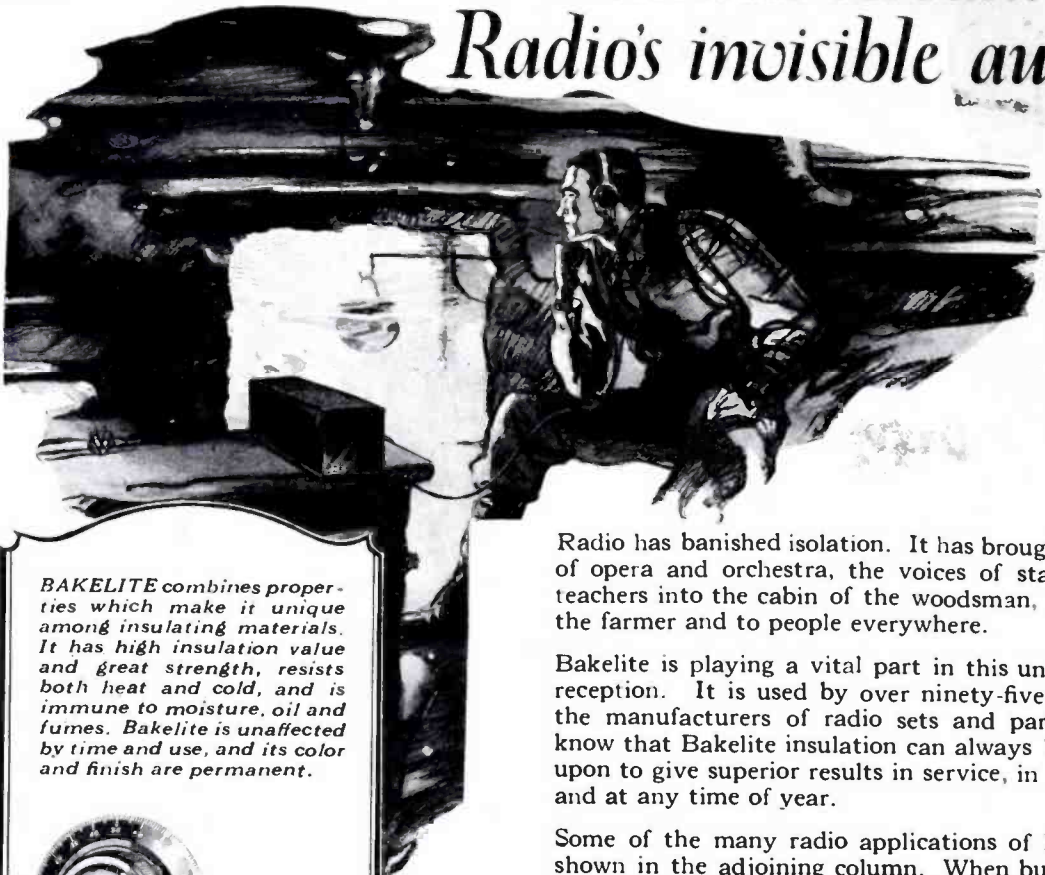
Maker of Thompson Neutrodyne Radio Receivers and the Thompson Speaker.

30 CHURCH ST., NEW YORK, N. Y.

"Experience is the Vital Factor in Excellence"



Bakelite — Faultless servant of Radio's invisible audience



BAKELITE combines properties which make it unique among insulating materials. It has high insulation value and great strength, resists both heat and cold, and is immune to moisture, oil and fumes. Bakelite is unaffected by time and use, and its color and finish are permanent.



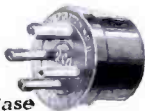
Na-ald Dial



Rathbun Condenser



Na-ald Tube Socket



R. C. A. Tube Base

Radio has banished isolation. It has brought the music of opera and orchestra, the voices of statesmen and teachers into the cabin of the woodsman, the home of the farmer and to people everywhere.

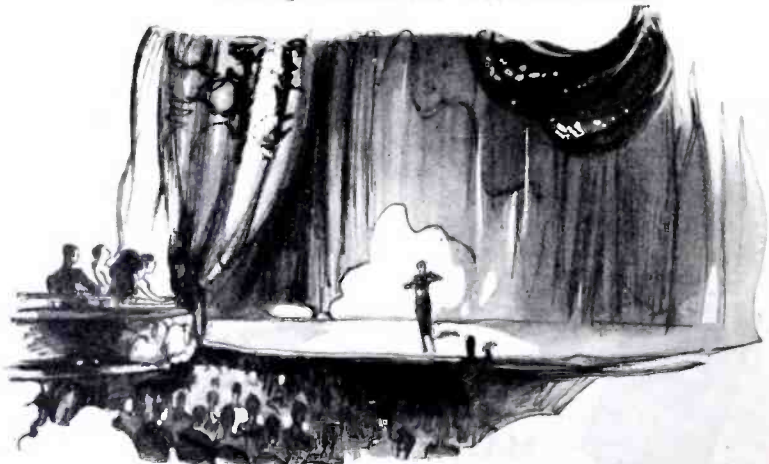
Bakelite is playing a vital part in this universal radio reception. It is used by over ninety-five per cent of the manufacturers of radio sets and parts, for they know that Bakelite insulation can always be depended upon to give superior results in service, in any climate and at any time of year.

Some of the many radio applications of Bakelite are shown in the adjoining column. When buying a radio set or part make sure it is Bakelite insulated, for this is a definite indication of quality.

Write for Booklet 26

BAKELITE CORPORATION

247 Park Avenue, New York, N. Y.
Chicago Office: 636 West 22d Street



Bakelite is an exclusive trade mark and can be used only on products made from materials manufactured by the Bakelite Corporation. It is the only material which may bear this famous mark of excellence.

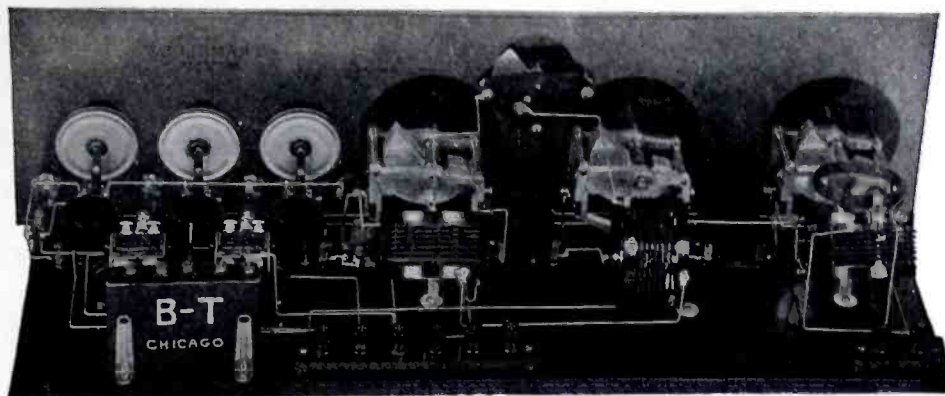
BAKELITE

BAKELITE is the registered trade mark for the phenol resin product manufactured under patents owned by the Bakelite Corporation

TRADE MARK REG. U. S. PAT. OFF.

THE MATERIAL OF A THOUSAND USES

"Quality Goods for Quality Readers"



"The Radio Set Without a Regret"

B-T LOW LOSS NAMELESS

Every day we receive hundreds of letters from fans all over the United States saying that they have just constructed our New Low Loss Nameless and are amazed with the results obtained.

There's no mystery concerning the manner in which these results are obtained. It's simply the combination of the best low loss parts that engineering skill and painstaking workmanship can produce, with a tried and tested circuit.

It is our firm belief that in no other five tube set on the market can you get as much selectivity, distance, volume and tone as you do in the New Low Loss Nameless, regardless of price.

Here's Proof of Performance

Read the excerpts from some of the more recent letters that we have received. They are typical of the unsolicited testimonials that we receive—not exceptions.

Chicago, Ill., Dec. 16, 1924.
 As I believe in credit where credit is due I am submitting a list of 30 stations received last night on the Nameless, covering from coast to coast as you can see. This is not my record but what I get regularly every Monday night. I am also quite successful on distant stations during the week. Thank you for putting a No. 1 radio equipment on the market. E. G. S.

Chicago, Ill., Dec. 15, 1924.
 I have been testing the New Nameless for two weeks and it is without question the best radio set that I have had my pleasure to tune. On Monday night I logged about forty stations. Listening to from one to four numbers from each station, I live about four miles from WEBB but can get many distant stations every night regardless of who is operating in and around Chicago. L. S. W.

Minneapolis, Minn., Dec. 22, 1924.
 I have received stations from coast to coast—Gulf to Canada—GNO at Newcastle, England, and KGU at Honolulu, Hawaii. This I believe to be entirely due to the excellence of your products. I have gone right through locals and picked up Schenectady (WGY) on the loud speaker. I have built numerous sets since I got the radio bus, but I have never found any that could equal B-T. D. B. B.

Chicago, Ill., Dec. 23, 1924.
 I have had one of your New Nameless sets working for the past two nights. I must say that for quality and purity of tone it surpasses anything that I have ever listened to. This past year I have made up three Nameless sets—they were good performers.

Get a Copy of Better Tuning Today

Our forty page book of photo-diagrams, hook-ups, construction, tuning and general information on crystal to multiple tube sets sent postpaid for 10 cents. A valuable addition to even the most complete radio library.



\$26.50

B-T Low Loss Nameless
 Kit No. 3

Contains three J-Circuit Transformers; three 250-M.M.F. Lifetime Condensers; one 40-M.M.F. Control Condenser with 2" Dial, and a complete set of Blue Prints and Instructions with a complete list of the other needed parts.

\$10.50

B-T Low Loss Nameless
 Kit No. 1

Contains three J-Circuit Transformers only. Blue Prints for building the Nameless must be purchased separately.

Nameless Blue Prints

Full size Blue Prints and Instructions for building the New Low Loss Nameless, exactly the same as packed with Kit No. 3, can be purchased separately for \$1.00. At your dealers', or from us postpaid.

BREMER-TULLY MFG. CO.

"Pioneers of Better Tuning"

532 S. CANAL STREET

CHICAGO, ILL.



You *need* a headset

- to tune-in with
- to get distant stations — both domestic and foreign
- to listen-in without disturbing others
- to shut out the noise in the room — and get all the radio fun
- to get the truest and clearest reception — always

No one realizes these facts more forcibly than the makers of the famous Radiola IIIA. They include Brandes as standard equipment.

Brandes

The name to know in Radio

Copyright by C. Brandes, Inc., 1925.

"Quality Goods for Quality Readers"



Use
Any Tube

UV-200 or C-300



Volts—5
Amps.—1
Grid Leak
0.5—2
Megohms
Condenser
.00025
-.0005 M-f.

UV-201A or C-301A



Volts—5
Amps.—.25
Grid Leak
2—9
Megohms
Condenser
.00025 M-f.

WD-12 or C-12



Volts—1.1
Amps.—.25
Grid Leak
2—3
Megohms
Condenser
.00025 M-f.

WD-11 or C-11

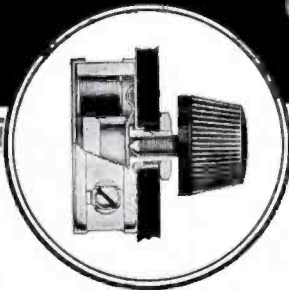
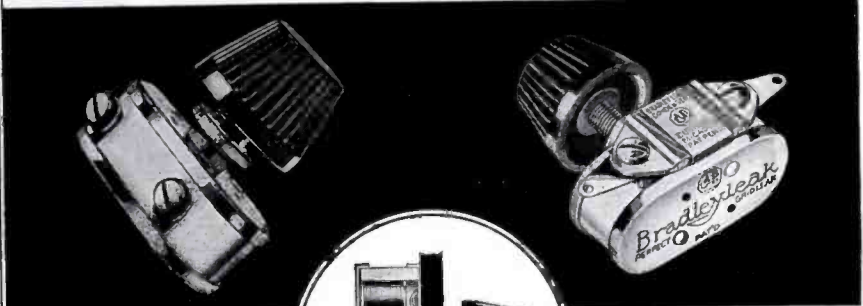


Volts—1.1
Amps.—.25
Grid Leak
2—3
Megohms
Condenser
.00025 M-f.

UV-199 or C-299



Volts—3
Amps.—.06
Grid Leak
2—9
Megohms
Condenser
.00025 M-f.



Bradleystat
PERFECT FILAMENT CONTROL

Bradleyleak
THE PERFECT GRID LEAK

Do You Know—

*that any tube can be used in your set?
without changing rheostats or grid leaks.*

IT SOUNDS unbelievable, but it's true. The perplexing problem of selecting the correct rheostat or grid leak is solved by using the Bradleystat and the Bradleyleak. They offer the most marvelous range without steps or noise, and such smooth precision of control that no other rheostat or grid leak can approach them in performance.

The Bradleystat has a resistance range from approximately 1/4 to 100 ohms, by merely turning the adjusting knob that varies the pressure on the graphite discs. It will handle *all tubes* without change of connections, and provide ample control in every case.

The Bradleyleak, with a range from 1/4 to 10 megohms, can be adjusted instantly for any tube, indicated in the adjoining table of tube ratings, by turning the adjusting knob.

Be ready to use any tube in your radio set. Install Allen-Bradley Radio Devices, throughout.

Have you used the Bradleyswitch? It saves batteries and tubes.

Allen-Bradley Co.

ELECTRIC CONTROLLING APPARATUS

Sales Offices:
Baltimore
Birmingham
Boston
Buffalo
Chicago
Cincinnati
Cleveland
Denver
Detroit

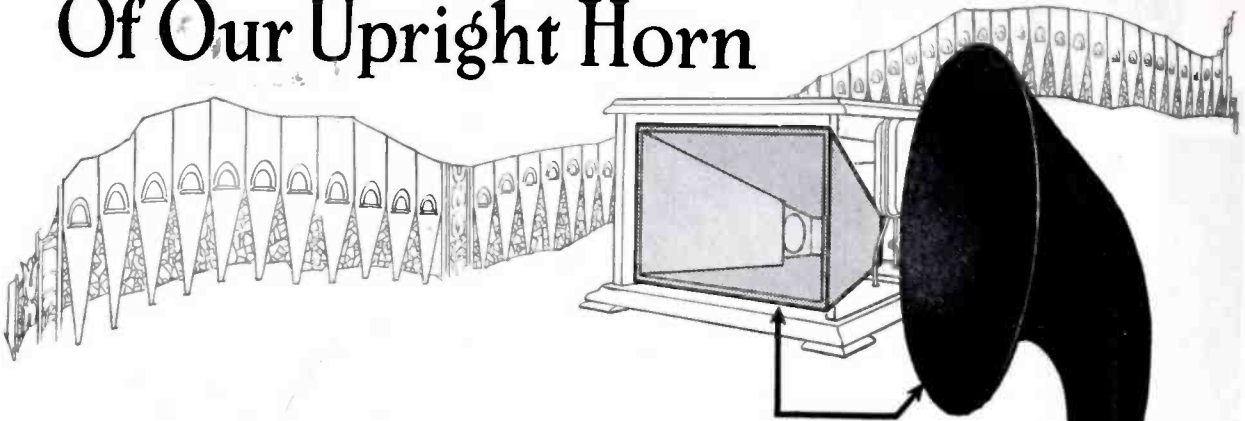


Sales Offices:
Knoxville
Los Angeles
New York
Philadelphia
Pittsburgh
Saint Louis
Saint Paul
San Francisco
Seattle

General Offices and Factory: 283 Greenfield Ave. Milwaukee, Wis.

Manufacturers of Graphite Disc Rheostats for Over Twenty Years

It Has The Full Sweet Resonance Of Our Upright Horn



The new cabinet model has a seasoned wood horn which is "full floating"—the outer end, or bell, does not touch the cabinet. This, together with a long expansion chamber, gives it that same freedom of vibration which goes to make the Bristol horn type Loud Speaker such a resonant, sweet-toned instrument. It also has the same high-grade electromagnetic sound mechanism. It is not only a handsome piece of furniture, but a speaker worthy of the best radio set that money can buy.

Both Horns are Free to Vibrate Like the Open Diapason of the Organ



Model S Audiophone \$25.00

Rubber horn 14 1/2" in diameter. Cast metal throat. Velvet mat finish of mottled bronze and gold.



The "Voice" of the Audiophone

Cabinet Model \$30.00

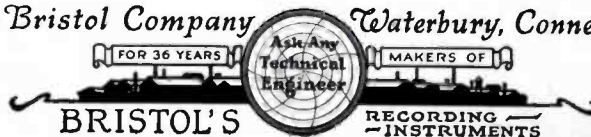
Beautifully finished mahogany. Full floating wooden horn and cast metal throat. Musically, a companion to the finest set ever built; size 17 x 10 x 10 1/4".



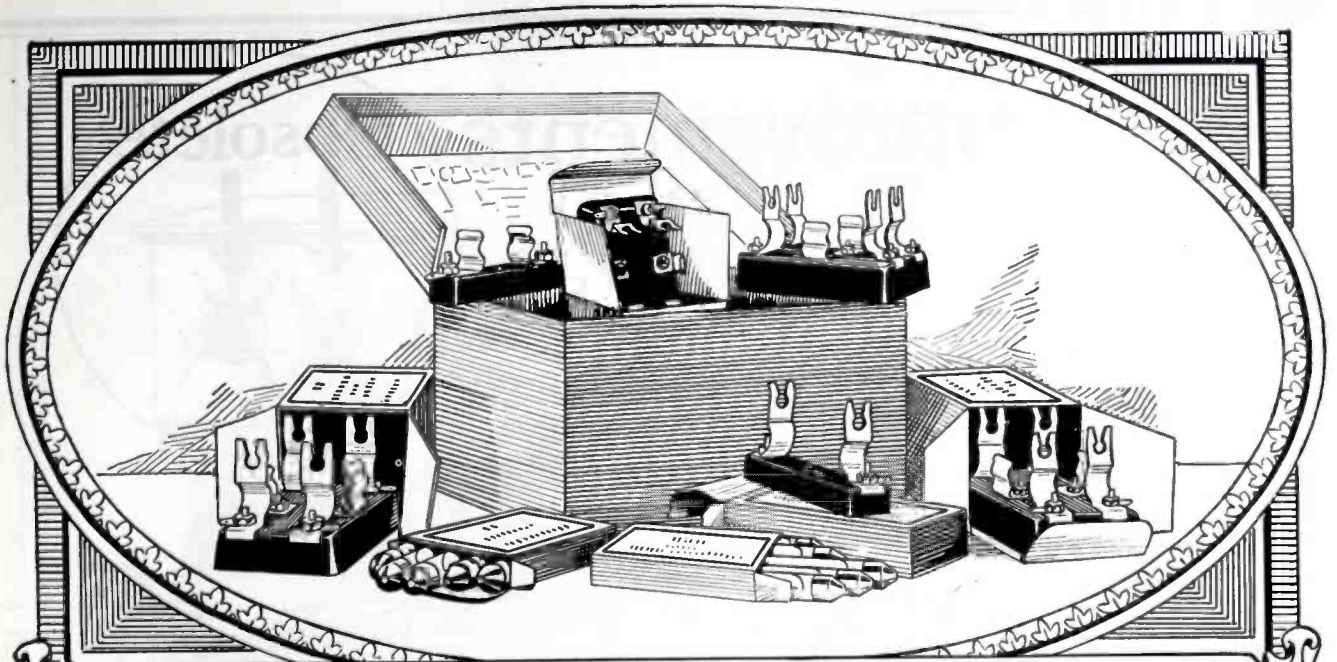
There are five Bristol Loud Speakers, priced from \$12.50 to \$30.00. If not at your dealer's, write for Bulletin No. 3020-V.

Bristol TRADE MARK AUDIOPHONE REG. U.S. PAT. OFF. Loud Speaker

The Bristol Company Waterbury, Connecticut

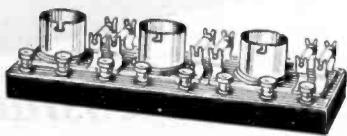


"Quality Goods for Quality Readers"



RADIO PRODUCTS of DISTINCTION

The DAVEN Resistance Coupled Amplifier Kits



THE DAVEN SUPER-AMPLIFIER UNIT

For those who prefer to buy a complete Resistance Coupled Amplifier Unit rather than build. This unit comes ready to install—it is the neatest and most compact amplifier now offered to the public.

It is laboratory tested and represents the ultimate in amplifier design. The base is of molded Bakelite and is small enough to fit within any cabinet. All connections are hidden beneath the base.

Sold Everywhere

Obtain from your Dealer, the "RESISTOR MANUAL," our complete handbook on Resistance Coupled Amplification. 25 cents. If your Dealer cannot supply you, we will send you one direct, postpaid for 35 cents.

These highly perfected Resistance Coupled Amplifiers have convinced the most skeptical that Resistance Coupling is matchless. Add the DAVEN Resistance Coupled Amplifier to your favorite tuner and you will have a worthy combination, hard to beat and amplification that is perfect.

The assembly is very simple, while the satisfaction of having built such a perfect device yourself is beyond mere words to describe. Its volume is adequate for all purposes—its perfect tone quality and absolute lack of distortion place it beyond comparison.

These Kits can be purchased at all good Radio Stores—they come with complete instructions for assembly so that the novice will have the same success as would be expected of Radio Engineers. Sockets and mica fixed condensers are not included, but instructions are furnished giving complete information and diagrams. Supplied for either three or four stages.

TRADE MARK
DAVEN RADIO
"The Sine of Merit"
CORPORATION
Resistor Specialists

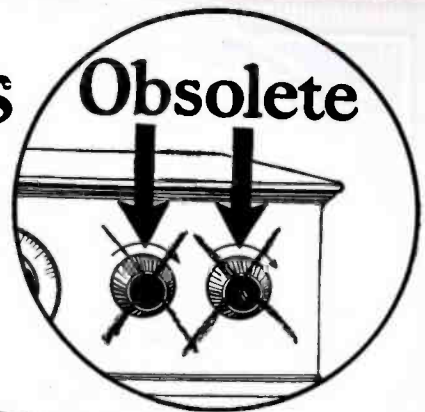
Newark

New Jersey

"The Aristocrat of Amplifiers"

"Quality Goods for Quality Readers"

8 improvements at ONE stroke



The Self-Adjusting Rheostat

1. Eliminates hand rheostats—thereby simplifying control and giving compactness.
2. Greatly simplifies set wiring, therefore makes for greater efficiency.
3. Prolongs life of tubes from 2 to 3 times.
4. No moving parts—therefore no grinding noises.
5. Permits use of any type of tubes or any combination of tubes.
6. No filament meters necessary.
7. Brings the most out of each individual tube—automatically—no guessing.
8. Makes perfect tube operation absolutely fool-proof.

AMPERITE operates on the thermo-electric principle. Contains a specially treated filament hermetically sealed in a glass tube and surrounded by an inert gas. This filament has the unique property of automatically changing in resistance as the "A" battery voltage changes—so that a practically constant current is maintained in the tube filament. Consequently the tubes are constantly operated at maximum efficiency. No knob to turn. Nothing to get out of order. Amperite mounts conveniently inside the set. Really takes the place of a good hand rheostat, a delicate meter and an expert operator.

Thoroughly approved by every prominent laboratory. Used as standard equipment in such sets as Somerset, Ultradyne, Marshall, Pfanstiehl, Kilbourne & Clark, Heteroplex, Cockaday and numerous others. Perfect for every circuit. Fully guaranteed.

PRICE \$1.10 EVERYWHERE

Write for
FREE
Hook-Ups

RADIALL COMPANY
Dept. W.A.-7, 50 Franklin St., New York

AMPERITE

REG. U.S. PAT. OFF.

"means right amperes"



The Silvertown Cord Orchestra (above) under the direction of Joseph Knecht, has been delighting millions of lovers of good dance music in programs broadcasted every Tuesday night from 10 to 11 from WEA, N. Y.; WJAR, Providence; WFI, Philadelphia; WCAE, Pittsburgh; WGR, Buffalo; WEEL, Boston.

Better Reception

Science has established a big fact in radio—dielectric losses reduce range and selectivity.

Hard Rubber has the lowest dielectric losses of any practical panel material yet employed. Goodrich Hard Rubber Panels are distinctly superior in permanence of color and lustre, and freedom from warpage. Use them in your set and bring in those distant stations finer—get better reception and enjoy to a greater degree the big dance orchestras, soloists, orators, and other features.

For maximum selectivity and widest possible range use Goodrich Rubber Radio Products. Fifty-five years experience is behind them—they represent highest rubber quality.

*Goodrich Hard Rubber Radio Panels.
Goodrich V. T. Sockets • Goodrich
Variometers Unwound • Radiophone
Ear Cushions • Spaghetti Tubing
Battery Mats.*

THE B. F. GOODRICH RUBBER COMPANY
ESTABLISHED 1870 Akron, Ohio

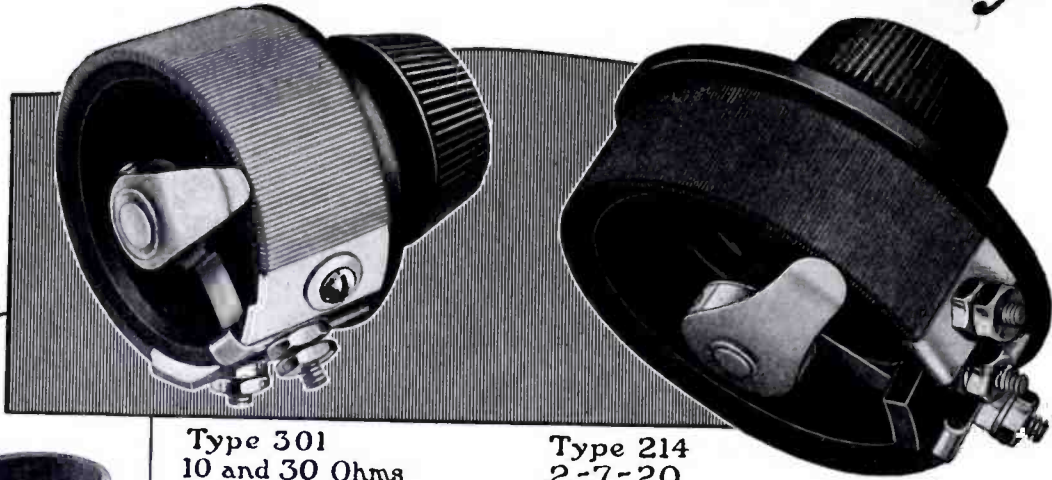
Goodrich RUBBER

RADIO PRODUCTS

"Best in the Long Run"

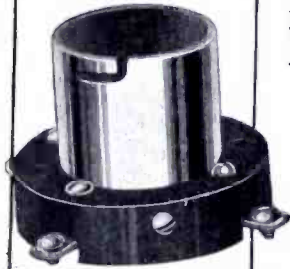
GENERAL RADIO

Rheostats and Sockets mean higher tube efficiency



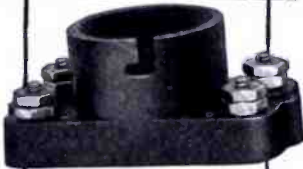
Type 301
10 and 30 Ohms
Price \$1²⁵

Type 214
2-7-20
and 50 Ohms
Price \$2²⁵



Type 156

For all standard base tubes. A positive wiping contact is made to the side of the tube prongs by double spring terminals. These terminals hold the tube firmly and prevent vibrations. Price \$1⁰⁰



Type 299

For UV-199 Tubes. This socket is a particularly high-grade socket of moulded bakelite. Contact is made to tube prongs by phosphor bronze terminals with double leaf blades. Price 50c.

General Radio Rheostats Are Smooth Running and Uniform

TH**ERE** is only one way to operate tubes at their peak of efficiency—by the use of properly designed rheostats and sockets. In building your set, remember that vacuum tubes are important factors in successful radio reception, and require rheostats which provide a gradual and uniform resistance control over the filament.

General Radio Rheostats are smooth running, uniform, and capable of very minute variations. Many of the well-known manufacturers of receiving sets have chosen General Radio Rheostats and Sockets as standard equipment because of their high efficiency in tube operation. Why not use them in the next set you build, and get more out of your tubes?

Sold at all good radio stores
Write for New Radio Catalog 920

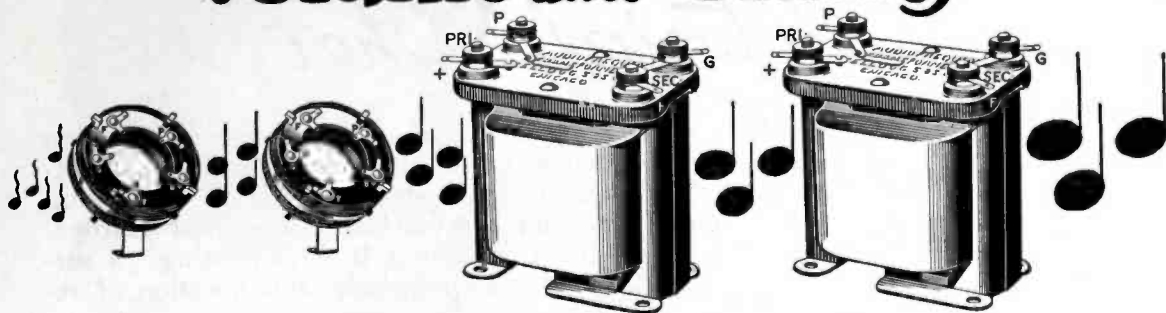
The red cartons with the General Radio label are your unfailing assurance of satisfaction.

GENERAL RADIO Co
Cambridge, Mass.

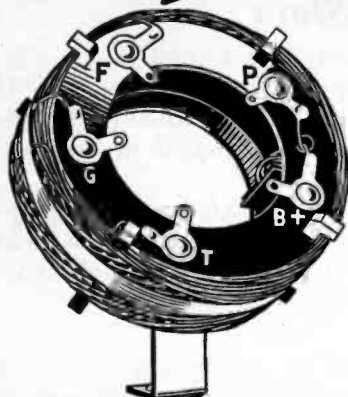


"Quality Goods for Quality Readers"

Volume and Clarity



with Kellogg Transformers



Radio Frequency Transformer

A Radio Frequency Transformer of the aperiodic type suitable for all sets with which tuned radio frequency is desired. Also used for one stage of radio frequency amplification ahead of regenerative sets to prevent re-radiation.

Consider these points of superiority:

- No dope to hold windings in place.
- Soldered connections.
- Mounting bracket holds coil at correct angle.
- Minimum rubber used in form.
- Lowest possible loss, with greatest transfer of energy.
- Works with any .0005 condenser.
- Secondary arranged with suitable taps for biasing features.

This transformer makes the construction of a radio frequency set an easy matter, assuring best possible reception with widely varying types of circuits, including reflex.

Built and guaranteed by Kellogg Switchboard and Supply Co.

No. 602 Radio Frequency Transformer
at your dealers for \$2.35 each.

Kellogg Audio Frequency Transformers are the "stepping stones" of modern amplification.

Clear, accurate reproduction assured over the entire range of the musical scale.

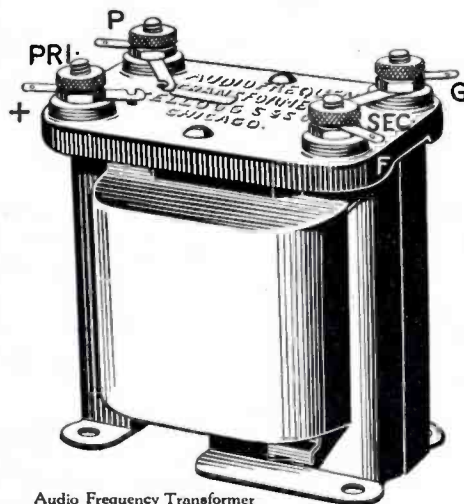
Plainly marked, accessible terminals.

It is acclaimed by test to be the best.

No. 501 Audio Frequency Transformer
Ratio $4\frac{1}{2}$ to 1—

No. 502 Audio Frequency Transformer
Ratio 3 to 1—

\$4.50 each



Audio Frequency Transformer

KELLOGG SWITCHBOARD & SUPPLY CO.

1066 WEST ADAMS STREET, CHICAGO

"Quality Goods for Quality Readers"

Editorial Chat

RE-BROADCASTING, or relaying of important radio programs, will no doubt, remain a part of the permanently established system of broadcasting. Public interest demands it, and those who broadcast are developing its advantages. This phase of radio has reached Continental Europe, and WIRELESS AGE this month presents in "Continental Re-broadcasting," a survey of radio conditions throughout England, which includes this question of re-broadcasting.

The work done by the Radio Market News Service of the Government is surprising—"Rural Life Modernized" tells you all about it.

Adventure and Screen Stars

If you like adventure, turn to the story entitled "On Patrol." This is a true tale of the sea and the experience of a radio operator in service with the "Suicide Flotilla" off the coast of France during the war. Thrills aplenty, blended with the ordinary routine of handling radio traffic as it happened in war-time, depicted by one who was on the spot.

Then turn to the beauties of the screen. WIRELESS AGE considers itself fortunate in being able to introduce to you these coming screen stars who broadcast regularly from Station KFI—and don't overlook our "Atlantic Coast Broadcasters." You'll enjoy seeing those you've heard in song and music.

For Women

"The Women's Hour," by Golda M. Goldman, is just that. It conveys information about programs especially designed to help women in their home activities—cooking—clothes—styles—furniture—needle-work, etc. Study and lecture courses are mentioned with time, station, and instructors noted. You'll find some subject in which you are interested.

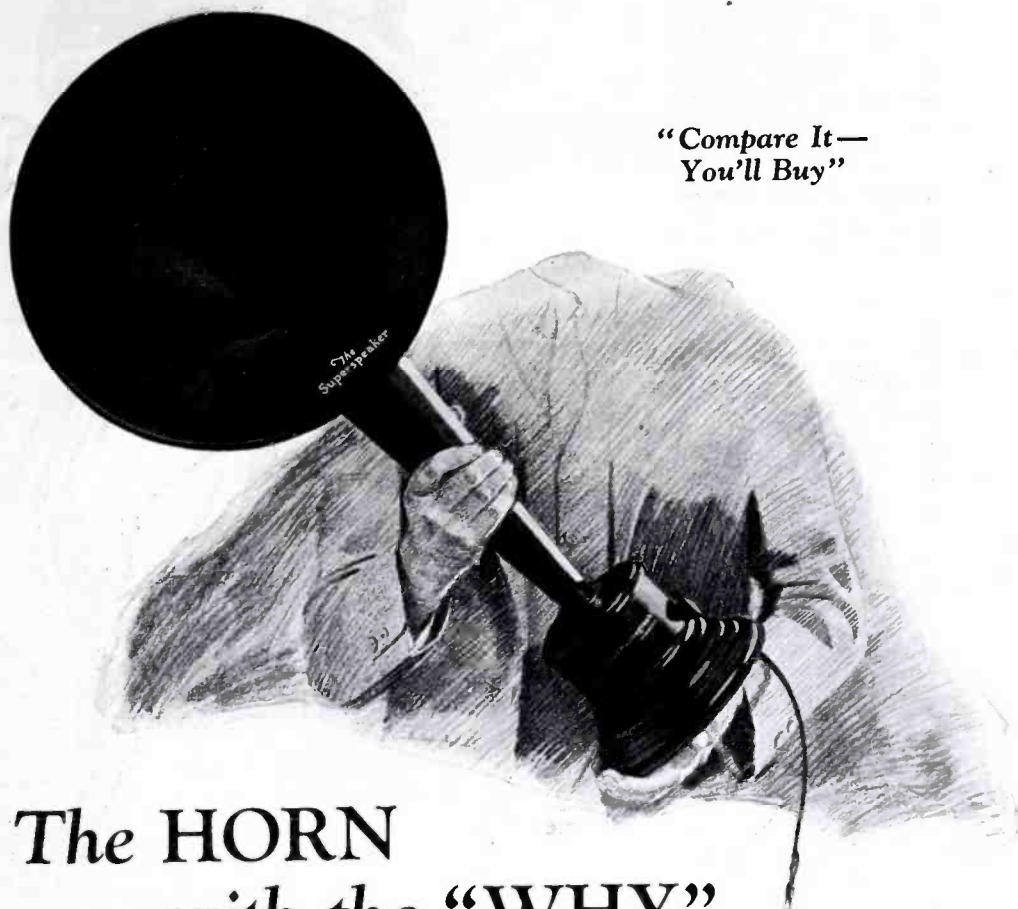
Technical

For our technical friends—Bradley's "Reliable R. F. Receiver" tells its own story—easy to build; easy to operate; easy to enjoy the programs. Dr. Minton is with us again with an interesting installment on "Loud Speakers." You will learn something about them if you read it. "Tube Transmitter Design" starts you off with a simple, practical one-tube transmitter which has many uses, and then we have the "D-Coil" again—this time an account by a WIRELESS AGE reader who built one that gets coast to coast reception. Wavemeters constitute a necessary part of transmitting and receiving equipment under certain conditions. R. E. Bogardus tells you how to make and operate one that is efficient, and "Radio Compass Bearings" describes the method of navigating the seas and inland waters by means of the loop direction finder.

Cross Words

Our "Cross Word Contest" went over so big that we are running another one this month. Responses from every state in the union and some foreign countries and ships at sea have been received. See if you can't win one of the hundred prizes this month.

—THE EDITOR.



**“Compare It—
You’ll Buy”**

The HORN with the “WHY”

When you first hear Radio through the Jewett Superspeaker, you marvel at the amazing accuracy and volume of the reproduction.

Yet there is no mystery in Superspeaker performance; it is based on laws you yourself can easily understand.

One could never jam the massed harmony of a full brass band through the eye of a needle. So the Superspeaker horn is ample in size for the work it must do.

Also sound, as you know, moves in a direct line. The Superspeaker throat is therefore straight as an organ pipe, avoiding the bugling effect due to the crooks or curves. And its inner surface is smooth and glossy, never tripping or confusing the waves of music or voice.

But most important of all is The Superspeaker's absolute immunity to harmonic vibration. It adds no notes of its own to the round, natural message with which it fills your room. So it “violins” only to a violin—“trombones” only to a trombone—rings only to a real bell. Non-metallic materials, in tapered and laminated construction, are the secret here.

Finally, to reflect its message into your home theater, The Superspeaker provides a sounding board shaped like a shell—the model used for generations by acoustical engineers.

Just listen to The Superspeaker! Compare its performance with that of any other loud speaker in the world. The difference will amaze you.

No extra batteries—Exclusive air-gap adjustment to modify results from nearby stations, and increase strength of those from far away—A true musical instrument, built and guaranteed by the million-dollar company whose name it bears. Sweep the ether with a Superspeaker!

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5678 TWELFTH ST., DETROIT, MICH.

The Superspeaker

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“Quality Goods for Quality Readers”



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Why let "Hi-Voltage" take his destructive toll of YOUR Radio Tubes?

Do you know that 91½% of all tubes are destroyed before serving their full normal life?

RADECO SAFETY FUSES will positively prevent vacuum tube blow-out from any cause. Tested and approved by the world's foremost technical authorities, they are the only fuses which slip on the filament prong of the tube, and therefore protect it against all causes of blow-outs. This sure protection costs only \$0.50 per tube.

RADECO FUSES fit any standard tube and go in any standard socket. One fuse to a tube is sufficient. Equip all your tubes NOW and foil "Hi-Voltage." If your dealer cannot supply you, order direct. Fuses will be sent postpaid. In ordering state type of tube used.



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 RADIO EQUIPMENT COMPANY
 20 Stuart Street
 BOSTON MASS.

New England's Oldest Exclusive Radio House.





The Savoy Havana Band whose weekly dance music is re-broadcast to all sections in England

Continental Re-Broadcasts

Efforts being made in England to arrange for re-transmission of programs between Continental countries—Broadcast conditions in the British Isles

By *Anne C. Granbeck*

AS IF in perfect synchronization with America, England, the other day, also had a flare-up of antagonism against radio from the direction of concert and theatre managers. From this, it would seem as though conditions of radio were fairly similar in America and in England, but the facts are the opposite.

Although England is, next to America among the countries of the world, keen about radio broadcasting, the ratio of difference is still very great. Oddly enough, the ratio of difference in radio interest throughout the world corresponds fairly closely to the ratio of difference in automobile registration per thousand of population. In other words, the countries having the largest number of automobiles, appear, also, to be the countries having the largest number of radio sets. This may seem to indicate a relation between radio and the automobile, but the relation goes deeper. The countries which are the greatest

automobile countries have generally, fairly similar conditions.

Traveling in England, after one is fresh from America and its radio craze, leaves one with a sense of a vacuum. There is lacking the enthusiasm and the zestful following of radio technique. The American visitor can live in a London hotel for a week and neither hear nor see anything of radio, and unless he looks sharp, see very little in the newspapers. There are very few radio stores and the whole subject appears to be taken with time-honored British phlegm. Do not mistake the fact, however, that England is not alive to radio. In fact the number of sets in use is in striking contrast to the general interest.

THERE are various estimates running up to and over a million sets in use, and I have not been able to make up my mind, in the absence of official figures, what is

the truth. That it is over a million is certain, for licenses issued have gone over that figure. The recent radio shows in England have naturally stimulated interest in radio. The progress in the past year has been unusually rapid; in fact 50 per cent. of the sets appear to have been sold in the past year, and this is why the ratio of progress appears to be on the increase. That England has been slow to enthuse over radio is no mark of discredit, it is simply the standard British character, which dislikes being stamped.

Furthermore, the broadcasting situation in England is far from being conducive to the radio craze. The broadcasting situation naturally vitally influences radio development, and, until recently radio in England was actually suffering from suppression. The geographical position of England in relation to other countries and the general political and military conditions of Europe have made it a part of British policy to strongly subordinate radio broadcasting to maritime needs, and the principle of national defense. England is, after all, a comparatively small island and her navy has been her chief defense. Wireless must always, therefore, in England be a government controlled device to a far greater extent than in America. The result, therefore, is a very unusual broadcasting plan in England.



Mme. Nellie Melba, Internationally known opera singer, who has been on the air in England

The Post Office Department, an arm of the Government, controls all radio broadcasting through the organization of the British Broadcasting Company, a private organization, closely under government supervision, whose stock is owned by the manufacturers of radio equipment. Its revenue is used in the expansion of radio broadcasting service. A charge of 10 shillings (about \$2.40) tax on buyers of receiving sets is made. One-half of such revenue goes to the Post Office Department, and the remaining half goes for the payment of artists. In this manner, the controversy over the payment of artists is never heard in England; at least in regard to the B. B. C. stations.

The British Broadcasting Company operates eight stations—or rather it is linked up directly with eight stations, although it does not own all of them.

These linked up stations use the London stations' programs whenever they desire.

HOW close the relation is between broadcasting and government and ship conditions is illustrated by a decision now being carried out to move the Liverpool station, because of its alleged interference with territorial wireless work.

The principal station is, of course, in London, and



Sir Walford Davies, and his choir, before the microphone—The British Broadcasting Co. of London gives daily programs of music for the benefit of London Schools

the other eight stations are scattered in the main cities, providing a thoroughly uniform national service throughout England, Ireland and Scotland. The highest class of music is broadcast; opera from Covent Garden, some theatrical music and, in the main, classical music. Unlike America, jazz is broadcast in rather limited quantity. The Savoy Hotel Orchestra provides jazz at 10 P. M. nightly. Military bands are also popular. A good deal of official material, such as safety talks, and talks on Post Office matters and farm data are broadcast. The outstanding feature of English broadcasting is a much stronger emphasis upon news than is common in America. There is a ban on political material, except on special occasions; and for some reason, news broadcasting is considered a principal item.

As for broadcasting events, this is not particularly in vogue, as English sports do not very readily lend themselves to broadcasting. Cricket, soccer football, rugby, etc., are popular, but are not easily broadcast in the manner of American baseball, football and boxing. The latter is beginning to get broadcasting attention, but has yet to achieve the American intensity of interest.

Another interesting feature is that there is a growing attention to dramatic broadcasting. This accounts for the above-mentioned sharp controversy between theatre managers and radio. Some time ago a play which had been weakly patronized, was broadcast, and immediately there occurred a full house and a very excellent advance sale. Theatre managers did not deny the facts of this instance, but asserted that it was a unique case and that general broadcasting of plays would unquestionably hurt them. Not long ago, Mendelsohn's "Elija," an oratorio, was broadcast in two periods during an evening.

AS for DX fans, they seem to be in very small number. This, despite the fact that Paris, Holland and Germany can be heard on tube sets, as well as other Con-

tinental stations. Occasionally American stations are re-transmitted by the big broadcasting stations, and this feature, if developed, would undoubtedly help the radio situation in England.

One reason why there are so few DX fans is that most of the sets are home-made sets, and there is not the technical facility for long distance listening in. It is the general custom to make your own set, and the proportion of home-made sets to commercial sets is quite

overwhelming. We have still to see in England the popularity of the multiple tube cabinet development, the combination phonograph period cabinets, as well as the more complicated circuits used in America. Most of the sets are of the regenerative variety and the tuned radio-frequency type. Needless to say, such home-made products, which are in general use in England, are not built for appearance though the construction follows the advance development of receiving circuits.

Of course the decisive factor in all this is the general economic conditions which have prevailed in England since the war. A nation which, for the most part, eats butter only once a day at

breakfast for reasons of economy certainly is not likely to be much of a spender on radio. But as in all countries, radio makes its own appeal, winding its way and inevitably spreading its net over a greater proportion of the population. With the development of good cabinet sets at low prices, England will unquestionably advance still more rapidly in radio.

This winter has brought a strong impetus through the effects of the radio shows, some of which have been quite unusually successful. The Manchester show showed 177,000 visitors, which surely indicates real interest. This was an average of 17,000 per day, and the manufacturers appeared to be well satisfied with sales results. Other shows are now taking place in other cities of England.

(Turn to page 64)



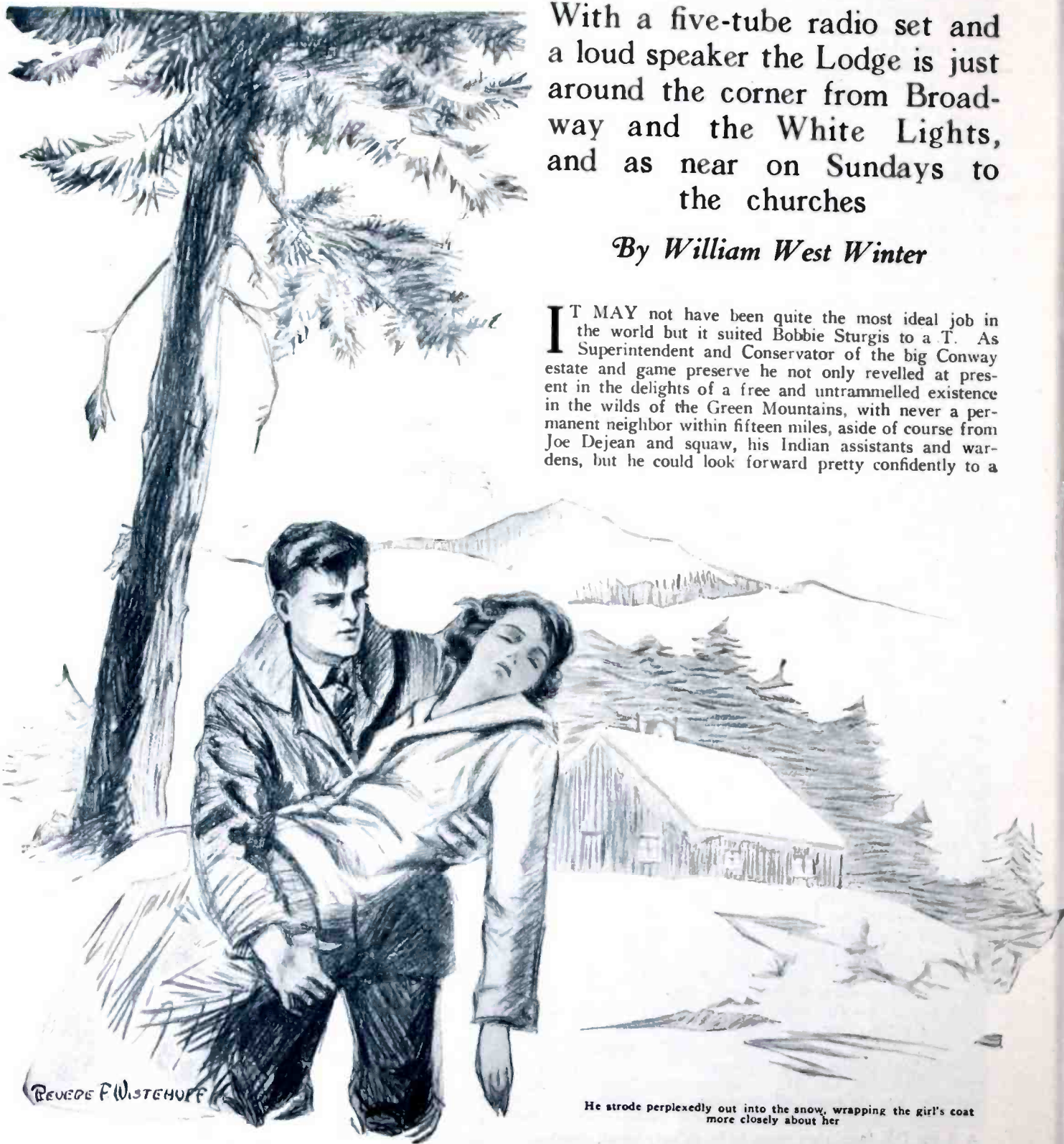
The famous actress-entertainer, Helena Millais, who has been heard extensively from English stations

The Lodge on Baldtop

With a five-tube radio set and a loud speaker the Lodge is just around the corner from Broadway and the White Lights, and as near on Sundays to the churches

By William West Winter

IT MAY not have been quite the most ideal job in the world but it suited Bobbie Sturgis to a T. As Superintendent and Conservator of the big Conway estate and game preserve he not only revelled at present in the delights of a free and untrammelled existence in the wilds of the Green Mountains, with never a permanent neighbor within fifteen miles, aside of course from Joe Dejean and squaw, his Indian assistants and wardens, but he could look forward pretty confidently to a



He strode perplexedly out into the snow, wrapping the girl's coat more closely about her

future of some profit whenever Mr. Conway made head on his plans to develop the big tract for water power and pulp wood. Bobbie was slated for a responsible position when that time came around.

When Mr. Conway had hinted, rather dubiously, that a lonely winter in the snowy and impassable mountains might be too much for him he had scoffed lightheartedly. He loved solitude, he was hardy and robust, he had rifle, snow shoes and some books and the entertaining company of the deer, partridges and half dozen elk whose guardian he was to be. His job even promised to be a sinecure after the snows set in to keep possible poachers away from the preserve, for there were no near neighbors and had not been for five years, since old Sam Whistler had departed with a curse from his unproductive acres lying just outside the limits of Conway's holdings. The ramshackle house and the rusting chicken wire and the crumbling walls of piled field stone that marked the limits of his farm were, in fact, more suggestive of a deserted wilderness than even the virgin wildwood that ran back in dark majesty up the steep slopes of Old Bald Top, furnishing shelter and food for the shy denizens of the Preserve.

"And, besides," he told Conway, in last, light refutation of his doubts, "where in the world can a man find solitude today? Why, on Baldtop I'm as much in touch with civilization as you are. Don't talk to me of loneliness! With a five tube Radio set and a loud speaker the Lodge on Baldtop is just around the corner from Broadway and the White Lights and as near, on Sundays, to the Churches. I can have jazz through the week and hymns on the Sabbath. What more could one ask for."

"Well, I hope you stick," said Conway. "Keep busy and it won't be so bad. Plenty of grub to last you? Have anything you think of sent in before the snow flies. And if you can't scare up sufficient work you might locate the limits of old Whistler's farm for me. If we can find his heirs, I want to buy it in. He died last year out in Illinois, but his wife and two children had left him years ago and we can't find them yet."

"I'll locate and stake every corner and blaze every line," promised Bobbie, and later, he kept the promise.

BUT now Winter had set in earnest and the snow was beginning to whiten everything except the gaunt, black feathered pine and spruce that shadowed the mountain. It was not deep as yet, nor did it offer any great obstacle to communication with the outside world, but it was only a question of time when the storms would descend upon him and close him in behind white walls of bottomless drift. And little he cared. Old Joe DeJean and Mona, his wife, were there to attend to his needs while the white clad slopes were his to prowl over by day, and by night the radio opened to him all the wonders

of the air through the mere tuning of a dial or two. He didn't even have to fear failure of his batteries for Conway had furnished the Lodge with the luxuries and there was a gasoline engine and a generator to furnish him all the light and current he needed.

So he was sitting, as he expressed it, "on the top of the world" that night when, replete with a good dinner of Mona's cooking, basking in the flickering light and grateful heat of the big log fire, he tuned in the set and began to fish for a program that would satisfy him. For an hour or more he listened to a program from Rochester, steeping his soul in music until he was as drowsy and content as a cat. Then, in idleness, he began to tune for nearer and smaller stations.

HE got something and as the commotion started, he manipulated his dials more carefully until the announcing voice was pouring clear and distinct from the horn. But it seemed to be the close of a program and pretty soon he caught the final announcement of a short program.

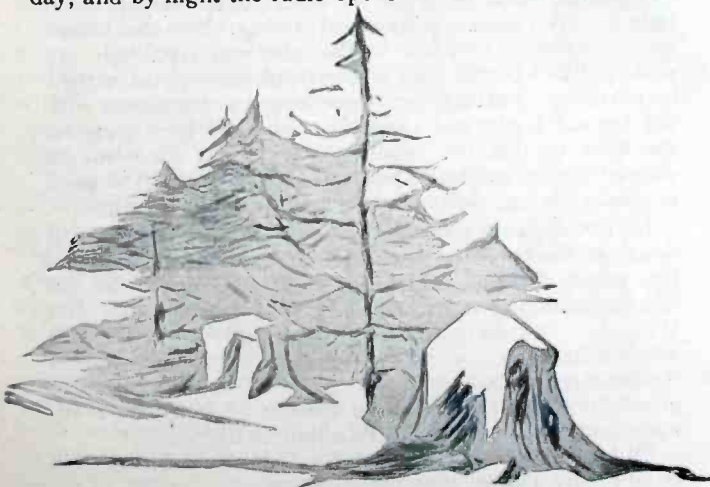
"—trust that you have enjoyed our entertainment tonight, broadcast from Station VRU, Rutland, Vermont, and we would be glad to hear from any of you that have any suggestions to make whereby it may be improved. And now, before I sign off I am going to ask everybody to stand by for a moment in the interest of law and order. This is Station VRU, Rutland, Vermont, and the Police Department has asked me to make an announcement in appeal to all law-abiding citizens to aid in apprehending a criminal. I will read from the circular handed to me.

"On Wednesday, December 8, 1924, Baroness Irma Montalga was held up in a taxicab on the streets of Boston, and robbed of a pearl and diamond necklace valued at upward of fifty thousand dollars. When she resisted she was shot by the thief, though not mortally wounded. From her description of the assailant and other evidence in the hands of the police of Boston, it is known that her assailant was a female bandit known to the police as "Shingle Sadie," who is wanted for a number of crimes in various cities.

"Shingle Sadie is about twenty-three years old, five feet two inches in height, of slender build, pretty, with fair complexion, slightly freckled, brown hair, blue eyes, and a generally unsophisticated air. She is fond of posing as an innocent country girl and her appearance fits well with this pose, though she is really a cool and dangerous criminal who stops at no violence to achieve her ends. A reward of one thousand dollars is offered for information leading to her arrest and conviction.

"She has been traced from Boston, leaving there on the Nine Fifteen train on the B. & M. shortly after the commission of the crime. On December 10th a person of her description arrived at Rutland and was seen leaving this city in a small automobile, heading, apparently, to the Eastward. All farmers, lumbermen and others who have heard this announcement are requested to be on the lookout for her and to apprehend her if encountered, notifying as soon as possible, either the chief of police of Rutland or the Boston Police Department."

THEN the announcer signed off and the instrument fell silent except for the usual clickings and wheezes that continued until Bobbie shut it off and went to bed, to think casually and rather pityingly of the girl who was being hunted so infallibly by this new instrument of civilization. Poor devil! Even if she was a vicious little tiger of a thief, what sporting chance had she against this far flung searcher of the air? It hardly seemed fair to Bobbie, though, if she came his way, which was hardly likely, he had every intention of catching her and turning her in. December 10th! This was the 12th.



When Bobbie awoke next morning the air was opaque and white with steadily falling flakes and had been for hours. He had never seen such a snowfall. Already, the snowy blanket was piling thickly on every level spot and the steady wind was drifting it deep into every hollow. If this kept up, as it gave every sign of doing, he was surely in for an early and long hibernation. Not a trail would be passable except on snow shoes, in another twenty-four hours.

Nevertheless, in company with old Joe, he went joyously out to his work, donning his webs and facing the storm blithely. There was one remaining line of Whistler's abandoned farm to run and he might as well get it done while he felt like it. So, with compass and hand axe they sallied forth into the soft, smothering blanket of falling snow.

The way led them over fairly well cleared and open

ground, where, except in the hollows, there had as yet been no deep drifts. With rather easy going an hour brought them out beyond the high, wire fence and near the old, overgrown road that had once run to Whistler's from the tie

camp down on Spruce Creek. They were about to turn into this with the assurance that the old trail would lead them to the farm, when the noise of brush crackling and bending under the progress of some clumsy creature made them pause. In the next moment a man carrying a rifle bulked large in the smothering mist as he crushed his way to the half obliterated path. He paused, warily, on seeing them, and then made his way forward with caution.

"Hey!" he said at last. "The Deppity, is it? You lookin', too?"

"I'm always looking," said Bobbie significantly, as he recognized Jim Whipple, from the tie camp. And Jim was a potential poacher if ever there was one. "What are you after up here with a rifle?"

"Nothin'," said Jim hastily. "I ain't shootin'. You ain't set eyes on a girl around here have ye? A kinda smallish girl with a—er—hat and coat on."

"What would a girl be doing up here?" demanded the suspicious Bobbie.

"Well—she's—I reckon she's lost, like, and I'm lookin' fer her," said Jim, reluctantly and untruthfully.

"Well, you can stop looking for her up here, Jim," said Bobbie. "There are no girls loose on Baldtop and there *are* a lot of deer yarded there. You'd better unload that rifle and head the other way."

WHIPPLE grinned and turned back into the brush, his progress away from the fence advertised by the racket he made. With a shrug, Bobbie led the way to the old cabin and finally leaped the tumble down wall of field stones, to strike across a former field now growing up to scrubby hardwood brush and past the old cabin to the other boundary where his work called him.

They came suddenly on the ghostly bulk of the place, its outlines uncertain and misty in the snow. Bobbie gave it slight heed and would have passed had not a sound attracted his attention. It was a slight sound, which ordinarily might not have been heard, but in the deathly silence of the snow storm it carried out through the half open door hanging disreputably on its failing hinges and out to the open. It was a sighing sound, accompanied by the

rustle of something moving. And in an instant the alert Bobbie was on the threshold, the door pushed open, peering inward.

"Who's here?" he called. There was a slight gasp from the gray gloom and then silence profound. He took a step inward. A blaze of light greeted him, a thunderous report shocked him, a vicious something whanged past his ear.

He acted instinctively, as much in fright as out of courage, leaping forward and toward the shot with the idea that he must grapple the assailant and prevent a second and perhaps fatal attack. But no shot greeted him and he plunged right upon an inert form before he could check himself. Then he stopped, to grapple, and his hands closed on a soft and rounded body.

The gray light enabled him to see a little and he carried the girl to the door to get the benefit of what illumination it gave. He found himself holding a slender, fair faced

creature with a mass of cropped and curled brown hair. She had apparently fainted though her hanging right hand clung to a little revolver, and he had a good chance to study her without "distraction. As he stared at her, bewildered,

a description, half recalled, was running through his thoughts.

"Slender, fair complexion, slightly freckled, brown hair and a generally unsophisticated air." Well, there was little room for doubt who this was and what "lost" girl the unsavory Jim Whipple was looking for. If this was not "Shingle Sadie" it was at least her double. Bobbie thought grimly that she was as quick on the trigger as had been hinted in that announcement.

IT was something of a predicament, his plans not having contemplated the arrest and delivery of female criminals. And he found the role in which he had been cast singularly distasteful. He strode perplexedly out into the snow, wrapping the girl's coat more closely about her, faced the astonished Joe and curtly announced that work was postponed for the day. He was badly upset and not entirely front having been fired upon. Every time he looked at the girl—and he had to look often to see if she gave any sign of coming around, his perplexity grew.

She had been described as pretty and she was all of that. They hadn't flattered her in the description. Bobbie could have enlarged upon it without half trying. She also looked unsophisticated, so much so that she was startlingly appealing, like a pretty child whose helplessness is advertised by adversity. Furthermore, something was the matter with her beyond fright and exposure. She had been lying on the floor of that old cabin, unable to get up when he entered and he had heard her sigh as if in pain. And pain, in another being, always roused pity in Bobbie Sturgis.

He strode along followed by the wondering Joe, looking down at the girl and assaulted by conflicting emotions. She was a criminal, said to be desperate, and he did not like criminals, even when only half lawless like Jim Whipple. But she was also a wonderfully attractive girl, helpless and hurt, whose whole soft, inert being moved Bobbie's heart astonishingly. He knew he would have to give her up and every time he thought of doing so his inmost impulses rose in wild rebellion at the idea.

"Who ees dose gal?" asked Joe from behind him. He flung a curt answer over his shoulder.

WILLIAM WEST WINTER is the author of "Louisiana Lou," "Quemado," "The O'Donoju," and one or two other popular stories picturing the "Old Rustler's Trail" and "Brown's Park" out in the West as it is said to have once been—In "The Lodge on Baldtop" he takes you to the historic Green Mountains and with radio transfigures an otherwise bleak and unromantic urban atmosphere into something conducive to social life and activity—and it has a happy ending too.

"The one Whipple was hunting. Heading for Canada, I think."

"Eef she's ron from Wheeple, I don' blame 'er," said Joe, sapiently. Bobbie felt that he did not blame her either. However, foolish the feeling might be, he was possessed with an unreasoning rage at the thought of this poor little thing being hunted and chivvied into the wilderness by men.

The girl suddenly stirred in his arms, opened sky blue and terrified eyes, kicked a bit and uttered a feeble cry of pain. Bobbie instantly stopped.

"There! There!" he said with the tone of comforting a child. "I didn't mean to hurt you! You're all right!"

"My ankle!" said the girl, plaintively. "It's hurt."

INSTANTLY he had her on the ground in the snow and was at her high lacing shoe. Its removal disclosed a swollen ankle, evidently severely turned if not sprained. She gasped in pain as he manipulated it.

"How did you do that?" he demanded.

"I—I don't know. Down there—at the camp, I stopped to ask my way and they frightened me. I drove off—up this way on the old road until I couldn't go further. And they were after me—shooting at me. I ran as far as I could. I slipped in the snow and hurt myself. Then I crawled to the cabin and hid. Someone came and I shot at him and fainted."

"I don't blame you!" said Bobbie indignantly. "Those damned brutes shot at you? The dirty cowards!"

"They frightened me terribly," said the girl. "You won't let them get me?"

"Not on your life!" said Bobbie, and he also added to himself that the law be damned. "You're all right now. I'm taking you up to my place where we can fix that ankle of yours. They shan't get you."

"Thank you so much!" said the girl with a sigh. She allowed Bobbie to lift her again and nestled quite trustfully in his arms for the rest of the journey. And, in the end, she was turned over to the ministering hands of old Mona, who had lore at her command anent the treatment of sprains and simple injuries. And later she slept soundly in one of the Lodge's vacant rooms.

In the evening however, with her ankle bandaged, she was able to limp out to the big lounging room, cheerful with its glowing fire. Bobbie greeted her with embarrassment and yet at the same time, as she sank into a big chair, he felt that something the Lodge had hitherto lacked and which he had just begun to notice, had unaccountably been placed there. He looked at the girl and she looked at him.

Both blushed.

"I'm afraid," said the girl, in a small voice, "that I owe you an apology. I've been thinking. It must have been you I shot at, wasn't it?"

"Oh, don't mention it!" said Bobbie hastily.

"I'm glad I'm a poor shot," she said simply, and Bobbie instantly felt grateful to her for having shot at him. In embarrassment he turned to the radio and began to tune it. Soon the strains of a concert were filling the air of the room. Someone in Rochester was singing "Oh, believe me, if all those endearing young charms." The song seemed singularly appropriate to Bobbie and his eyes kept wandering to the girl. When they unexpectedly met hers, he blushed a bright red under his outdoor pigmentation, and she also blushed until her tiny freckles faded into the pink.

What a blessing the radio was! Except, of course, when such people as those tie camp ruffians had it; then it was a curse.

But the next day the problem began to assume troublesome proportions. They would be hunting that girl and they might come here at any moment in spite of the still raging storm. They must not find her here—or anywhere else, Bobbie determined. He had dismissed reason entirely by this time. Law was law, when it dealt with ordinary criminals, but not when it persecuted such as this one. If she was a criminal, Bobbie did not mind being one with her. He was prepared to fill any character, even to that of a law-breaker, if by so doing he could

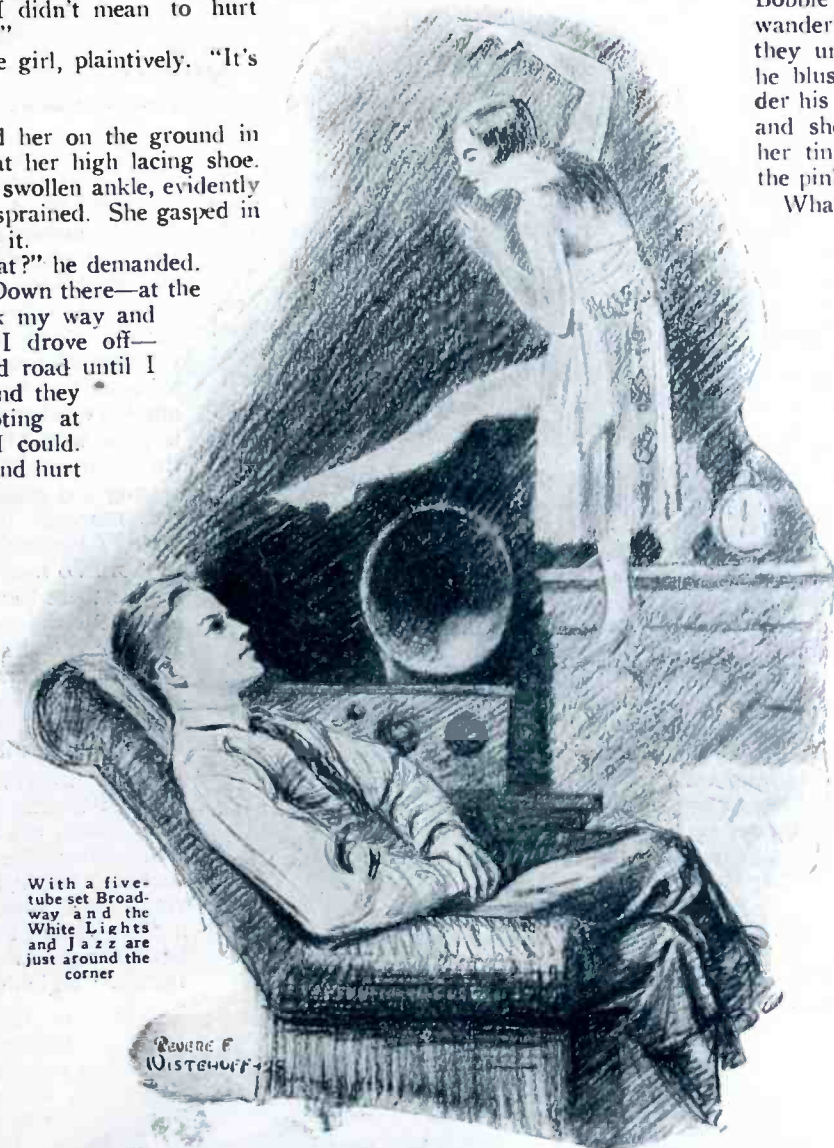
serve her. He only hoped, if it came to that, that it might be Jim Whipple who filled the role of victim. Beating Whipple would not be so bad. In any case, however, he had definitely enlisted on her side.

"**L**ISTEN," he told her that evening as they sat at the table together, still shy and almost speechless in each other's presence. "I'm afraid this won't do. You've got to get out of here. But don't you worry Miss—er—Miss Sadie."

"Miss Who?" asked the girl, startled.

"Miss— whatever you want to be called. I didn't mean to force your confidence. What I'm driving at is that you're not safe here. As soon as you can travel, we'd

(Turn to page 66)



With a five-tube set Broadway and the White Lights and Jazz are just around the corner

Revere F. Wistehuff



Rural Life Modernized

Radio broadcasting is turning the wanderlust spirit of youth away from the big cities back to the country and great open spaces

By *J. C. Gilbert*

Radio Market News Service, Bureau of Agricultural Economics

THE farmers of the United States are finding in radio a solution of some of their problems of isolation. This in itself is full justification for the thought and effort which is being exerted to make broadcasting the wonderful thing it is.

Of all the things that have made farm life unattractive, isolation from other human beings has been the one hardest to bear. Country life is pleasant as a change from the clang and clamor of the cities, but the desire to hear the voices of other people brings us all into the cities sooner or later. The peril that besets life and property at sea has been greatly lessened by the coming of radio, or wireless, as it was first called. Just so, radio broadcasting is dispelling the terrors of isolation on the most distant farms.

Though equipped with rural telephones, electric lights, automobiles and the rural delivery of mail, the farmer of today, like the pioneers who conquered the wilderness, still has to contend with problems of isolation such as infrequent contact with quick news, and meagre and unsatisfactory forms of entertainment.

As a means of remedying the situation, farmers are finding that there is a wealth of news, reports and good entertainment broadcast daily which is theirs for the taking.

RADIO broadcasting has had one of the most phenomenal growths of any form of communication ever devised. From the experimental stages, it has progressed in a few years to such a degree of prominence that the country is virtually blanketed with radio waves carrying all manner of news, lectures, market reports, and

entertainment for public acceptance.

This development of radio voice transmission has had as a background the years of research in wireless telegraphy and wire line telephony. This is undoubtedly the reason that once started, the radio telephone progressed so rapidly. Although the development has been fostered by the larger electrical companies, broadcasting is being done by concerns of all kinds. The idea of using radio as a means of advertising induced many to start broadcasting who found out later that direct advertising at least does not meet with general approval either with the public or the radio authorities.

Many newspapers on the other hand have found that broadcasting is a means of securing rather general publicity and if the program of news, reports and entertainment are kept up to a high standard much good-will accrues to the paper. It is safe to say that many churches, newspapers, schools, electrical companies, and stores, are now much more widely known by reason of their broadcasting.

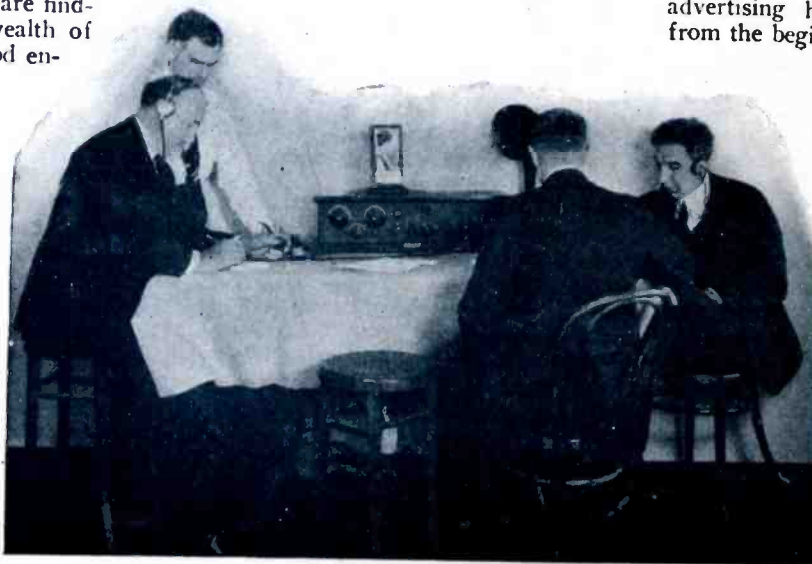
THE desire to broadcast swept over the country like a prairie fire. All

sorts of stations were constructed by all sorts of people. Churches, high schools, newspapers, theaters, garages, music stores, department stores, electric shops, installed sending sets and employed radio operators and embarked on an uncharted sea of talk, phonograph music and such entertainment as they could get together. No one knew what the expense of the enterprise would be. No one knew how the public would receive it. The broadcasting fad might be called the Great Adventure of 1922. In March there were 77 stations licensed to broadcast; in April 76 more applied, and by September there were 524 stations in operation, but the demand for receiving sets which had swamped the manufacturers and dealers in the Spring of 1922 fell off surprisingly in the fall, and in October and November many broadcasting stations discontinued operation.

There are several causes that contributed to this falling away, but the main reason was that of expense. The returns from the investment could not be measured and no one seems even yet to have devised a method for figuring the value of broadcasting. Direct advertising has been frowned upon from the beginning, and the impossibility of getting any

direct returns has caused many stations that started out bravely to quit the game.

Since the issuance of the first broadcasting license to the Westinghouse Electric & Manufacturing Company on September 9, 1921, there have been 1006 stations licensed. Of this number 472 have discontinued and as this is being written 534 are now in operation. Since May, 1923, the num-



Receiving market reports by radio in the office of a prosperous fruit farmer

her of new stations has been a little more than offset by those that have discontinued so that the total has recently grown smaller month by month. We may look for the discontinuation of still more of the stations now sending. As to what the final status of stations will be no one even now seems willing to hazard a guess. There are those who argue that a few high power stations can cover the country and they will do the job well. Others contend that the local broadcasting stations will serve a useful purpose in the communities and help to build up community spirit. Time and experience will reveal the best plan.

PREVIOUS to the war the U. S. Weather Bureau made some experiments with radio telegraph broadcasting in some of the western States. These experiments were carried on in co-operation with the agricultural colleges and with the help of a large number of radio amateurs who were interested in the new method of communication. It was these same amateurs who formed the backbone of the radio communication service during the war.

June 26, 1922, this work was inaugurated at the Navy Station NAA at Washington with two broadcasts daily at 10 A. M. and 10 P. M. Later, similar services were started at the Great Lakes (Chicago), San Francisco, and New Orleans, stations.

Radio telephone broadcasts of the weather reports were first begun at the University of Wisconsin in January, 1921. In April, the St. Louis University took up the work. By

sylvania over 100 miles from the Capital. When the copy was compared with the original as sent, it was correct word for word except for one or two words lost by reason of a faulty storage battery. In April of the year following, the Air Mail Service of the Post Office Department which had begun to broadcast the weather reports for the Weather Bureau offered to broadcast the market reports of the Department of Agriculture from the stations at the Air Mail landing fields at

These two photos illustrate a common condition in rural homes today—radio is used both for pleasure and business



Bellefonte, Pa., Cincinnati, Ohio, St. Louis, Mo.,

July twelve stations had made arrangements to broadcast daily weather forecasts and river reports as well as cold wave, frost and other warnings. Since

and Omaha, Nebr., and from the control station at Washington, D. C.

This chain of broadcasting stations made the information available in a strip of territory 200 miles broad stretching from the Atlantic seaboard to the Missouri River. The broadcasting was begun by spark transmission on a wave length of from 800 to 1800 meters. Later that year the chain of stations was extended from Omaha westward by the addition of stations at North Platte, Nebr., Rock Springs, Wyo., and Elko, Nev. The type of transmission was also changed from spark to undamped arc and the wave lengths increased to 2500 and 4000.

When in the latter part of 1921 radio telephone broadcasting became known, its possibilities for the benefit of the average small townsman and farmer appealed to the folks in the department who had been experimenting with radio telegraph, as a means of quickly distributing the department's reports and arrangements were made by both the Weather Bureau and the Bureau of Agricultural Economics with the few broadcasting stations then operating.

The Weather Bureau through its many field offices located in almost every state in the Union, delivered its

On February 15, 1921, broadcasting of forecasts by radio stations operated by the Post Office Department in connection with the air mail service at Omaha and North Platte, Nebraska, was begun, and a little later from its stations at Washington, D. C., Bellefonte, Pa., St. Louis, Mo., Cheyenne and Rock Springs, Wyo., and Salt Lake City, Utah.

The distribution of reports by radio-telegraphy to interior points served a valuable purpose, but it was of limited value to farmers because few of them could take the time to learn the telegraph code. Thus practically no receiving sets were purchased by farmers.

This, however, has not prevented the development of radio telegraph broadcasting of the weather reports. On

then the work has been extended and by January, 1923, there were 140 stations in 39 states regularly broadcasting the reports. Since that time there has been some changes in the list of stations. Some have discontinued and others have been added. At the present time 117 stations are on the job supplying regular daily forecasts and reports.

The value of this work to the farmers is beyond calculation. Letters by the hundreds have come to the Department attesting to the value of the service.

ON December 15, 1920, the first market report was broadcast by radio telegraph from the laboratory of the U. S. Bureau of Standards at Washington. The writer has a copy of this report received in the attic room of a radio amateur living in a town in Penn-

daily forecasts to the stations it had selected to broadcast its messages of warning and weather predictions. Farmers never before had had access to the weather forecasts and warnings in time to really make use of them.

The market reports of the Department before radio came were, and are yet for that matter, distributed through the mail, printed in the newspapers and telegraphed to any one who will pay the telegraph charges. Radio broadcasting has not displaced any of these methods, but may reduce the tele-

the wire lines connect with Denver, Salt Lake and San Francisco. At all the markets representatives of the Market News Services collect and distribute marketing information. These points are also centers for radio distribution. In each of the larger cities mentioned, broadcasting stations take the reports furnished by the Government's market reporters and send them out for all who care to listen in. About 125 stations are now broadcasting the various weather, crop and market reports of the department. The depart-

these stations and are available to suitable receiving equipment.

AT the direction of the President, the Secretary of Commerce, Herbert Hoover, called a conference February 27, 1922, of the various Government departments interested in radio. Manufacturers, dealers, scientists, and users were invited. A thorough discussion of the whole radio broadcasting situation was had and a series of general recommendations were arrived at.



The country bank posts government market reports received by radio, for the benefit of its farmer patrons

graphic service to a certain degree. The market news of the department is gathered by means of a leased wire system which connects all of the important markets for farm products. This wire system runs from Boston through New York, Philadelphia, and Baltimore, to Washington. To the south it connects Washington with Richmond, Raleigh, N. C., Atlanta, and Jacksonville. Westward, two trunk lines connect Chicago, St. Louis, Kansas City, Omaha and Minneapolis to Washington through Pittsburgh, Columbus, and Cincinnati. The Southwest with offices at Fort Worth and Austin, Texas, is linked into the system through Kansas City. Westward also from the central point

ment's press service also sends its "Agriograms" to about 186 stations.

In order to place the daily market reports and quotations on agricultural products quickly into the hands of the broadcasters and to transmit the reports to a number of the Government market news field offices not located on the leased wire, a system of primary broadcasting has been devised. This method is made possible by the utilization of the high power Government radio telegraph stations operated by the Navy. These are: NAL at Washington, D. C., NAJ at Great Lakes (Chicago), Ill., NAT at New Orleans, La., and NPG at San Francisco. Regular daily schedules are sent out from

On April 24, Secretary Hoover invited each of the ten Government departments to name a representative to a permanent committee to co-ordinate the radio broadcasting of the Government. A certain amount of broadcasting was being done by several departments with little or no co-ordination.

Of all the departments, agriculture had the most extensive program of reports and information going out over the radio telegraph stations of the Post Office and Navy Departments. The Radio Market News Service and the Weather Bureau were also using the private broadcasting stations. Numerous difficulties of interference, time allocations, wave length assignments,

etc., made the development of a satisfactory service difficult. Groups of the broadcasting stations had attempted to solve the problem of interference by voluntary action, but with only partial success.

The Interdepartmental Committee was originated to act in an advisory way and its recommendations were passed on to the office of the Chief Radio Inspector of the Department of Commerce. This committee with the help of outside radio experts and the broadcasters devised a system of wave

secure the fullest co-operation not only within the government departments, but from the private broadcasters all over the country.

WITH the details of the relationship of the broadcasters and the Government in a fair way to be worked out and with some assurance that broadcasting will continue, the problem of radio in the country has been to get the farmers interested.

The farmers of this country are not so different from the people who live

making of them. About 2500 names of farmers using radio sets had been sent in by the county agents. To these a letter was sent asking several questions. The 1166 replies brought some interesting facts. Forty-five percent of the farmers replying had made their own sets. Not just crystal sets, but sets of one, two, three and more tubes. The average cost of the parts employed in their construction was \$83.00 while some spent as high as \$300 to \$350. More than 75 different makes of sets were reported by the 55 per cent. that



Live stock shippers copying market reports sent out by the Radio Market News Service

length, assignments possible under the radio law of 1912. A priority schedule of types of material was also worked out that gave a working basis upon which decisions could be reached as to what kinds of material should be considered the more important when a possible clash of interests should arise.

This all meant much to the Department of Agriculture and the farmers for the relative value of the weather and market reports was established and set down in order. Weather reports practically head the list with the market reports next. This front rank position, in regard to the character of the information, has made it possible for the Department of Agriculture to

in towns. Their isolation and lack of social intercourse has been a great hindrance to all around development, but it has given them a chance to think, which many of us who live in cities hardly seem to have time for.

That radio has an appeal to people living in the country has had ample demonstration. A rough estimate based on the replies to a questionnaire from several hundred county farm advisers seems to indicate that there are probably somewhere near 300,000 farmers who already installed radio sets on their farms. In order to get a starting point for further effort along this line, the Department wanted to know what use the farmers who had radio sets were

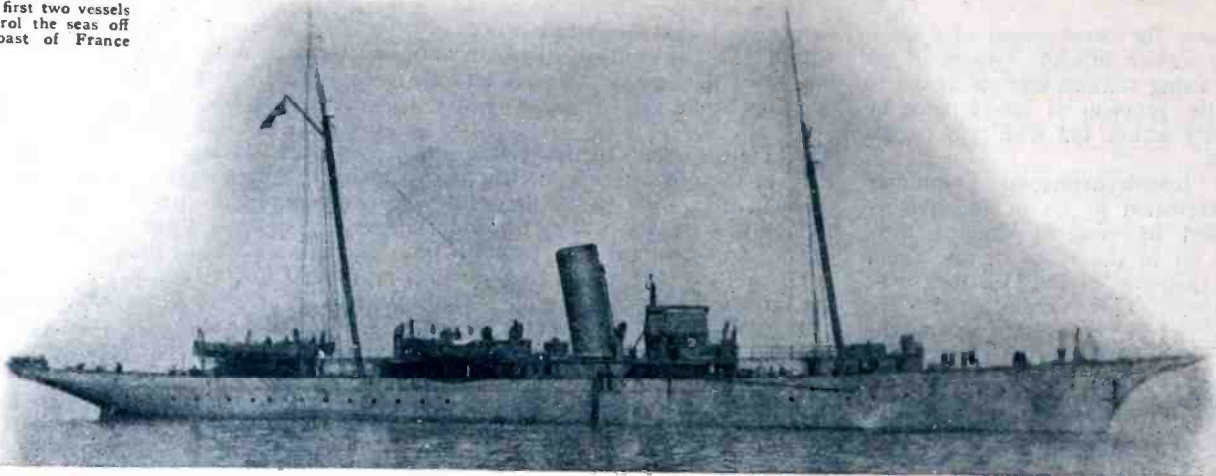
bought their equipment. The average price of these sets was \$175, but many paid \$400 to \$500 for complete outfits.

With probably not more than 2 per cent. of the farmers equipped with radio sets, but with apparently a willingness to buy the best, the farm field for radio seems to be worth cultivating.

Farmers do buy many things on a "sight and unseen" basis and are often "sold out" by clever demonstrators who have no interest in future business, but radio need not be one of these. Good equipment at reasonable prices is now available both in complete sets and as parts, and with intelligent demonstrations the farmers of the country

(Turn to page 69)

The Corsair was one of the first two vessels to patrol the seas off the coast of France



On Patrol

By Lieut.
Harry F. Breckel

The Veteran "Suicide Flotilla" and some of its adventures in the Bay of Biscay during the war

THE night was filled with that stygian darkness as only those who have sailed the seas can visualize. The *U. S. S. Corsair*, proud veteran of the "Suicide Flotilla," the term applied to the division of armed yachts on duty in the war-zone, gamely drove her bow into the foam-flecked seas, to the mournful dirge of the ever-increasing gale which shrieked through the shrouds, seemingly angered because it could not destroy the man-made thing which dared defy its strength. But, like the enemy with whom it was at odds, it did not take into consideration the initiative—ability, aye and the endurance, of the men who manned the vessel. Once a beautiful yacht aboard which the Kaiser himself had enjoyed the hospitality of its American owner, it had now become a potential source of destruction for any U-Boat with whom it might come in contact.

The *Corsair*, flagship of the Sixth Flotilla, had steamed out of Quiberon Bay two days previous in company with the armed yachts *Aphrodite*,

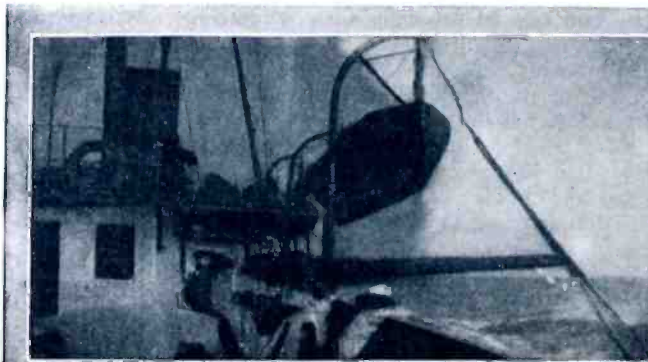


The Author

Noma, *Wakiva* and *May*, to locate and escort through the submarine in-

fest Bay of Biscay, a convoy comprising three American troop-ships, for the safety of which our "Skipper", "Wild Bill Kittinger" had begun to manifest considerable anxiety, in view of the fact that they were not to be seen when we arrived at the appointed rendezvous. And the fact that the enemy was unusually active throughout our area did not serve to alleviate this anxiety, which was equally shared by the remaining officers. To add to the difficulty confronting us, was the ever-increasing force of the gale which threatened to blow as it only can blow in the Bay of Biscay, that treacherous, turbulent sea, which provided a watery grave for more than one vessel far more rugged and able to withstand its pounding seas, than were we.

I was not surprised at all to receive orders to make every effort to get in touch with the convoy by radio. This seemed to be the only remaining chance to locate the missing vessels, for they were obviously off their course, or behind their schedule. All during the day the radio operators of



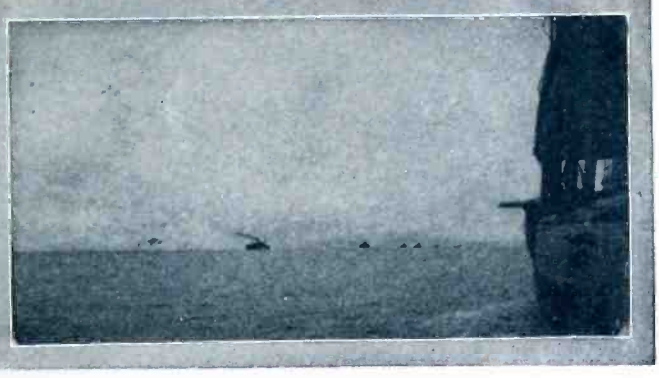
Gun crew on watch



The *Wakiva* picking up survivors



Our water-covered deck



The Corsair steaming to the convoy

the various watches had sat faithfully with the receivers literally "glued" to their ears. Sometimes came the call of a stricken vessel, again news of the rescue by another ship, of survivors of some little, unprotected fishing sloop, a victim of relentless war, but never a sound to guide us to the convoy which it was our duty to find and escort safely into port. Repeatedly the high-pitched whine of our own powerful radio was heard throughout the ship as the searching flash of the waves were sent hurtling through space, calling upon the radio operator of the convoy to answer.

I had been on watch during the 8 P. M. to midnight period, hoping that I would be able to "raise" the senior operator of the Convoy with the aid of the added range given the radio by reason of darkness. All during my watch the gale had slowly risen in strength, until at midnight it became necessary to secure loose articles about the radio room to prevent their being dashed about by the roll and pitch of the little vessel whose twin screws were driving her steadily into the teeth of the wind and sea, thanks to the stamina of the "Black Gang" laboring in the heat of the firerooms below, where it took almost super-human effort to keep your balance, let alone feed the blazing maw of the fires beneath the boilers. Ever and anon the spiteful "whir-r-r-r-r" of the little

steering engine mounted on the rear of the steel after bulkhead of the radio room, gave testimony to the vigilance of the officer-of-the-deck and his helmsman in their joint effort to keep the *Corsair* on her course and to meet



Commander Kittinger ("Wild Bill Kittinger"), the "skipper" of the Corsair

the now towering seas which swept the fo'c'sle and at times deluged the bridge in a shower of icy spray.

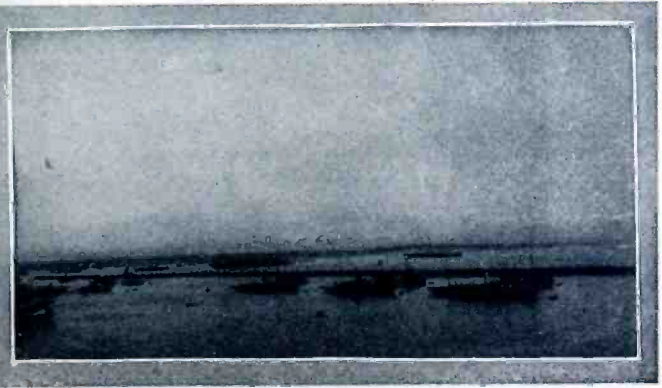
At half after midnight I gave up trying to reach the convoy and decided

to go forward and call my relief—the second operator in charge—who slept up forward in the petty officer's quarters. Somewhat cramped by sitting so long before the operating desk, I made a grab for my cap and opened the door leading out of the lee side of the radio room. This operation automatically extinguished the small blue light over the receiver as I stepped over the hatch combing, not onto the deck as I had expected, but into six or more inches of icy sea water. The seas sweeping on board did not drain off properly, because the scuppers were too small. I held onto the door knob until the ship took a roll to port and I could close it, after which I grabbed the hand-rail along the cabin and started to make my way slowly forward along the deck, through the inky blackness of the night, with the water slopping about my legs with every roll and heave of the ship as she was buffeted about by wind and sea. Collisions with other members of the crew while moving about the docks at night were not un-common and I was not surprised when I suddenly received a jolt that all but knocked the wind out of me. Expecting to exchange the usual "Why-dontcha-watch-where-yure goin'," I was surprised to hear the voice of the Skipper boom forth. "take it easy," "take it easy," to which I replied with the usual "Aye, Aye.

(Turn to page 72)



Dropping depth-bombs



The "Suicide Flotilla" at Brest



ENA GREGORY



VIOLET AVON



DOROTHY REVIER



ANNE CORNWALL

The WAMPAS BABY

EVERY year the Wampas, the film industry's organization of publicity men, elects thirteen girls to be the honor guests at their annual Frolic and these are known as the Baby Stars. Then each of the Baby Stars speaks to radioland from KFI under the auspices of The Los Angeles Examiner.

The girls are chosen, not so much on their past record, as for future prospect. Stars of the past have rapidly risen in their field and hence rivalry for the honor is keen.

Baby Stars of other years include Bessie Love, Claire Windsor, Laura La Plante, Carmelita Geharty, Colleen Moore, Helen Ferguson, Mary Philbin, Kathryn McGuire, Lila Lee, Lois Wilson, Eleanor Boardman, Derelys Perdue, and Gloria Grey.

1925 Stars just elected, include the following: Anne Cornwall comes from Hamilton, New York, and has been seen on the screen in "The Gold Diggers," "Dulcy," and "To Have and to Hold." Madeline Hurlock, hails from Federalsburg, Maryland, and moved to Hollywood where she has played the lead opposite Ben Turpin in Sennett comedies. Norfolk, Virginia, contributed Natalie Joyce, who visited Southern California on a vaudeville tour and now she is a leading lady for the Christie comedies. Catherine Jelks was born in Hot Springs, Arkansas, and won a beauty contest in Los Angeles. The Wampas gave her the screen name of Joan Meredith. Evelyn Pierce was born in Del Rio, Texas, nineteen years ago and her interest in dancing brought her to Los Angeles where she worked for the Metro studio as an extra and is now contracted by the Metro-Goldwyn-Mayer people for a long term.

New York State contributes another Baby Star in the person of Lola Todd who hails from Spuyten Duyvil. Family acquaintance with Carl Laemmle



MADLEINE HURLOCK



JOAN MEREDITH



BETTY ROSS



EVELYN PIERCE



DUANE THOMPSON



NATALIE JOYCE

STARS OF 1925

brought her in contact with the Universal people and she has played in "The Phantom of the Opera," and other films. Dorothy Revier is a native daughter, born in San Francisco. She has appeared in "The Triflers" and the "Rose of Paris." Betty Arlen, is a sixteen year old Miss from Providence, Kentucky, who began her career as a dancer and then took extra parts in the movies. Violet Avon, a sister of Laura La Plante, changed her name in order to avoid conflict. She was born in St. Louis and visited her sister in Hollywood where she got the "movie bug" and has appeared in several films.

June Marlowe, a striking brunette of 19 years, was born in St. Cloud, Minn. She has played minor parts since 1922 in "When A Man's A Man," "The Tenth Woman," and other films. Ena Gregory, a demure blonde of 17, was born in Australia where she spent six years on the stage as a child actress. She has played various small parts in Hollywood for five years.

Olive Borden is another 16 year old actress from Richmond, Virginia. She attended a convent and, last year, her mother brought her to Los Angeles where she has played in Hal Roach comedies. Duane Thompson, of Red Oak, Iowa, entered the film colony via dancing and now she plays leads opposite Walter Hiers, comedian. And Edwin Hubbell, six years old, was again chosen as the Starlet of the Wampas—the official mascot.

The Wampas presents its semi-monthly radio program through KFI on alternate Wednesdays from nine to ten in the evening. You'll have an opportunity of hearing these Baby Stars not only on the Wampas programs but other times as well during the 9 to 10 o'clock hour on this Los Angeles station.



EDWIN HUBBELL



LOLA TODD



OLIVE BORDEN



JUNE MARLOWE

A FOUR-TUBE radio frequency receiver that is absolutely reliable



How to construct and operate it for maximum efficiency

Reliable R. F. Receiver

By R. A. Bradley

WHAT folks seem to want most in a radio set is reliability, after that, selectivity and then tone quality. The fact that selectivity and tone quality are placed in a secondary position to reliability does not mean that these qualities are any less important. But it does show that the family listeners want to be assured of reception at a given time and of a given station. Of course, selectivity must be had too, but few of us are troubled with a lack of it anymore since low loss parts and apparatus have appeared. Good tone quality we expect and demand of a well built receiver.

So the main requisite of a receiver narrows down to reliability—a station when you want it and the way you want it.

This four-tube set fulfills this requirement and does it well. There are two stages of tuned radio frequency using well designed low loss coils, a non-regenerative detector — not a troublesome crystal—and two stages of audio frequency amplification; the first of which is reflexed back into the second radio frequency tube. Reflexing in this manner can be done easily and effectively, realizing about one and three-quarters tube output out of the

LIST OF MATERIALS

One Hilco Tuned R.F. Kit including three .00025 mfd. variable condensers and three R.F. transformers.
Four Howard sockets—standard.
Four Amperites for UV-201A's.
One Carter filament switch.
Two Pacent closed single circuit jacks.
Three Ultravernier dials.
Two Samson audio transformers (6-to-1 and 3-to-1).
Seven Eby binding posts.
Four .002 Hilco Precision fixed condensers.
One .00025 Hilco Precision fixed condenser with one Durham 2 megohm leak.
One 7" x 24" Condensite Celeron Panel.
One 6½" x 23" Base-board.

reflexed tube. Of course some radio frequency amplification is lost and some audio, but with the help of good by-pass condensers, this loss has been reduced to a minimum. The circuit is very stable and selective. The radio frequency coils are placed at an angle of 57 degrees with respect to the panel so that there will be no inductive feedback between stages which would result in an unstable oscillating set. The

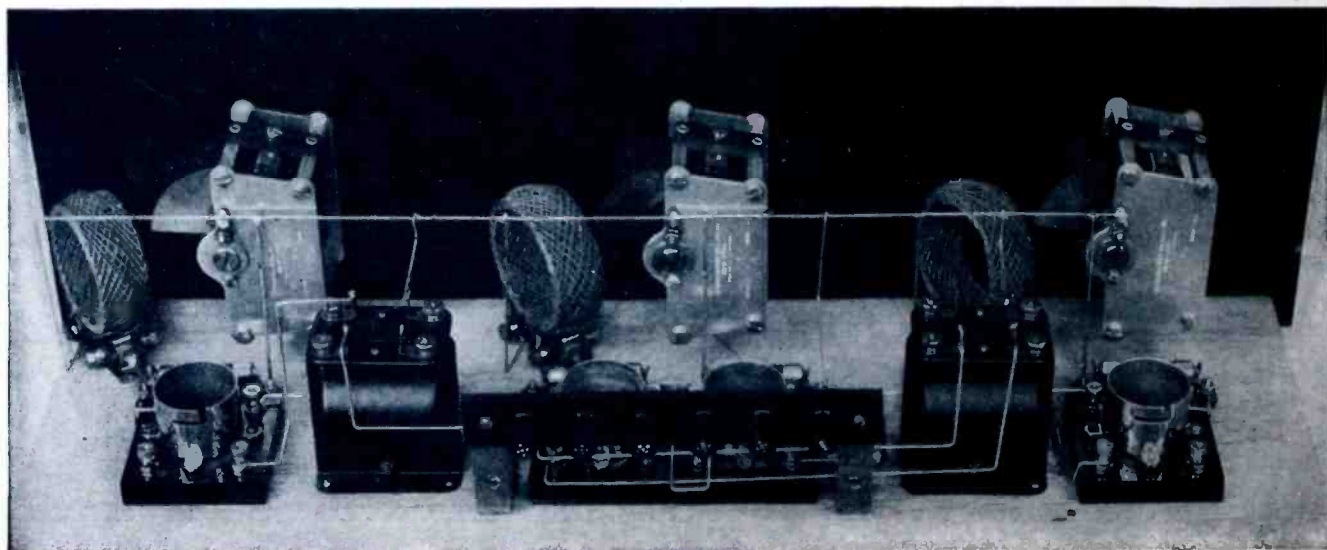
three circuits must be tuned to resonance with the desired wave. This makes all three tuning dials read practically the same for a given station. When a station has been tuned in it will be found possible to return to these settings and be assured of reception, providing of course the station is operating. The tuning of this set requires no skill nor is it at all difficult to log station after station.

In its construction particular attention should be paid to the angle at which the coils are placed and also the arrangement of the baseboard apparatus. No attempts should be made at further compactness as this tends to unbalance the receiver.

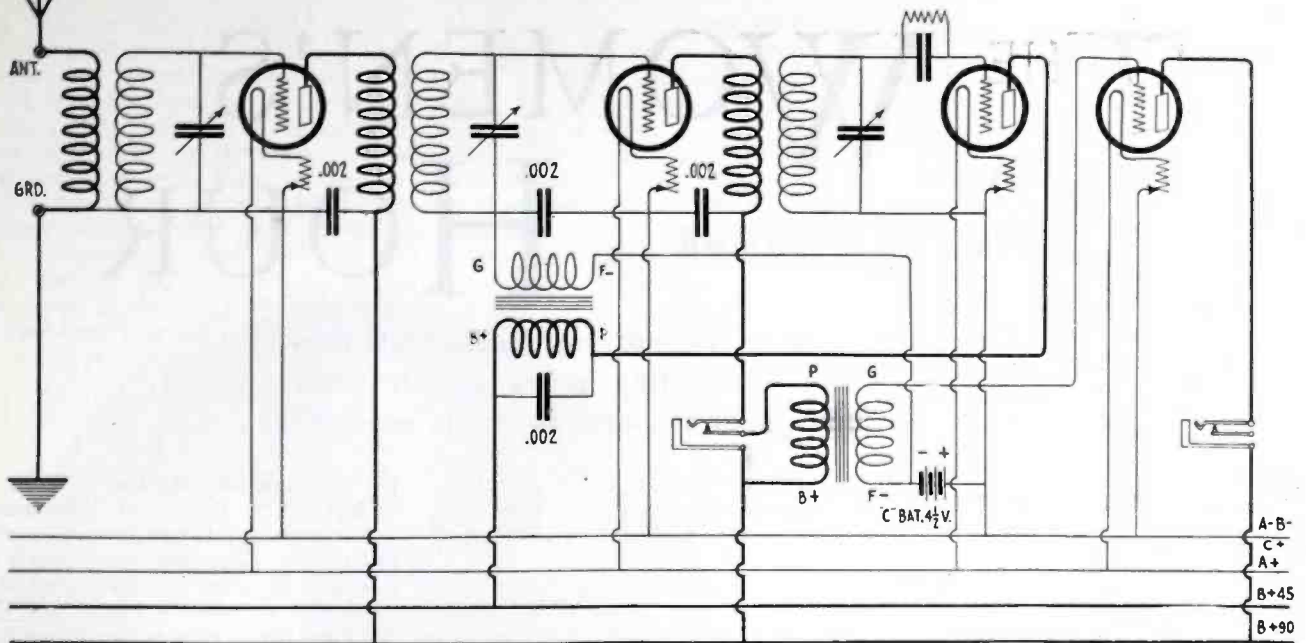
For best results from this receiver we used a single wire antenna seventy feet high and about sixty feet long. UV-201A's were used throughout in the set. A UV-200 may be used in the detector with slightly better results.

CONSTRUCTION

Following the popular practice this receiver contains two stages of tuned radio frequency, a detector, one reflexed audio stage and one straight stage of audio frequency amplification. Either dry cell tubes or storage battery



The layout of the back-panel apparatus calls for close study before attempting to hook up the instruments. Arrange all base board apparatus to simplify connections as much as possible



The circuit diagram for this receiver shows clearly the method of reflexing the first audio stage. Note that by-pass condensers are used across both primary and secondary of the reflexed transformer

tubes may be used. When properly constructed the necessity for neutralizing condensers or biasing potentiometers for controlling the radio frequency tubes is entirely eliminated as the tendency toward self-oscillation has been taken care of in the design of the tuning units and their mounting angle on the panel. The design of these tuning coils is such that an unusual high inductance is obtained in the secondary winding, a very desirable feature in radio frequency amplifiers. The panel lay-out is approximately the same as that for the family receiver which was described in the November issue of WIRELESS AGE. The three dials on the three tuning condensers are equally placed on the panel. No other controls appear except the jack and filament switch. A novel feature of the dials enables the operator to write in the call letters of the station opposite the pointer so that he may immediately turn to a given station having once made its calibration. This makes it possible for the whole family to tune in the set with no trouble in hunting for stations. In the rear of the panel the three radio frequency transformers are mounted directly next to the condenser which tunes each one while still providing plenty of space for the rotor plates to turn. The arrangement shown in the illustration of the baseboard layout is probably the best, although not by any means the only arrangement that will give satisfactory results. The audio transformer in the reflexed stage is placed near the left hand end of the baseboard.

There follows the second radio frequency tube, the detector tube and the second audio transformer and then the last audio tube. The Amperites controlling the filaments automatically are placed directly in front of each socket.

Connection is then brought out from one post on the socket to the Amperite, and the other end of the Amperite is then connected to one long piece of bus wire which forms the negative leg of the filament and to which all return leads are brought. Be sure to mount the coils at the angle specified—that is 57 degrees. This may be readily determined by placing a 180-degree dial on the edge of the baseboard and marking off 57 degrees or its complement 123 degrees. Remember that a 57-degree angle does not mean 57 degrees on a 100 division dial such as is commonly used. In connecting up the receiver connect up this negative filament lead through the Amperites. Now bring your ground connection from the binding post directly to this at the nearest convenient point. To this negative lead the following instruments are connected. The A minus post of the first radio frequency transformer, the rotary plates of the first variable condenser (on the left) the F minus post of the reflexed audio transformer, the F minus post of the third radio frequency transformer, the rotary plates of the variable condenser tuning this transformer and in case the C battery is not used the F minus post of the audio frequency transformer in the second stage.

When these connections have been made the rest is easy. The plate and grid connections are made in accordance with the diagram and should offer no difficulty. Be sure to include in the circuit the by-pass condensers across the primary and secondary of the reflexed audio transformer. This is necessary to the proper operation of the reflexed tube as a radio frequency amplifier as well as an audio frequency amplifier. It appears in the circuit diagram that the .002 mfd. fixed conden-

sers connecting the B plus post of the two radio frequency transformers to the minus filament both do the same thing. In reality they do, but it is better to have the two of them and to place them as close to the radio frequency transformer as is possible so that the path of the radio frequency current through the primary winding on the transformer may be brought through the shortest possible path back to the filament instead of going through high resistance B batteries or audio frequency transformers. Make all connections with bare bus wire and make them as straight as possible. Keep the wiring low in the set near to the baseboard. To have leads running through the air neither helps a set's appearance nor its operation. Make grid and plate leads as short as possible and keep them well separated. You will note that we used a single closed circuit jack in the first audio stage. Personally we do not see any reason for a four-pole double circuit jack in this instance. It is hard enough to wire a jack with bus wire and do a neat job when there are but three posts to solder to without adding the unnecessary fourth one which would cut off the B battery from the transformer and leave it entirely open circuited.

In wiring a set always make the framework of the jack that is the part which makes contact with the sleeve of the plug the positive B battery side. This leaves the top connection which makes contact with the tip of the jack go to the plate, and the short circuiting arm which engages the plate contact when the plug is out to the post marked P on the audio frequency transformer. A C-battery is not essential to the operation of the audio frequency stages, but helps considerably in tone quality and lowering your B battery drain.

THE WOMEN'S HOUR

By
Golda M. Goldman

At ten o'clock in the morning mother sits down, with a basket of mending in her lap, and enjoys a special radio lecture course in home economics

SATURDAY afternoon father and the boys tune-in for the big baseball and football games. Evenings at seven little Johnny monopolizes the ear-phones because the bed-time story man is on the air. But in the morning at ten o'clock mother sits down with a basket of mending in her lap and paper in front of her and prepares for her special lecture course in home economics. And let it be understood right now that this has come to be one of the most important features in mother's life. After ten or fifteen years of washing dishes and mending clothes and cooking meals and rearranging the living room furniture so that will look as though she had some new decorations, Mother had begun to find that the charm of housekeeping was a negligible quantity. She did the things which everyone else considered dull and uninteresting. She did the things which didn't show, but which had to be done. She was tired of it, for it does grow rather monotonous to move around in the same circle day in and day out for fifteen years, with nobody to talk to except the children at lunch time or a gossiping neighbor who interferes with one's housework.

And then suddenly in a literally magic fashion from out of the air came a friend—a friend who didn't interfere but who helped—helped to reinvest the prosaic drudgery of the household tasks with some of their early glamour and who gave variety and brought fresh ideas into the little world of home. This is not a really recent development as some of the broadcasting stations started the household talks as much as two years ago,

but the past year has seen a development of this type of broadcasting along very systematic and all-embracing lines.

A typical program is that of Station WJZ in New York City. Miss Bertha Brainard, who is assistant pro-

gram manager of the station, has worked this out in its fullest details. Miss Brainard, who is one of the most energetic and Titian-haired young ladies in the broadcasting field, has been well known to the listeners-in since the early days when WJZ was owned by the Westinghouse Company and situated in Newark. For some time she was more interested in bringing the theatres into the home in a feature which she called "Broadcasting Broadway," than she was in anything else. But the possibilities of working in close co-operation with thousands of women every day has intrigued her interest to the degree that today WJZ goes on the air from ten to eleven, five times a week, with features which will appeal to every housewife in the land. She has, for instance, arranged for a series of talks called "The Home Beautiful Series" in which Dorothy Ethel Walsh, a free-lance writer and interior decorator, gives talks on color and color harmony, the use of chintzes, etc., in the average simple home.

Mrs. Francesca Von der Kley, the associate editor of "Vogue," gives a series of talks on etiquette and manners in the home, beginning with the training of the baby and progressing through what table linen should be used on state occasions. The Henry Street Visiting Nurses Service gives a series on the care of the child and general health, while Miss Ethel R. Peysler who owns the unique title of "Counsellor on Household Equipment," tells her audience how to make their own household repairs so that now they can repair everything from the refrigerator to the electric iron. There are talks on

embroideries, on books, on gardens, on what to place in sunken gardens and kitchen window boxes and so on indefinitely.

Two of the most outstanding features which occur daily are typical of the high calibre of the talks which are going out from almost all of the big stations in the country. The first of these is given by Mrs. Julian Heath,



Mrs. Anna B. Scott, cooking expert and food economist at station WDAR, Philadelphia

gram manager of the station, has worked this out in its fullest details. Miss Brainard, who is one of the most energetic and Titian-haired young ladies in the broadcasting field, has been well known to the listeners-in since the early days when WJZ was owned by the Westinghouse Company and situated in Newark. For some time she was more interested in bring-

the founder and president of the "National Housewives League." This league was started in 1911 in New York and has branches all over the country. Its purpose is to organize the housewives who are the executives in the home and make them realize that housekeeping is a business and that its representatives should really form a trade organization just the same as the butcher or the baker or the candlestick

idea in mind that the housewife of today must keep abreast of new developments, if she is to conduct her household in an efficient manner.

"There is nothing," she says, "in the idea that the women of today are lazy, and it is unintelligent not to use what the commercial packer can provide so much more cheaply and more economically than it could be put up in the home."

It has always been Mrs. Heath's ambition to get in daily touch with the women and she has certainly made the most of this opportunity.

five hundred at a time. She is rapidly bringing about the realization of her ambition to correlate the trade organization of housewifery to trade organizations of other kinds.

The second daily feature at WJZ is conducted by Mrs. Sarah Futres Hitchcock who is on the editorial staff of that great trade newspaper, "Women's Wear." In "Women's Wear," Mrs. Hitchcock conducts a column on business promotion and the analysis of advertising copy. At WJZ she gives a series of talks on cable fashions from Paris. Because of her trade affiliations, she is able to predict styles six months in advance. She gives a fashion story giving the newest facts of the industry from both the European and the American point of view. These talks are arranged for her by Eleanor Gunn and other representatives of "Women's Wear" who are fashion experts. They give the educational point of view about fashions, openings of fashion houses showing the sort of thing that great

makers design for various types of people, making reference



maker. In Greater New York alone this league represents some three hundred thousand women. Mrs. Heath is peculiarly equipped to conduct her daily program as she has been editor of the "Housewives Magazine," and chairman of the Home Economics Committee of the City Federation of Women's Clubs. Her program divides itself into several definite parts. First she gives a market report. This she calls her "Daily Housewives Ticker," her idea being that just as the men in their offices make it their business to know the fluctuations in price of the various commodities so should the housewife know. Secondly, she discusses any outstanding rise or fall in price, giving particular attention to seasonable commodities such as turkeys at Thanksgiving. Thirdly, she gives a dinner menu which fits the market, using those products which are particularly reasonable that day. Last of all, she gives any recipes which are needed in order to carry out that menu satisfactorily. She conducts her talk with the



Above—Mrs. Anna J. Peterson, whose "Table Talks" from KYW are very popular

Right—Miss Vivette Gorman, assistant to Mrs. Peterson

Her listeners-in write her that they get their dinner out of the "little black box." The young folks who are learning find it good and the older ones who are tired of old things and of deciding what to have for dinner, find it equally good. Once a month she calls her radio audience together, and at a meeting in the Edison Electric Lighting Rooms she has as many as

to what important persons wear in order to instill a sense of occasion which is supposedly lacking in American women.

By hearing what these society people wear at the polo grounds, at the matinee, at the concert, etc., the listeners-in can avoid embarrassing mistakes of costuming.

"For," says Mrs. Hitchcock, "what (Turn to page 73)

Gladys
Rice



By
Anne
Snow

The Funmaker of Roxy's Gang

YEARS ago on the American vaudeville stage there was a team composed of John C. Rice and Sally Cohen. They appeared at a place which was as famous in its day as is Keith's "Palace" now. This was the old Hammerstein's "Victoria," and here the two convulsed their audiences year after year with their entertaining sketches.

But Hammerstein's "Victoria," like "Daly's" and others of its historic contemporaries, could not compare with the modern playhouses, and they tore it down, and on the site there arose a thing of beauty, designed by Samuel L. Rothafel, and known as the "Rialto" Theatre.

John C. Rice and Sally Cohen married after working and playing together for some time, and to their daughter, Gladys, they bequeathed an inheritance of song and laughter. When Mr. Rothafel looked about for fresh young talent to divert his "Rialto" audiences, Fate sent him Gladys Rice, and so on the same site where her father and mother won their laurels, Gladys Rice made her debut

as the fun-maker of "Roxy's Gang."

From her parents Gladys inherits her ability to do character numbers, and you have doubtlessly heard her time and again on Sunday nights as she sings, "Waitin' at the Church," "Is Yer?" "Little Black Rose," or "I've Got a Pain in My Sawdust." Her excellent voice won her a prima donna role in "Sweethearts," a season or two ago, and enables her to make Edison, Victor and Pathe records. Perhaps you also saw her dance in "The Spring Maid."

We would hardly expect any one with such versatility to be domestic, but that is just where we are mistaken, for Gladys is a beautiful seamstress and excellent cook. In fact, she admits making the best chocolate cake and the worst pies in creation. As a matter of fact I was promised one of those cakes months ago, and I'm still waiting for it. This provides a splendid opportunity for a gentle reminder!

Gladys's vivacious temperament is reflected in her sparkling face with the smile that never comes off. She

has a trick of winding her wavy brown bobbed hair around her finger just as her mother does, and it is so soft and pretty that you want to wind it too. Speaking of her mother reminds me that it is almost impossible to think of Gladys without remembering that person whom the Gang calls "her kid sister," for Mrs. Rice and her tall daughter seem to be the best pals ever, and I don't remember ever having seen one without the other.

Vivacity with Gladys, though, doesn't take the place of determination, for she gave up Smith College in order to make something of her voice. She is even determined to get fat, as there are only one hundred and twenty pounds to the credit of her five feet five, so she is drinking cream with avidity. To own a car is another desire.

"I've got my eye," she says, "on a four-passenger Buick coupe. I may end with a Ford, but if it's the last thing I do I'll get that car!"

This active young woman is an insatiable reader and an accomplished pianist, which reminds Mother:

(Turn to page 94)

♪ HOW DO YUH DOODLE DOODLE . ♪
DOODLE DOODLE DO ! ♪

The Midnight Frolickers

Here we have two popular entertainers of CKAC, La Presse, Montreal. They are Ernest Le Messurier and Bunny Foster.



Le Messurier writes and sings his songs, while Foster composes and plays the accompaniment. This drawing is "an impression of ourselves" by Le Messurier.

Broadcast Impressions

By Ed Randall



Ralph Palmer Merritt, member of U. S. Farm Commission, telling his "Dog and Bear" story

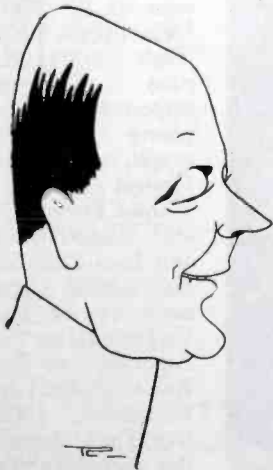
Here are some of the speakers at the National Republican Club whose luncheons are held weekly in New York City. The programs are usually broadcast through WJZ, WRC and WGY.



Benjamin F. Yoakum, formerly President of the St. Louis and San Francisco Railroad, telling the farmer to pay as much attention to business methods in running his farm as he does to the production of crops



Rosario Bourdon of New York—in action—leading the Victor Concert Orchestra, whose programs are broadcast through WEAJ



Hon. James W. Wadsworth of New York, member of the U. S. Senate, was the last speaker at a recent luncheon. As he put it: "It is my duty to empty the hall. I've had this job on many occasions and been quite successful"



Hon. Robert D. Carey of Wyoming, Chairman of the U. S. Farm Commission and formerly Governor of Wyoming, has produced a scenario on sheep raising. The "Dude Wrangler" is the bane of the cattle business, he agrees

IN case you didn't hear Mr. Merritt's "Dog and Bear Story" here it is—It seems a fellow played the part of a bear to develop the fighting qualities of a timid dog owned by a friend. The scheme worked so well that after several false attempts the dog attacked viciously and the fake "bear" yelled to his friend to call the dog off. The friend objected, at the same time remarking: "It may be tough on you, but it's the making of the dog."

Tug Boat Dispatching

The radio system of dispatching tugboats increases service

By Pitt P. Hand



THE New York Central Railroad in an extended test handled in co-operation with the Radio Corporation of America is considering dispatching its tug boats in New York Harbor by wireless.

The system is devised to replace the present practice of directing the movements by the chief dispatcher of railroad tugs and steam lighters by land telephone orders communicated to the captains of these vessels when tied up to piers throughout the Metropolitan harbor district. The object sought by the New York Central in utilizing rapid radio communication is to speed up the movement of that portion of its traffic handled by marine equipment.

The tug selected by W. B. Pollock, Manager of the Marine Department, for the first demonstration was "New York Central No. 18," under the command of Captain C. W. Degan. Under the supervision of G. Harold Porter, General Superintendent of the Marine Department of the Radio Corporation of America, this tug was equipped with a special radio telegraph transmitter of the vacuum tube type, together with a suitable receiver. This apparatus is so designed that it can be operated continuously

with absolutely no interference to broadcast listeners ashore.

All communications were handled on 600 and 660 meters, but as the service develops, the system will probably be changed to radio telephony and shifted to some special band of short wavelengths below those now used by the broadcasting stations. This would enable the tug boat captains to talk directly with the chief tug boat dispatcher.

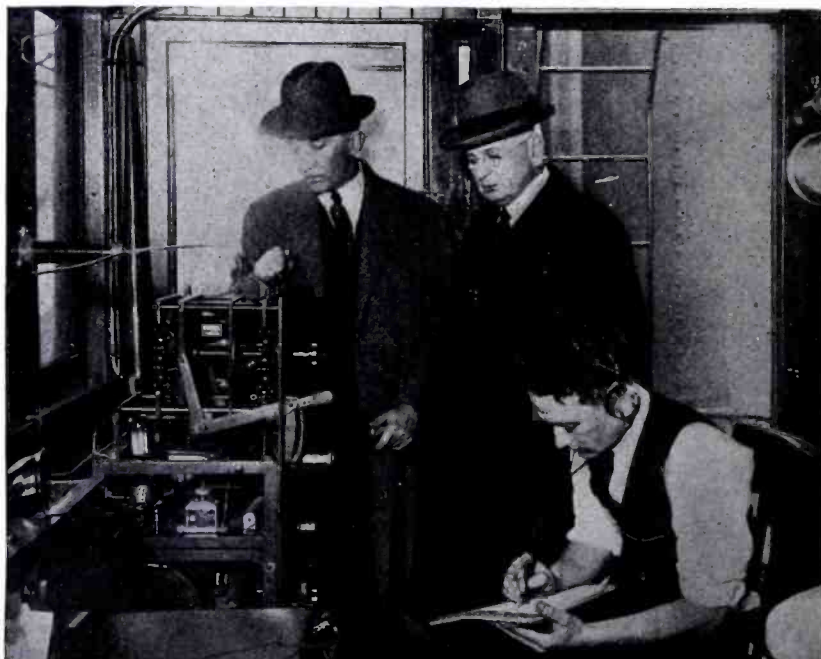
The tug with this special demonstration equipment in charge of G. H. Hamilton, operator, communicated and received messages from the Radio Corporation shore station, WNY at Bush Terminal, Brooklyn, via wireless, the tug having the code signal KFTQ. Between the Bush Terminal station and the chief tug dispatcher's desk at the New York Central Marine Depart-

ment office at 6 Beaver Street, a direct telephone connection was maintained.

This type of service proved a success on its inauguration day. Messages between the tug and the dispatcher being sent and answered in a total lapse of time amounting to one and one-half minutes. In cases where messages were exchanged while the tug was enroute between given destinations the saving in time formerly consumed in receiving dispatching orders was greatly reduced, and added materially to the service the tug could be utilized for in the movement of traffic.

The New York Central, if it adopts ultimately the system of marine radio telephone dispatching will install receiving and transmitting sets on a total of 43 tug boats and steam lighters now in service in the New York harbor district.

The inauguration of the demonstration was witnessed on board tug No. 18 by W. B. Pollock, Manager of the Marine Department, New York Central Railroad; E. C. Keenan, Superintendent Telephone and Telegraph, New York Central Lines; G. Harold Porter, General Superintendent and Paul Ringold of the Marine Department of the Radio Corporation of America, and B. A. Kaiser, Special Representative, Executive Department of the American Telephone and Telegraph Company. All agreed that the system would prove a success.



G. Harold Porter, General Superintendent of the Marine Department of the Radio Corporation of America, W. B. Pollock, Manager of the Marine Department of the New York Central Railroad, and Operator G. H. Hamilton conducting the test

Cross Word Contest

One Hundred Prizes To Be Awarded

HORIZONTAL

- 1—Variable resistance (PL)
- 2—A very rich man.
- 10—Support for chickens
- 17—Apparatus for electrical communication.
- 23—By way of.
- 24—Noisy.
- 26—Receiving coils.
- 29—Reach a destination.
- 30—Meaning height (abbrev.)
- 31—Lukewarm.
- 32—Halo (Pl.).
- 34—One who begins.
- 35—Radio signal that suspends broadcast.
- 36—Wicked.
- 38—Organ containing pollen in a flower.
- 39—A gesture.
- 41—One of the greatest developments of science.
- 43—Weapons.
- 44—Hearts of transformers.
- 45—Unit in Radiotrons (Pl.).
- 46—Period of time.
- 48—Radio operators' code for "From."
- 50—Nankara University (ab.)
- 51—Middle western state (ab.)
- 52—Aerial.
- 55—"Received" (International radio code).
- 56—Resident of Fresno.
- 59—Antinodes.
- 61—Transform.
- 64—Island near Italy (ab.)
- 65—Man's nickname.
- 66—Street (abbrev.)
- 67—Prefix.
- 68—Go to and fro.
- 69—Pledge of honor.
- 72—Famous marine coastal station.
- 74—Da Da Da; Dit Da.
- 75—Blood vessels.
- 80—Tract.
- 82—Dit Da Dit; Dit Da Dit; Dit; Dit Da Dit.
- 83—Radio operators' signal denoting merriament.
- 84—Southern state (abbrev.)
- 85—Taverns.
- 86—Sense of fitness.
- 89—Brought forth.
- 90—Fabled female monster.
- 93—A collection.
- 94—Scanty salary.
- 97—Prefix meaning before.
- 98—Horror-struck.
- 99—Fuse.
- 100—Knight of the Garter.
- 101—Conjunction.
- 102—Electrical engineer (ab.)
- 103—Ocean-going steamers.
- 104—Da; Dit Da Dit; Dit.
- 105—Da; Da Dit Da Da; Da Dit Dit.
- 106—Medieval theologian.
- 113—Western continent (ab.)
- 114—Old Testament.
- 115—Dit; Dit Da Dit; Da.
- 116—Suppose; conjecture.
- 118—Corrected.
- 119—Jog.
- 121—Manuscript (abbrev.)
- 122—Central America (abbr.)
- 124—Unit.
- 125—Hard, glossy coating.
- 129—Large city in British India.
- 133—Grassy field.
- 135—Central Eastern state (abbrev.)
- 136—Fondle.
- 137—Revised statutes (abbrev.)
- 138—Sitting or standing across.
- 139—Signal: "End of message."
- 141—What radio operators transmit.
- 143—Staten Island (abbrev.)
- 144—Self.
- 146—Fragrance.
- 148—Doctor of Medicine (abbrev.)
- 149—Prefix.
- 150—Past participle of start.
- 151—Preposition.
- 153—Animals of bay color.
- 155—Duration.
- 156—Western state (abbrev.)
- 157—Electric company (abbrev.)
- 158—Cash Delivery (abbrev.)
- 159—New England state (abbrev.)
- 160—Power converters.
- 162—Pieces out.
- 163—Unit of type measure (Pl.)
- 164—Real or artificial words.
- 165—Athletic association (abbrev.)
- 168—Preposition.
- 167—Exists.
- 168—Obliterate.
- 170—Dit; Dit Dit; Da; Dit Dit.
- 171—Direction (abbrev.)
- 172—Lowest point under foot.
- 173—Time before noon.
- 175—Radio signal for position report.
- 176—New Testament (abbrev.)
- 177—Those who own estates.
- 179—Large city in California (abbr.)
- 180—Water (French).
- 181—Ourselves.
- 182—Definite article (French)
- 183—Alienate.
- 188—Proceed.
- 189—Mournful.
- 191—Heaped together; amassed.
- 192—Spheres.
- 193—Reaction circuit.



VERTICAL

- 1—RCA sets.
- 2—Girl's name.
- 3—Greasy liquid.
- 4—Rested.
- 5—Dynamo delivering AC current.
- 6—A digit.
- 7—A highly popular set (Pl.).
- 9—Exclamation.
- 10—Type of serpent.
- 11—A burden as of proof.
- 12—Girl's name.
- 13—Parts taken by actors.
- 14—August.
- 15—Radio code for "Observer."
- 16—Steamship (abbr.)
- 17—Form of communication when WCC works KPH.
- 18—Sit.
- 19—Brightened.
- 20—Time preceding.
- 21—Begin to grow.
- 22—An Inn.
- 23—Prima Donna.
- 27—Longs.
- 28—Township (abbr.)
- 29—Dit Da; Da; Da Da Dit; Dit.
- 32—Performed.
- 34—Form of address.
- 37—Long Island (abbr.)
- 38—Conjunction.
- 40—Da; Dit Da Dit; Dit.
- 42—Sacrifices.
- 43—Meeting or touching of two circuits.
- 46—AC so forth.
- 47—Girl's name.
- 49—Form of address.
- 51—Builder's in brick or stone.
- 53—Highly explosive liquid.
- 54—Stories.
- 57—One dot.
- 58—Personal pronoun.
- 60—Possessive pronoun.
- 62—Township (abbr.)
- 63—Rods of iron rendered magnetic by current.
- 69—Name of a large canal.
- 70—Ambassadors (Ltn.)
- 71—Kansas broadcasting station.
- 73—Feminine pronoun.
- 76—Make dear.
- 77—Royal Navy (abbr.)
- 78—Detaches.
- 79—Stop, as bleeding.
- 80—Lesson; decrease.
- 81—Dit; Dit Da Dit; Dit Dit Dit Dit.
- 87—Suffix.
- 88—Determining experiments.
- 91—Gnawing mammal.
- 92—All correct.
- 95—Electrical term.
- 96—International signal for telegram to be mailed by registered post.
- 107—Almanac.
- 108—His Majesty (abbrev.)
- 109—Da Da Da; Dit.
- 110—Long Distance (abbrev.)
- 111—Sizing.
- 112—Apply; mete out.
- 117—Pidgin English (abbrev.)
- 120—"Other lines" (Telegraph code).
- 123—Smallest portions of matter.
- 124—Pray (Latin).
- 126—American Revolution (abbrev.)
- 127—Molucca Island (abbrev.)
- 128—Trained; instructed.
- 130—Botanical Garden (abbrev.)
- 131—Article.
- 132—Southern state (abbrev.)
- 134—Atmosphere.
- 135—Summits.
- 136—A government protection.
- 138—Opposed; detrimental.
- 139—Instigate.
- 140—Regarding (abbrev.)
- 142—Kind of battery.
- 145—Turn into bone.
- 147—Person doing this puzzle.
- 148—Mediocr.
- 152—Public speaker.
- 154—Old English (abbrev.)
- 156—Bow the head.
- 161—Point on the compass.
- 164—A membrane; net.
- 169—Formerly.
- 172—Small horse.
- 173—Southern state (abbrev.)
- 174—Encountered.
- 178—South American Indian (abbrev.)
- 180—For example.
- 184—Preposition.
- 185—Inland transit (abbrev.)
- 186—From (Latin).
- 187—Canadian province (abbrev.)
- 190—God Willing (Latin abbrev.)

CROSSED CODE

Composed by Helen F. Dittus

PRIZE CONDITIONS: Yearly subscriptions to WIRELESS AGE, The Radio Magazine, will be awarded to 100 correct solvers of the "Crossed Code" crossword puzzle who send in the best replies in 50 words or less to the question: "What Do You Like in Radio?" The editors of the WIRELESS AGE will select the winning letters on the basis of legibility, style, point of view and practical value. Closing date March 15. Winners will be announced in the May issue. The solution will appear in April WIRELESS AGE. Address "Crossed Code," WIRELESS AGE, 326 Broadway, New York City.

Solution to February Puzzle

(Winners will be announced in April WIRELESS AGE)



THE LOUDSPEAKER and Radio Reception

Physical characteristics of diaphragms—
Transverse and various modes of vibrations

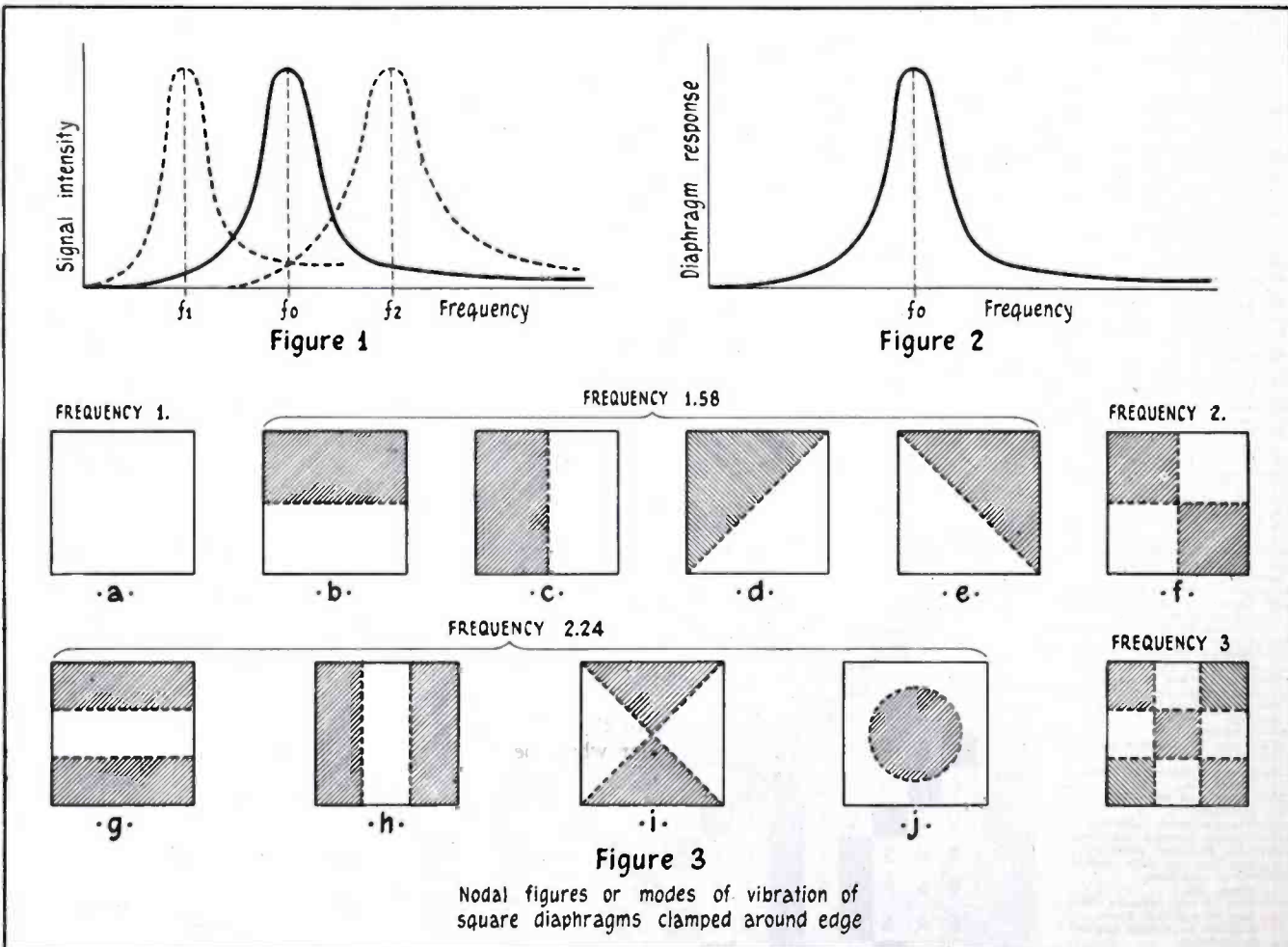
By John P. Minton, Ph.D.

IN our two preceding articles on "Loud Speakers and Radio Reception" we have described the various types of units used for loud speakers. We have described also how these units work when connected to a radio receiver and have pointed out the important differences that exist amongst the various units. With these two articles as a basis we are in a posi-

tion to discuss, in a way understandable by all, the function of the diaphragm, some of its important physical characteristics and the reproduction by it of the speech and music sent out from the broadcast station. Let us consider first the physical characteristics of the diaphragm.

of the ordinary bipolar receiver must be made of iron in order that the change in magnetic force on it may be brought about by the signal currents. The way in which vibrations, in unison with the speech and musical currents, of the diaphragm are produced has already been explained. We want now to consider the diaphragm itself and how the radio signals are going to

law, action and reaction are always equal and opposite, we must see that we take into account all the reactive forces. For a diaphragm the magnetic pull due to the signals is the direct force. The reactive forces are those due to the weight, stiffness and internal resistance of the diaphragm. The "weight" or inertia force is equal to the product of



tion to discuss, in a way understandable by all, the function of the diaphragm, some of its important physical characteristics and the reproduction by it of the speech and music sent out from the broadcast station. Let us consider first the physical characteristics of the diaphragm.

As has been explained in the first article on loud speakers the diaphragm

effect it during the process of sound reproduction.

To begin with all of us know from our every day experiences what a force is. In mechanics we have three kinds of reactive forces. What do we mean by reactive forces? These are forces which are trying to prevent the direct force from doing so much. Since, according to a well known mechanical

the weight (mass) and the acceleration of the diaphragm as it vibrates to and fro. The "stiffness" or elastic force is equal to the product of the stiffness coefficient and the amplitude of the vibrations as the vibrations occur. The "resistance" force is equal to the product of the mechanical resistance and velocity of the diaphragm as it vibrates. In other words, in a simple case, we

may write on one side of an equation the magnetic force, F , and on the other side the quantities ma , rv and sd where m , r and s are mass, resistance and stiffness coefficients of the diaphragm and a , v and d are acceleration, velocity and displacement of the diaphragm at any time or instant during the vibrations. The equation would be, then,

$$F = ma + rv + sd$$

This shows in a simple way how important are the weight, resistance and stiffness of a vibrating diaphragm. It is our aim to produce large vibrations of the diaphragm in order to get intense sound signals. If the signal currents are a definite maximum amount which the receiver can give without distortion and overloading, how can we design a diaphragm to produce the loudest sound for this given case? Obviously we shall secure the loudest sounds by getting the largest vibrations. Confronted with this law of "action and reaction being equal and opposite" how shall we secure these large vibrations which are needed?

Theoretically, this is a simple task: Looking at our equation,

above, let us suppose that the iron is less stiff. Then the displacement, d , or amplitude of vibration will increase automatically. This will give louder signals for a given force particularly over the lower frequency region. Again, suppose we use a lighter diaphragm, then the acceleration will increase, which corresponds to larger vibrations, and thus more intense signals will be obtained, particularly at the higher frequencies. The less the internal resistance (molecular resistance as the diaphragm crystals are forced to slide about during vibration) the greater the velocity and amplitude of vibration and, therefore, more intense signals, particularly over the middle frequency region where the stiffness and mass forces have about balanced each other out.

This point where the stiffness and mass forces balance each other is called the natural frequency of the diaphragm. In any particular diaphragm this natural frequency is at a definite,

fixed value. If we could vary either the mass or stiffness factors at will, then the diaphragm could be tuned at will, so to speak. We would have, then a system corresponding to the station selector of a receiving set. In a receiving set we vary the tuning to

as indicated in figure 2. If the frequency of the applied magnetic force is equal to f_0 , the natural frequency of the diaphragm, the response of the diaphragm will be greatest. In fact the stiffness and inertia reactive forces balance or cancel each other at this

particular frequency just as the inductive and capacity electric forces balance each other at the natural frequency of the receiver. At this frequency, the electric current is prevented from attaining large values because the electric resistance limits it. In the same way as the natural frequency of the diaphragm the mechanical resistance of it prevents the amplitude of vibration from becoming large, relatively speaking.

Hence in the frequency region corresponding to the natural period of the diaphragm, the mechanical resistance is the controlling factor. Below this natural frequency the stiffness force becomes more and more important, until finally the inertia and resistance reactive forces can be neglected. Above this natural frequency, however, the inertia reactive force be-

comes more and more important until finally it completely outweighs the stiffness and resistance reactive forces. What shall, or perhaps better, what can be done with this system to obtain good results, is a question which requires much time and thought for its answer. Let us, now, consider some additional physical characteristics of diaphragms.

Not only will a vibrating diaphragm vibrate strongly when actuated by an alternating magnetic force (such as caused by the signal currents) whose rate of vibration corresponds to that of the natural frequency of the diaphragm, but it will vibrate quite vigorously at certain other frequencies which are higher than the natural frequency. These frequencies correspond to what is referred to as the normal modes of vibration of a diaphragm. In the case of a square diaphragm some of the various modes of vibration are represented in figure 3. 'a' represents the

(Turn to page 75)

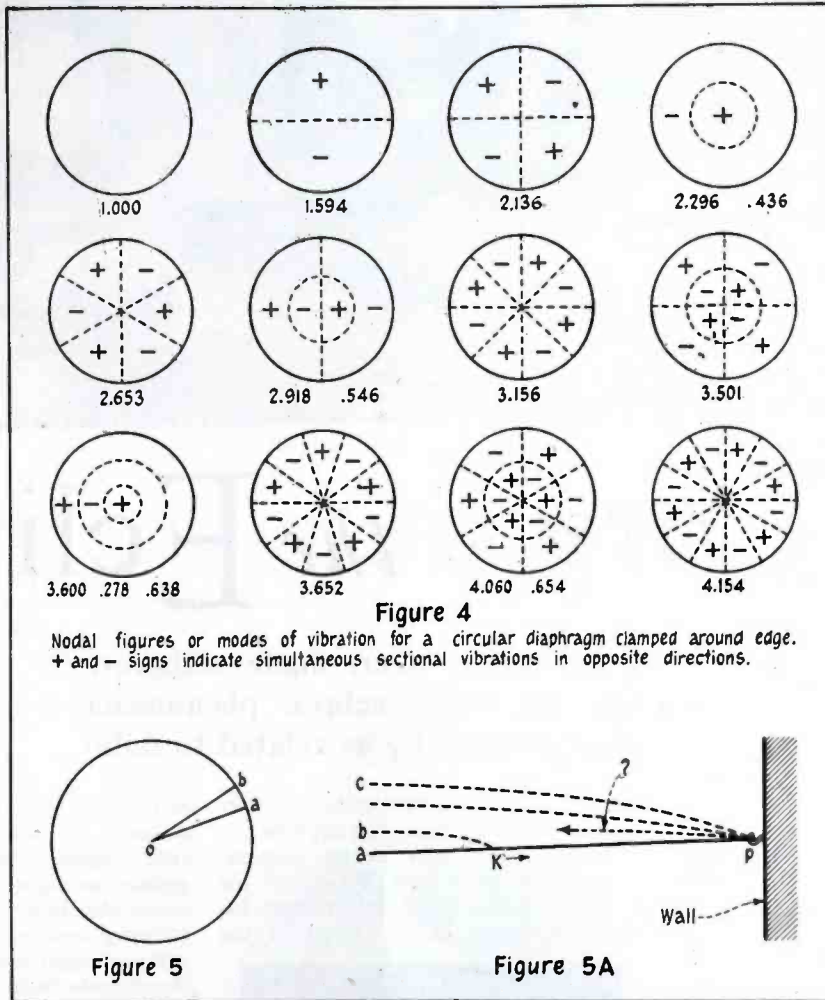


Figure 4
Nodal figures or modes of vibration for a circular diaphragm clamped around edge.
+ and - signs indicate simultaneous sectional vibrations in opposite directions.

Figure 5

Figure 5A

give different natural frequencies to the set and thus are able to select or tune-in the different stations. The case of the diaphragm and the tuning circuit of the receiver are exactly analogous.

Now, in the case of the receiving set, the signals are louder when the station is exactly tuned-in, than when the system is imperfectly tuned; that is, slightly de-tuned. Referring to figure 1, if the tuning is exactly right, corresponding to a station frequency of f_0 , the signals will be a maximum. If, however, the tuning is less perfect, corresponding to frequencies f_1 , f_2 , or others not equal to f_0 , the signals will be less loud. In fact, some sets need to be very accurately tuned, indeed, in order to get satisfactory signals in quality and loudness.

In the case of a diaphragm, we have the same phenomenon entering. The response or amplitude of vibration of the diaphragm to the magnetic force varies with the frequency in a manner

Dr. A. N. Goldsmith, C. B. Beach, A. Van Dyck and Dr. Van B. Roberts of the Radio Corporation of America adjusting the apparatus used in making radio tests during the eclipse



The Story of the Eclipse

Scientists the world over, made elaborate preparations to study eclipse phenomena and its effects, especially as related to radio

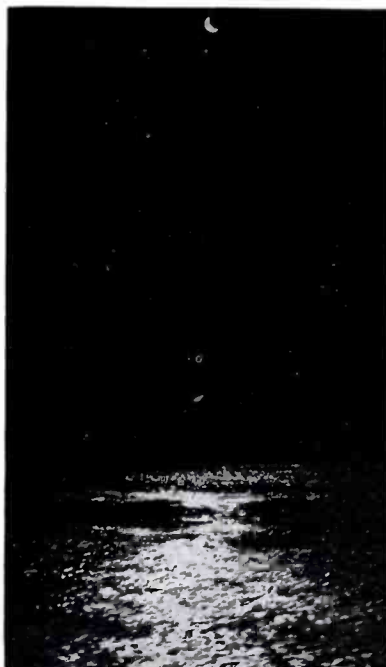
AFTER much advance preparation for an event which was long in coming and which will be long in reappearing, scientists and engineers tell us the eclipse of the sun had a marked effect on radio conditions. Officials of the Radio Corporation noted that static, the terror of all DX fans, is not entirely a local condition because it was affected by the general conditions attending the eclipse. The long waves of the trans-oceanic stations which were irregular in intensity during daylight before the eclipse became noticeably regular, and had greater audibility during the totality. Concerning the effect on short waves, Dr. A. N. Goldsmith reported the short wave—75 meters—could not be heard until just before sunrise when it made a faint appearance. As the sun appeared the signals became stronger, likewise the static. During the totality the short wave was blotted out entirely, and conditions were exactly the same as before the sun rose. When the eclipse ceased the short waves and also the static returned as the sun appeared. The longer waves were affected in exactly the opposite manner. They were irregular and weak before the eclipse and became strong and regular during the totality. In Chicago the tests proved conclusively that the sun's rays

were responsible for the reduced power of broadcasting during the daytime.

There were very elaborate preparations made at station WGY of the General Electric Co. at Schenectady for the observation of the effect of the

eclipse on radio reception and transmission. It is well known that a station's signal strength becomes much greater at night. It is possible to get some idea how radio waves travel by noticing how much stronger they become at night and the extent to which the signals fade in or out. It is also possible from such observations to get information as to whether radio waves travel along the earth exclusively or whether they also travel far overhead. Some scientists and engineers hold that there is good reason to believe that electromagnetic waves travel through space in the upper strata of the earth's atmosphere being reflected back to the ground by a layer of air in the upper regions that has the property of electrical reflection.

The instruments used at WGY were two complete Radiola Superheterodyne receivers which were each connected to a recorder, one of the receivers was tuned to the 380-meter wave and the other especially adapted for the 75-meter wave. It was not desirable to depend on the ears of the observers for the accurate measurement of the signal strength as too much of the human element entered into this and the ear is not sensitive enough, so the automatic records were employed. The strength of the radio signal was recorded by a



An unusual photo of the eclipse taken at sea aboard the S. S. Paris

wavering ink line similar to that produced by a barometer. An electrical clock was provided and both recorders were electrically wound and kept synchronized with the clock, the tape moving forward about one inch per minute. The temperature, the air pressure, and the humidity were also recorded, in order that all circumstances which might possibly affect the radio signal would be on record. These experiments were not limited to the time of totality, but were carried on previous to and for several days after the eclipse. Dr. A. N. Goldsmith, C. B. Beach and A. Van Dyck together with Dr. W. Van B. Roberts in the experimental laboratory of the Radio Corporation of America conducted these tests.

Another point bringing out the elaborate preparation made for the rare occasion was the transmission of time by station WEA, of the American Telephone and Telegraph Co. of New York City. All clocks and watches used in connection with the tests were checked with Arlington's time signal to insure accuracy and also the time of the individual observers was checked. WEA sent out a continuous tone, which was interrupted once every minute, a second interruption was made at the end of every five minutes. This was done in order to make certain that observers in the field reported the correct time of totality.

It will be weeks before scientists will come to any definite conclusion as to just what effect if any, was made on the sudden change from daylight to darkness. The receiver at the Radio Corporation laboratory seemed to show a lessening of interference as the atmosphere darkened, giving a steadier tone and a more reliable signal. On the lower wavelength in the neighborhood of 80 meters the interference was so great that it is thought the record will be valueless. At the moment of totality a sudden jump was recorded that was not sustained for more than a second. It is generally reported, however, by listeners-in that during the eclipse, the shutting out of the

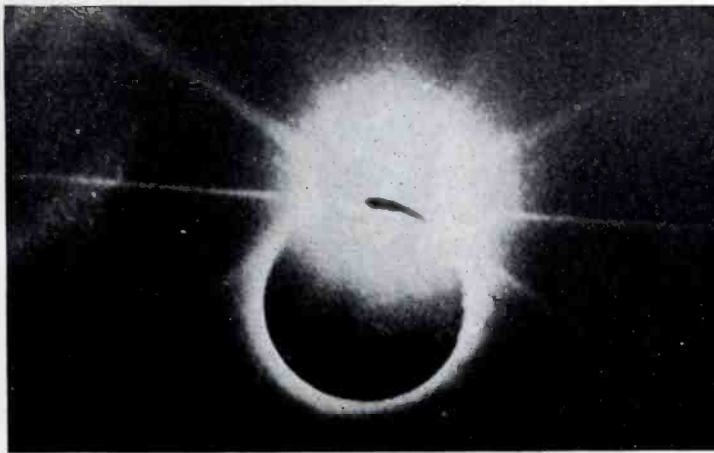


Photo of eclipse taken at point of totality just as it ended and the flaring streamers of light from the sun broke out

sun gave a slight increase to signals—these reports coming mostly from the Western States. Reports from England where the eclipse was only partial, indicated a radio signal of increased audibility, especially with respect to the United States. It was reported that a decided increase in signal strength from KDKA on 62 meters and WGY on 380 occurred at the moment of totality. These stations

fact has been the increase in range during a momentary period at the breaking of dawn. Just before daylight for a few moments tremendous ranges can be covered greater than even during the darkness. Foreseeing the possibility of testing this sunlight theory during the period of artificial darkness produced by the eclipse, the Zenith Radio Corporation established its 100-watt Portable Broadcasting Station WJAZ mounted on a one-ton truck in Escanaba, Michigan, in the exact center of the path of totality. A wavelength of 268 meters was used with a total power of 100 watts, the radiation being approximately three amperes with an upward modulation of 4/10 ampere.

A three-hour musical program was given each night for three nights preceding the morning of the eclipse, these programs each running from 10:00 P. M. until 1:00 A. M. About 500 telegram reports per night were brought in, and the average distance covered during these evening programs was approximately 800 miles. The normal range of the transmitter during the night period therefore would appear to have been 800 miles as a maximum. On the evening preceding the eclipse the transmitter did not equal this range.

At 3:00 A. M. a second program of music was started and this ran through until 9:00 A. M. The eclipse occurred at 8:02 A. M., Central Standard Time. No change was made in the apparatus and only ordinary normal results were obtained, a few telegrams from Missouri, Kansas and Eastern Nebraska reporting reception.



Dr. E. E. Free, chief of the Scientific American expedition, at Easthampton, Long Island, operating apparatus designed by Thomas A. Edison, Inc., to secure permanent records of effects on radio transmission during the eclipse



World Wide News

By C. S. Anderson

Managing Editor of Wireless Age

Radio Bans Lifted—Soviet Broadcasting—Radio Invades Spain—New Stations in Germany—International Exposition

Radio Bans Lifted

GRADUALLY the smaller countries of the world are awakening to the possibilities of radio broadcasting as a means of entertainment and education with the result that their governments are beginning to lift the rigid ban against the use of radio apparatus. This awakening offers wonderful opportunities to the American manufacturer, giving him new outlets for surplus production.

The British government for two years maintained a complete embargo against all foreign apparatus. This has now been lifted and the field is open. Australia is another important field for American apparatus. The Antipodes and South American countries have their radio seasons during the off season in this country. This is due to their location south of the Equator.

Soviet Broadcasting

RUSSIAN radio, although practically unheard of abroad, has taken big strides in the past year. Many large stations under the control of the Union of Soviet Socialist Republics now broadcast regularly from Moscow, from Leningrad, (Petrograd), and from Nijni-Novgorod. Moscow boasts two; the huge central station operating on a wave length of 3,200 meters, and a smaller military station. In the afternoons, the former station broadcasts political news and weather reports; and in the evening

it entertains the Russian public with musical programs and items of news.

Radio Invades Spain

SPAIN was almost the last of the older nations to take up radio seriously; but now over 100,000 licenses have been issued for the in-

stalling of receiving sets. There are many amateur broadcasting stations in the towns, employing up to the maximum power which is 100 watts. It is prohibited for an amateur to use a set with a wave length between zero and 120 meters, so that very short wave transmission is practically impossible for them. All amateur transmitting sets are subject to a tax of 200 pesetas which must be paid to the Spanish government annually.

New Stations in Germany

BROADCASTING is advancing in leaps and bounds in Germany. A new station working on 392 meters has recently been finished at Hanover; and plans have been completed for two other stations, one at Kassel and one at Dresden, both of which will be started shortly. The exhibition held just last month has done much to arouse interest in radio all over Germany; and is hastening the construction of transmitters as well as the sale of receivers.

International Radio Exposition

GENEVA is to have a new International Exposition of radio in the fall of 1925. It will take place in the Electoral Palace between the 23rd of September and the 4th of October. During the session of the League of Nations, the committee has organized radio shows to take place in relation with the work of the Assembly.



King Alfonso of Spain, making his first appearance in a Spanish broadcasting station

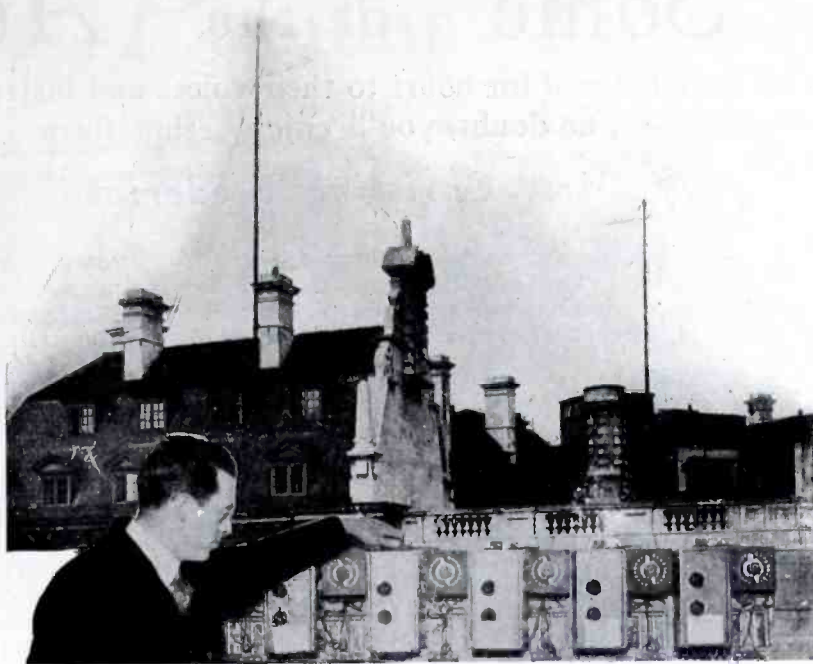
Stations in Greenland

GREENLAND leaps into the radio limelight with the construction of four stations there by the Danish government. Three are being built on the west coast, one at Julianehaab, one at Godthaab, and one at Godhavn, each placed five degrees of latitude apart. The fourth station, at Angmagssalik, is on the east coast, opposite the Godthaab station.

The Julianehaab station is being built to maintain communication with the Feroe Islands, which lie about 1,300 miles away; and when atmospheric conditions are favorable, they hope to reach as far as Copenhagen (2,200 miles.) It is expected that all the stations will be completed before the end of the year.

New Station for England

PLANS have been accepted and construction started on the high power broadcasting station in Daventry, England, by the British Broadcasting Company. The aerial will give a fundamental wave length of about 1600 meters. The power rating is estimated at 25 kilowatts although the actual consumption will more nearly approximate 100 kilowatts.



London Station 2LO and Capt. P. P. Eckersley, chief engineer with relaying apparatus

Danes Reorganize

DENMARK is now reorganizing its wireless system, in order to avoid unreasonable competition between the various State radio stations. At present the State owns and conducts three stations. To these is to be added a powerful dispatching station, to be erected by the naval authorities near Copenhagen. Broadcasting is conducted by private radio clubs, which are allowed the use, to some extent, of the government stations.

New Station for Nicaragua

THE radio station at Managua, Nicaragua, was placed in operation in January. The new station is

one of the most powerful among the fifteen or more radio stations which rim the Caribbean. It occupies a commanding site on the shores of Lake Managua, three miles from Managua. Its city offices are directly opposite the presidential palace and a most modern system of remote control and multiplex operation gives instantaneous service between city office and plant.

Two transmitters have been installed. One is a twenty kilowatt tube outfit, the other is a one kilowatt tube transmitter.

To Broadcast Inaugural Ceremonies

ARRANGEMENTS have now been completed to enable the entire radio audience of the United States to "listen in" to the Inaugural Ceremonies at Washington, D. C., on March 4.

This announcement was made following a conference between the committee appointed by Congress, representatives of the American Telephone and Telegraph Company, the Chesapeake and Potomac Telephone Company and the Radio Corporation of America.

The proceedings will be broadcast through WEAf, WRC, WJZ, WGY and many other stations throughout the country.



Every large club in Berlin is equipped with receiving apparatus as shown here to furnish news of all important events by radio

Meet Some of the Atlantic

You have listened for hours to their voices and instruments so, no doubt, you'll enjoy seeing them

By Mrs. Christine Frederick

HARDLY any mythical characters, from our fairy tale days up, have inspired in us the feeling of friendliness and influenced us in favor of their charming, unknown personalities as have the radio broadcasters. We have listened for hours to their voices and instruments coming through that magic medium of air. Notwithstanding our sophistication we have often built up in our own imaginations personal ideas of what these broadcasters are like and what they stand for. Sometimes it almost has seemed as if they weren't real. Yet, of course, all these broadcasters are honest-to-goodness he-men and she-women, thoroughly human, with all the delightful high lights and shortcomings of human beings. Probably these very qualities in them make them "get across" to us over that intangible abyss of air building a bridge of spirit. Human beings, when complementary to each other through these qualities of spirit, feel drawn to each other, even through the air; and repelled when they do not complement each other. Such a quality is enormously important to a radio broadcaster, for we get the "feel" and sense of his or her voice and sympathetic humanness long ere we visualize the real person back of it. For few radio fans need a formal introduction to these "voices" and "personalities" of the popular broadcasters. Nevertheless it will be interesting to see what they look like and to get a "line" on what they do and what they think.

AMONG the most popular of these eastern broadcasters is the famous French organist, Marcel Dupré, who, I am sure, is well known to all radio fans. Mr. Dupré has justly been called the "Paganini of the organ," and a master for whom it has no secrets. We do not want to go into ecstatic adjectives, but there are such words as "gifted genius" that suggest

themselves when we think of what Mr. Dupré has given us "over the air." He has conducted recitals all over the country and, in fact, has the honor of giving more organ concerts than any other organist in the country. He has appeared with a number of the larger orchestras and recitals over the radio



Rosaline Greene, leading lady of the WGY players

Now a voice may be the only requisite necessary for an alluring personality "over the air," but certainly Miss Rosaline Greene, leading woman of the WGY players, Schenectady, New York, seems to have innumerable other allurements. In the photo shown of her she seems about ready to play "Peter Pan," and, in fact, has that charm that gets across the footlights and the air. Miss Greene is only eighteen and a junior at the New York State College for Teachers at Albany, where she is taking the classical course.

She has been with the WGY players for a year and if there is such a thing as a "radio voice" Miss Greene has it. Last Fall, shortly before the opening of Max Marcin's "Silence," a Selwyn production on Broadway, the WGY players were permitted to put this play on the air. Rosaline Greene played the lead. The producers and author listened in. Miss Greene was offered a chance to understudy the female lead in the New York production. Thus she evaded the hardship and disappointment of cooling one's heels in the outer offices of theatrical producers—she went to the producer's home, via radio waves. The offer was most alluring, but Miss Greene preferred to complete her college course and gain a little more experience before seeking a place in professional ranks. Besides, it must be thrilling to play, at such a youthful age, to millions of people, even though they are not visible to Miss Greene's laughing eyes!

through the Wanamaker station were broadcast by Stations WJY, New York; WGY, Schenectady, and WRC, Washington, on January 8th. Mr. Dupré has a most commendable record, and in musical circles it is believed that this generation has known no organist who has created so great a sensation. Certainly Mr. Dupré at 38 has attained a most remarkable position. Think of the organists of the past who, if they played to a thousand considered themselves playing to a large audience. Mr. Dupré plays to millions. Organ recitals are, by natural limitation, so little available to the public on the scale and with the general musical range provided by radio, that the public has been unusually grateful.

THEN you must shake hands with—or rather take a look at the personnel of The New York Trio, composed of Clarence Adler, pianist; Louis Edlin, violinist, and Cornelius VanVliet, 'cellist. This New York Trio is in its sixth season and has appeared, as the only chamber music group ever engaged as soloist as an organization in the history of its career, by the Philharmonic Orchestra under Mengelberg. Clarence Adler was born in Cincinnati and has been heard in ensembles with the Kneisel, Flonzaley and Letz quartets, and as solo artist with the New York Symphony Society and New York Philharmonic Orchestra. Louis Edlin is a native of New York and has had such masters as Volpe,

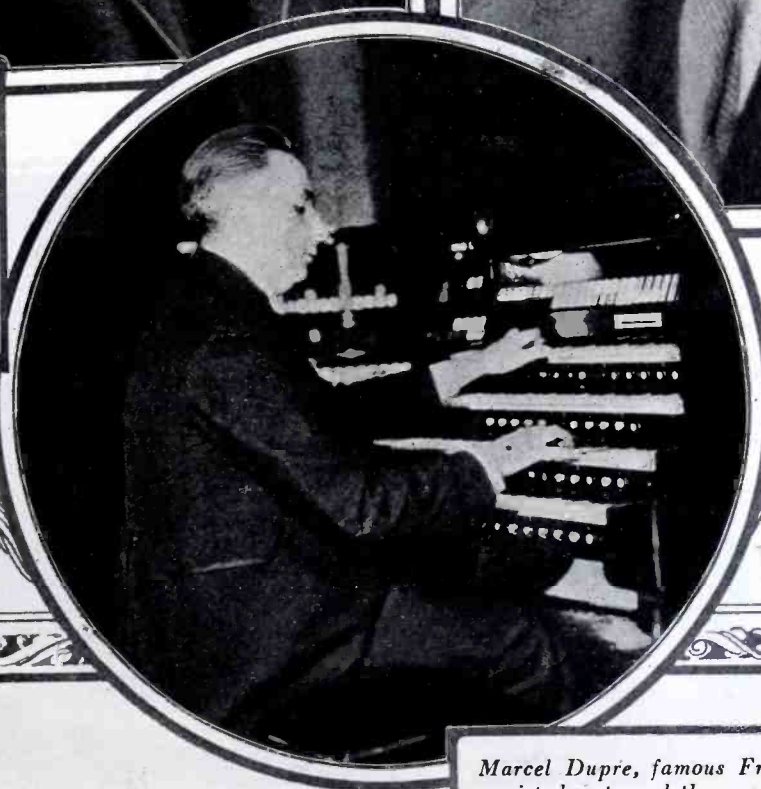
Coast's Popular Broadcasters



Dr. H. H. Saunderson, author and preacher, who gives original "Tales and Talks" every Tuesday evening from WGI



Oliver Saylor, author and dramatic critic, broadcasts his "Footlight and Lamplight" from WGBS every Thursday evening



Marcel Dupré, famous French organist, has toured the country over in recitals and has broadcast from the principal stations

Outstanding Artists From Outstanding Stations



Elsie Jean, well-known writer and composer of children's songs and stories, broadcasts regularly from WJZ, New York



Miss Mary E. Vogt, organist of station WOO, Philadelphia, is highly talented and one of the most charming of broadcasters



Miss Helen M. Haney, editor and writer, talks every Friday evening from WGI on "Fashions in Footwear"



Harold Anson Bruce, "king of small college track coaches" and a director of physical training in Union College gives an "air treat" every Monday evening from WGY



Dr. Sigmund Spaeth, Music Editor of station WOR, gives a "Studio Party" every Monday evening—If you have not attended one, tune in next Monday and get a real treat

Kreisler and Flesch. Mr. Van Vliet, violocellist, was born in Rotterdam and has also appeared with the larger symphony orchestras. Each member of this group is a distinguished soloist and renowned as an instructor. Mr. Adler says of the picture which accompanies this that it "does not do justice to the handsome good looks of the gentlemen," but I say "Handsome is as handsome does," and these gentlemen do very handsome and artistic programs over WJZ, New York, so radio fans will forgive them if they are not living images of "what the best looking man should look like!"



The New York Trio, composed of Clarence Adler, Louis Edlin and Cornelius Van Vliet, have been heard from WJZ

IF YOU want a real treat in "personality" say "Howdy" to Dr. Sigmund Spaeth, Music Editor of WOR, Newark and New York—in fact the only radio music editor there is! But to listen to Dr. Spaeth's talks on music is to hear the "human" tone that makes a real broadcaster. Dr. Spaeth gives what he calls a "Studio Party" from WOR every Monday evening, and if you want to go to a real "party"—even though it comes over the air—listen in on Dr. Spaeth. Everybody has a good time—the participants, the audience and Dr. Spaeth himself. "What shall we sing?" ask some of the people helping with the party. "Sing something that hasn't been done over and over again, for people get tired of the same

thing," says Dr. Spaeth. Which is good psychology, for he also says that the so-called popular music goes through its popularity phase in short order, via radio, because people will hear the popular song so much they don't want it again.

"Radio is doing great things for educating people to better music," says Dr. Spaeth. "Audiences get 'fed up' on the popular song, but never tire of hearing a Beethoven symphony twenty times over again. Radio listeners are, of course, less well defined than any other group of listeners, but the radio's greatest value lies in 'doing to death' the inferior music; and naturally the survival of music is its greatest test."

Dr. Spaeth used to play as well as coach football, and you can well believe that he was "there" in both; for as a player he must have been splendid, and as a "coach" he has the qualities that make for leadership. He broadcast

who can hold the radio fan's attention for three hours has a real gift of personality.

Dr. Spaeth is a speaker; also arranges unusual musical programs, and is the author of "The Common Sense of Music." One of the significant things that Dr. Spaeth said in his talk is: "I believe in humanizing art for the people," which, undoubtedly, is the reason for his success as a broadcaster.

ALL the glory of putting through the air your personality must not go to the men, for who has not, whether they be grown up or little people, listened with joy to the "Peter Panthiest" broadcaster, Miss Elsie Jean, who gives original stories and music from WJZ (New York) on Sunday mornings for the New York American. Elsie Jean knows child psychology; knows how to write chil-

(Turn to page 79)



The Robert E. Golden WOO Orchestra, whose dance music has been relayed through KDKA to England, where guests at the Hotel Savoy danced to it

TUBE TRANSMITTER DESIGN

Including constructional data of an easily built low-powered one-tube transmitter—One capable of reliable short distance communication

By John R. Meagher

HAVE you ever thought of building a radio telephonic or telegraphic transmitting set? And have you imagined that it might be too difficult, too expensive, or that it might not give as much pleasure as your receiving set? Do you think that the transmitting amateurs are interested solely in that rather vague business of 'relaying'? Have you been frightened off by the necessity of securing operating and station licenses?

If so, or indeed if you have any interest whatsoever in radio transmission and experimentation you might like to know the following facts:

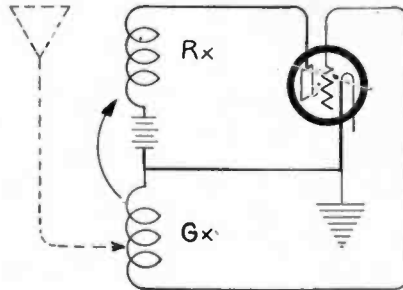
First; a good transmitter for amateur work can be constructed just as easily as the most simple vacuum tube receiver. The initial adjustments are not difficult and once set the transmitter may be left alone without further attention.

Second; the cost of a low-power 'phone set need not exceed about thirty or forty dollars. A very excellent outfit may be constructed for no more than seventy-five while a small transmitter using a 'receiving tube' and available batteries may be 'slapped together' for about ten dollars.

Third; the assignment of short wavelengths for amateur use opens the possibility of almost unlimited transmitting range with the average low-power amateur sets. But even if you succeed in talking with a fellow amateur only down the block, you will experience a thrill of rare delight and pardonable pride that will continue to trickle up and down your spine for many years after the momentous event.

For the experimenter and man in lonely surroundings the greatest asset of a transmitting set is in the innumerable friendly contacts that may be made with fellow amateurs all over the country.

Fourth; though we lack reliable data we believe that the majority of amateurs



The fundamental diagram of the small power conductively coupled transmitter

are interested in the experimental and entertainment side of transmission rather than in the work of relaying messages from point to point. This would seem to be a logical conclusion from the mere fact that the greater proportion of messages are of but little import, being for the most part greetings via radio and reports of reception that might just as well be sent through the mail. We believe that the amateur organization in stressing the importance of relaying treats too lightly, if not contemptuously, those amateurs who wish merely to 'chew the rag' and have friendly air talks with fellow experimenters. This view will doubtless broaden in time into its logical and infinitely larger field of pure experimentation and entertainment.

Fifth; so many youngsters in their 'teens' have secured amateur licenses that one should be ashamed to say that the requirements are too strict. To

obtain an amateur operator's license the applicant must pass a test at the office of the local radio supervisor to demonstrate his knowledge of the continental code, of simple radio theory and of the rules governing radio transmission in the United States. The license is not a privilege to be granted or withheld at the whim of the district office, but is a right that may be claimed by anyone with the requisite knowledge. It is necessary to have only an operator's license in order to secure a station license. Call letters are issued with the station license.

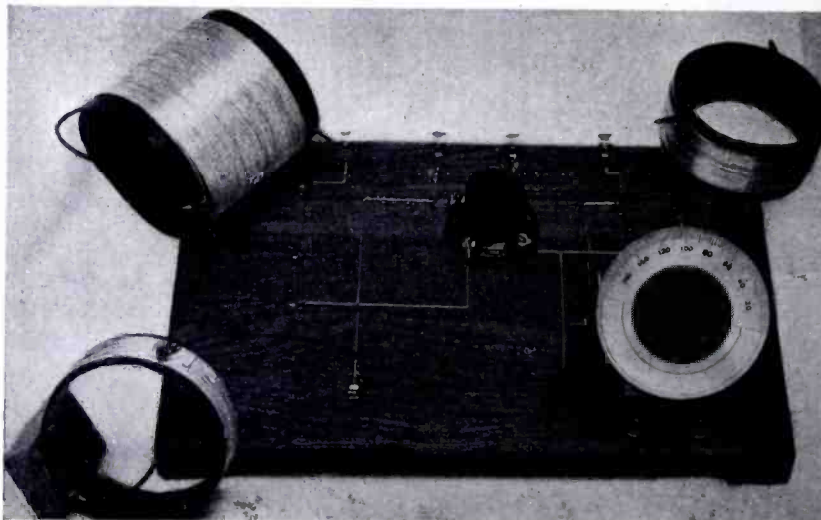
TRANSMITTING CIRCUITS

We have all probably noticed that there is very little difference between the circuits used for transmission and those used in regenerative receivers. In both cases our aim is to convert the steady electrical energy furnished by the plate battery into a varying or fluctuating energy. In reception this fluctuating energy is used to actuate the 'phones while in transmission it is used to excite the antenna system.

We should remember that the source of power is the plate circuit and that energy in the grid circuit exists only because of coupling to the plate circuit. When we wish to extract power from the 'tube' we should take it from the plate circuit. This is always done in reception where, for instance, power extracted from the plate circuit of one tube feeds the grid circuit of another.

The main difference between receiving and transmitting circuits is that in the former the input or grid circuit of the tube is coupled to the antenna, while in the latter the output or plate circuit is coupled to the antenna or primary circuit.

It is entirely incidental how the coupling for grid excitation is arranged. The grid may be coupled inductively, conductively or capacitively to the plate impedance or to any



Mr. Meagher's original laboratory transmitter with grid and plate coils ready to plug in, to suit the conditions and constants of the circuit

circuit—such as the antenna—which in turn is coupled inductively, conductively, or capacitively to the plate impedance.

It is a general rule and a logical one to refer to coupling in terms of energy transfer. We start from the source and trace the coupling from there to the input circuit. In a receiver the antenna circuit is the initial source of energy supply. In a transmitter the plate circuit is the source.

Just for a moment consider figure 1. This is a regular regenerative circuit

with the grid impedance G_x and the plate impedance R_x in inductive relationship. The filament or common terminal of both impedance is grounded. If the antenna is connected, as shown in dotted lines, to the grid circuit, we may term it a conductively coupled or single circuit receiver because a portion of G_x is common to both the antenna and grid circuits so that the transfer of energy from the source (antenna) to the input (grid) is conductive.

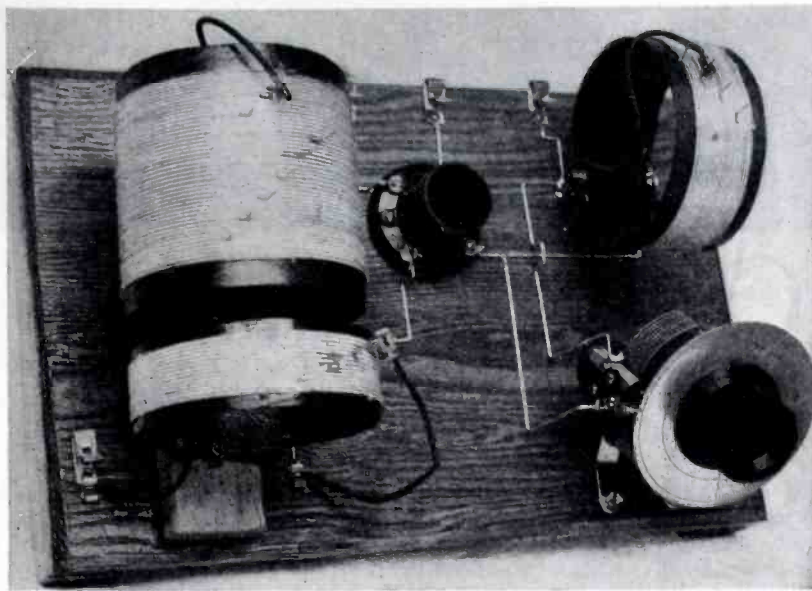
But if this same circuit is used for transmission the coupling between the source (plate) and the input (antenna) is inductive, and consequently this is an inductively coupled transmitter.

So we have the interesting but quite common case of one circuit being a single circuit receiver and at the same time—when oscillating—a double circuit transmitter.

If we merely change the antenna connection to the plate impedance the opposite is true. For in this case as a receiver the coupling between the source (antenna) and the input (grid) is inductive while as a transmitter the coupling between the source (plate) and the input (antenna) is conductive. It would therefore be a double circuit receiver and a single circuit transmitter. The Reinartz receiving circuit is of this latter class.

This is an interesting fact if for no other reason than that the Department of Commerce has ruled that a transmitter is conductively coupled when arranged as in figure 1.

To conform to this ruling we shall have to modify our explanation of figure 1 and say that it is a single circuit or conductively coupled transmitting circuit, though as a matter of fact it is really a double or inductively coupled



The author's "bread-board" lay-out, showing the placing of the coils and the tuning condenser and also the simple bus-wire connections

plate circuit is the most important part of the whole transmitter.

Second: the grid circuit is actually tuned to the desired wavelength. This is vastly superior to tuning the plate circuit and leaving the grid circuit untuned for these reasons: (A) The value of the grid-filament resistance in shunt to the grid circuit impedance is ever so much higher than the value of plate-filament resistance in shunt to the plate circuit impedance. Therefore the grid circuit impedance will tune sharp-

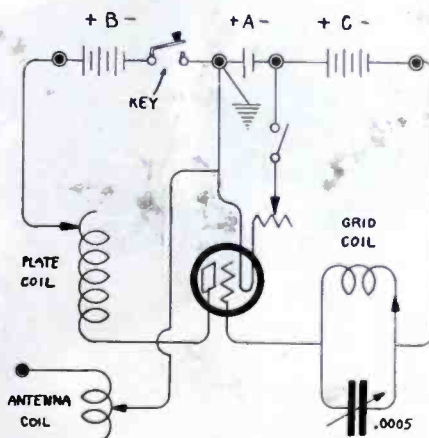
er than the plate circuit impedance

and as a consequence will play a more important role in determining the frequency of variation of the output energy. (B) In terms of voltage release the grid is the controlling electrode and as such is best suited from many viewpoints to control the output frequency. (C) The value of the plate circuit impedance may be adjusted independently of the wavelength setting. This can not be done if the frequency adjustment is dependent not upon the grid but upon the plate impedance.

Third: as indicated in the diagram, no special coupling is provided between the plate and grid circuits. The residual capacitive and inductive coupling will generally enable sufficient energy transfer from the plate circuit for proper grid voltage excitation. The grid circuit, of course, should be arranged so as not to absorb any more energy than is absolutely necessary for control of the energy in the plate circuit. By arranging the grid impedance so it is separate from and at right angles to the plate and antenna impedances the very common losses from this particular source may be minimized. It is not advisable to have an extra value of fixed capacitive, inductive or conductive coupling between the grid and plate impedances because then the only way to regulate the amplitude of the grid voltage variations is to change the effective value of the grid impedance, either by detuning the grid circuit or else by introducing resistance in the grid circuit. Detuning of the grid circuit is not advisable because it is best to have the grid circuit adjusted exactly to the desired wavelength. And introduction of resist-

DESIGN OF THE CIRCUIT

Figure 2 shows what we believe to be the ideal arrangement for a one-

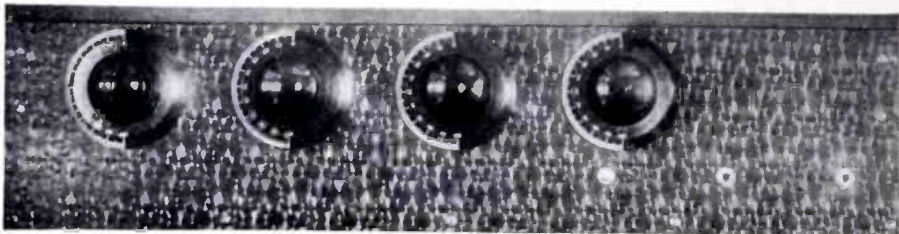


The hook-up for the one-tube transmitter which Mr. Meagher describes in this article

tube transmitting circuit; it has no name, though it might be conveniently thought of as an Armstrong tuned plate. It has the following good features:

First: the plate voltage supply is in series with the external plate impedance so there is no necessity for the decidedly inefficient choke coils common to shunt feed. All the specifications for choke coils the writer has seen have been quite inefficient for short wave work. Remember that the

(Turn to page 81)



"D-Coil" and DX

A Wireless Age reader gets coast to coast reception in daylight with very fine tone quality

DR. BURDETTE, of Salem, Oregon, constructed the first "D-Coil" Receiver described by Mr. MacIvain in the June, 1924, issue of WIRELESS AGE. Since that time he has built and rebuilt many of them and his latest product is the fine set shown in the illustration. We believe that he has gone Mr. MacIvain one better in his construction of the coils and the tuning elements employed. Located as he is on the West Coast, DX reception from the east means reception over half the continent in the early evening, when we in the east are content with merely local reception.

Quoting his recent letter, "I have had KGW in Portland and KGO Oakland, Cal., without either an aerial or ground or loop attached to the set with full loud speaker volume. With ground only I have had Los Angeles, Hastings and Calgary, time and again on the loud speaker. With the aerial and ground I can always depend on WEBH, WGY, WGR and KDKA and many other stations of like character.

"It is well to remember that locating stations from west to east is more difficult than vice-versa, due to the difference in time. We have to get most of our long distance reception before eight o'clock in the evening." Dr. Burdette has used extreme care throughout to make this a superior set. The tuning elements are mounted on the panel in convenient arrangement, and the controls, except those used in actually tuning in the station, are mounted on the sub-panel. The knobs shown in the rear view illustration are those of Marshallstats which having once been set in their proper position are not touched. The "D-Coils"

show that Dr. Burdette has reduced the losses to a very low minimum. The tuner employed is a Bremer Tully, such as was used in the "DX Go-Getter" described in the September issue of WIRELESS AGE. The "D-Coils" in the antenna circuit and second stage of radio were wound on tubes from which great slots of dielectric have been cut away. His ratio of turns were 10 turns in the primary and 60 in the secondary using No. 24 d.s.c. wire. No terminal posts were used on the tubing as the ends of the wire were threaded through two small holes drilled close together at the end of the

tically zero and for above 500 meters practically 100. He uses 45 volts on the radio frequency tube. Federal audio transformers were employed and they give excellent tone quality. All the wiring has been carried on below the sub-panel as shown in the illustration. There are very few connections and Dr. Burdette has simplified it as much as possible by using a minimum of bus wire.

The circuit used is essentially the same as used by Mr. MacIvain in the January issue of WIRELESS AGE. The variable condensers to tune the two radio frequency stages are .0005 mfd. 23-plate, to conform with Mr. MacIvain's specifications for the "D-Coils." The detector tuner is designed so that it is only necessary to use .00025 mfd. or 11-plate to cover the same range.

With this combination dial readings are practically the same for any given station, though the tuning is sharp, especially on the second condenser, but not too sharp, as quality of tone is very fine. We do not know where Dr. Burdette obtained the angle brackets which support the sub panel on the main panel, but

they certainly look very good and the idea is excellent. From our own experience the coupling coil to the detector should be varied with respect to the secondary coil. As this coupling is increased the tendency toward self-oscillation of the circuit is too great and, as in our "DX Go-Getter," best results are obtained with about a 45-degree coupling. The "D-Coils" are simply tied to the baseboard on the subpanel by thread through small holes drilled for the purpose. Metal

(Turn to page 94)



Rear view of Dr. Burdette's "D-Coil" receiver. The Bremer-Tully tuner and improved D-Coils are clearly shown

winding direct to their connections.

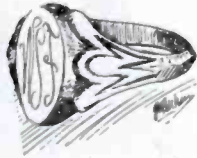
The wire was then led over and soldered directly to bus bar leads. The coils are tied to the sub-panel with thread. While Dr. Burdette used no by-pass condensers anywhere in the set their use perhaps would have improved it slightly. However, we are not attempting to improve upon a set which has behaved as well as his has. He can break the circuit in and out of oscillation from 200 to 550 meters without any difficulty. He reports the tickler setting below 275 meters prac-

Afloat and Ashore with the Operator

By W. S. Fitzpatrick

FOR many years—in fact, up to last Christmas, when I received another one, more fancy—I wore a signet ring, to which is attached an interesting tale of romance. Here is the tale.

Back in 1910 I was radio operator on the steamer *Concho* when, on one of our trips bound for Galveston, there was an abundance of girls among the passengers.



One evening on a visit to the bridge the mate on watch said to me:

"We sure have a nice ship-load of girls aboard this trip and I notice many of them hanging around the wireless room. Can't you introduce me to one? I'll be down after I get off at eight o'clock."

The first one to look into the radio cabin after I returned was a dainty little English girl who had become interested in wireless. I started a conversation, incidentally telling her how anxious the navigating officer on the bridge was to meet her.

I let her listen in on a nearby station sending a message, passing the old-time popular falsehood to her about it being Hong Kong, China, then had her follow the copy while I transmitted our eight o'clock "OS." (Used to be sent at least an hour previous to the time of the position). She remained until eight bells rang out, which was followed shortly by the appearance of the mate, whom I presented, and who immediately took a liking to her.

The two saw each other often on the days that followed and, of course, spent the evenings together on deck. Succeeding trips to Galveston found him rushing away during his time off to visit her. He had fallen madly in love.

THEN I was transferred to another ship, but a month or two later I met him on a street in New York. He was looking very dejected and told me that the girl and her family had moved to the interior of Texas. She, feeling they would no longer see each other, insisted upon breaking the engagement. He thought from his last visit he had won her over but the receipt of a letter that morning told him it was "all off."

He held in his hand a pretty lavalier that he had purchased at a Fifth Avenue jeweler's saying that he "guessed he would have to exchange it for something else." Then noting that I had no ring he suggested I should have one. Together we went to the jeweler's and arranged the exchange.

A little later he left the *Concho* for another ship and we corresponded occasionally. Three years or more passed and I had been promoted to an inspector when one day while making an inspection on a ship along the North River, I noticed from the radio cabin on the boat deck another ship at the opposite pier bearing a name I thought familiar. I suddenly realized it was the one on which my friend was chief officer the last time I heard of him.

Finishing my inspection I went over and was told there was no man aboard by the name—except the captain. Feeling that my friend was rather young to be master of a ship, especially one so large, I hardly thought he could be the same, but went along anyway to the captain's quarters.

I FOUND the commander busy at his desk, but upon seeing me he jumped up and grabbing my hand gave me a royal welcome—he was none other than my old pal.

We were talking but a few minutes when a cute baby girl walked in from an adjoining room. Seeing my look of amazement he explained that it was his little daughter.

"What! You married! How about the English girl? Remember this?" I said, pointing to the ring.

"Same one. She's inside. Here in New York on a visit. Wait until she comes out and see if she recognizes you."



When she came out the recognition was immediate. I thought I saw her glance at the ring and a guilty impression swept over me, but this was soon dispelled as she spoke with joy of past days aboard the *Concho* and of the *Concho's* radio cabin with its pleasant memories, including their first meeting which was arranged there.

I still have the jewelry meant for the girl and he has the girl he once thought he had lost and as I write I have the greatest desire to meet them again and have them introduce me—once again—to that baby who must now be old enough for me—to show the ring to.

KURT GERBERT, a reader in Berlin, Germany, has written for information about *The Radio Telegrapher*, to which we reply that that journal suspended publication with the January, 1922, issue. The original paper by that name, of which the writer was editor, suspended in May, 1918.

THE extraordinary good work being performed by the marine coastal stations WSC and WIM recalls to mind a famous station of years ago and familiar to all old-timers. We refer to "DF," opened at Steeplechase, Coney Island, June 14, 1902, later moved to Manhattan Beach and several years after back to Coney Island in old Dreamland Park. It was a highly popular station with wonderful carrying powers

and well earned the praise of the poet who wrote:

"Its signals get stronger and stronger, till they bloomin' nigh render you deaf;
You may go where you please, from Cape Race to Belize,
But you can't get away from 'DF'."

OLD time operators returning to the game are surprised to see to what extent CW is fast replacing the familiar spark gaps. A number of RCA ships have been equipped with tube transmitters and are showing wonderful results. The tube sets are proving popular not alone because of their working great distances, but through the elimination of interference, the ease and simplicity of their operation and the fact that they draw so little current from the ship's dynamo.

WHEN we saw the cross word puzzle in last month's WIRELESS AGE we said: "Ah! Here's where the ship operators are going to shine forth!"

We seem to have been mistaken for after taking a peep through one batch of answers, containing about 300, it is noted that most of them come from inland places in the middle west. Not so many from seaports or with ships as addresses.

We're going to feel sorry if Boyd Watts of Detroit, Mich., gets in on the 100 because we would hate to see the stenog. lose the five dollar bet. But perhaps we're more chivalrous than Watts. On the other hand he calls the WIRELESS AGE the "Radiomost Magazine" and that may tickle 'em into overlooking a slight error he made.

CONFIDENTIALLY we noticed that the first perfect solution was the thirty-fourth answer to be received. Our congrats to E. S. Holcombe of Harmon-on-Hudson, New York.

Our "73s" to J. H. Johnson of Seattle, Wash. Your reply was number 73 and we hope you got it right.

L. Capeling of Chatham, Ontario, Canada, must have brought his to the post office and personally saw to its stamping. There were eleven impressions of the post mark on the envelop and King Ed's picture was certainly hard hit. Incidentally this answer was number 100 so if it's K.O. you're sure in the century.

Mrs. Butler of Wiscasset, Maine, although complaining of the big blizzards in her state delaying the mails, looks to be in the running while R. B. Blake of Nacogdoches, Texas, where they never see snow, made quite a few errors.

We were much impressed with the neatness in which the puzzle was copied by Clair D. Mitchell, of Bloomfield, N. J., L. D. Lapp, of Toronto, Canada; Raymond McCreary of Beloit, Wis.; Lester Wood of Stillwater, Okla., (nice complimentary letter from Mr. Wood); John A. Tapparo of New York City, and Miss Margaret Lorenz of Milwaukee, Wis. We hope they all win—they deserve it.

AN EFFICIENT AND EVER USEFUL WAVEMETER

How to construct and
operate one

By R. E. Bogardus

HAVE you ever ridden in an automobile? Naturally you have: But—did you ever try to drive one without clear vision, at least in the direction in which you wished to proceed? No? That's more than foolhardy you say—we agree. Thus we come to you squarely with the subject of this young treatise, although especially intended for those of my readers who are going to go into the land of pleasure by way of our free ether; that intangible something which is mixed inseparably with our air and just as much polluted at times, and all the time we stay at home—yes—home—Friend Wife and everything.

We start—always. In this case we want clear vision ahead. We want to know where we go. Hence in this radio thing we want to go right. The U. S. Government has allotted certain privileges to us. We sit with our home folks and listen to wonderful concerts—speeches—sports and dine by the restful strains of dinner music. We turn the few or many dials of our radio set to a predetermined position expecting to hear that concert. Yes, there they are. The set is calibrated, so to speak.

To have produced this certainty—the original transmitter had to be sending its music on a certain wavelength of frequency. They stay “put” in most cases. When our evening is progressing favorably, our concerts remove themselves, one by one signing off for the night. Soon there is nothing more only empty space. Ah! did you hear the chatter and messages of cheer and greetings way down towards the zero marks? Not speech, but those familiar “Dit-Dit-Dah’s.” Another world discovered. Myriads of them conversing, covering thousands of miles and over continents and

oceans. Didn't you know they were there? They were quiet during our music, but music stops after a while and we just start, again. Way down there too, that's because “Uncle Sam” said, relative to ship communications, “Transmit on these certain wave bands.” To the broadcasters he said the same thing relative to their special bands of waves and then he stated in much the same tenor to us. So—each has his place assigned and for the mutual good each stays there. To do this we have a measuring device, well known to most of us, as a Wavemeter. It's that much needed vision we spoke of earlier. For ships, it is made for their band of frequencies or waves, for broadcasters it is made for theirs and for the rest of us we have ours. “Ours” cover the transmission bands below 200 meters. We operate a radio set which allows us to listen in on our good friends near and far and all this class of communication remains on



wavelengths 150 to 200 meters, 75 to 85.7 meters and 37.5 to 42.8 meters. To get into fractions of meters we must have a good wavemeter. And further, as broadcasting comes down the scale, we find that the range of a wavemeter that enables us to measure the wavelength of any station in the lower bands is desirable. We can use this same wavemeter as a trap to keep them out. The wavemeter we built gave us a range of from 65 to 280 meters—low enough to keep us on the right side of the law, and high enough to prevent undue interference with us.



Yes—it's accurate. Must be; best parts and carefully assembled, then just as carefully calibrated.

Here's how we built it. We obtained a small cabinet approximately 7" x 8" x 7". We purchased a panel of bakelite to just fit inside on the little ledge made of $\frac{3}{8}$ " square wood strips screwed to the inside of the cabinet allowing just enough depth so the upper surface of the panel was flush with the opened section of the cabinet.

Then we had to have a “good”—not “fair,” mind you—condenser with the plates so proportioned as to finally produce practically a straight line wavelength curve angling upwards over the graph paper which is an appurtenance to every wavemeter other than “Standards” which are sometimes made “Direct Reading.” A vernier is absolutely essential on the lower waves so we procured a large dial and a 10-degree division vernier for reading the parts of degrees on the dial. We chose the new General Instrument Company's geared vernier, .0005 microfarad capacity, Isolantite insulated, low loss straight line wavelength curve. Other condensers are suitable, but this is the one we selected.

The coil was of the Lorenze or basket weave type and made in circular form on a form 3 inches in diameter and having 15 pegs set around the circumference, wound with No. 20 double cotton covered copper wire—in and out until 22 turns were wound on the

In the April issue of *Wireless Age* there will be presented a noteworthy development in radio receivers. Mr. R. E. Bogardus, the author of this excellent treatise on Wavemeters and their construction and use, and a member of the technical advisory staff of the *Wireless Age*, has, through prolonged and intense study and experimentation on receivers, developed a simple receiver which has beaten our ordinary regenerative set both in results obtained and in the simplicity and postiveness of operation. It has—But we are not going to tell you any more about it until April. Get your soldering iron ready!

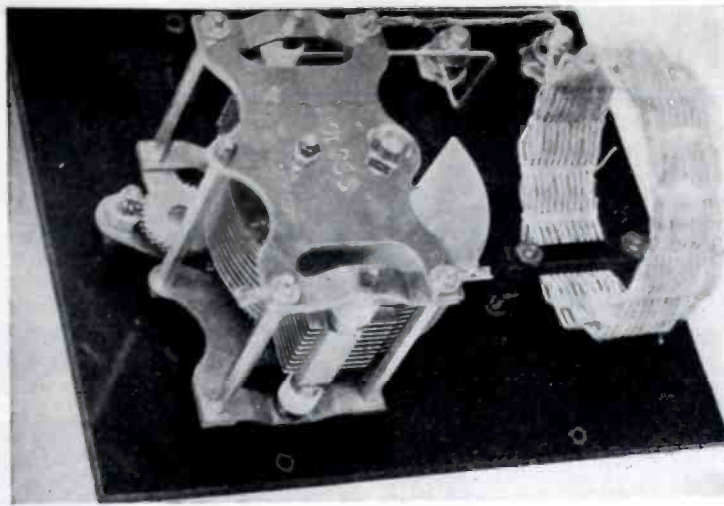
form. At each series of crossings of the wire we passed thin woven fish-line through top to bottom and vice versa, and tied each one separately tight—double knot, leaving the two ends of the wire of the coil short. No dope—no shellac, nothing else on it.

We placed a Weston thermo-couple galvanometer, which is extremely sensitive to radio frequency currents of medium power, in the set. Other galvanometers can be used, but the one to remain permanently in the wavemeter should be placed there first of all. The better the instrument, the better the results will be. In order that our calibrations will never be changed, we placed it in the circuit permanently by cutting a hole in the panel, clear of the condenser dial, $2\frac{3}{8}$ inches in diameter or just large enough to allow the meter to slip into, but not large enough to fall through. Some may not have a power drill and fly cutter, but the necessary hole may be made by marking the size on the panel and then drill a series of holes around the circumference very close together which will allow the breaking out of this center piece, and the hole can be smoothed down with the aid of a file and sand or emery cloth. The flange on the meter had the customary three holes and this fitted around the edge of the hole previously made. Round head machine screws and nuts were used to fasten the meter permanently in place through the drilling of the extra small holes.

To those of you who have built, or are building, your own sets—looks simple—is simple—but each soldered connection must be a real honest-to-goodness connection.

Take a good look at the photos and you will notice that two small strips of bakelite were used to mount the coil in conjunction with two long screws and necessary nuts. This will of necessity be different as the individual method of mounting the coil comes to each of you. This is the way we built ours.

You have located, drilled and mounted condensers in your own set,



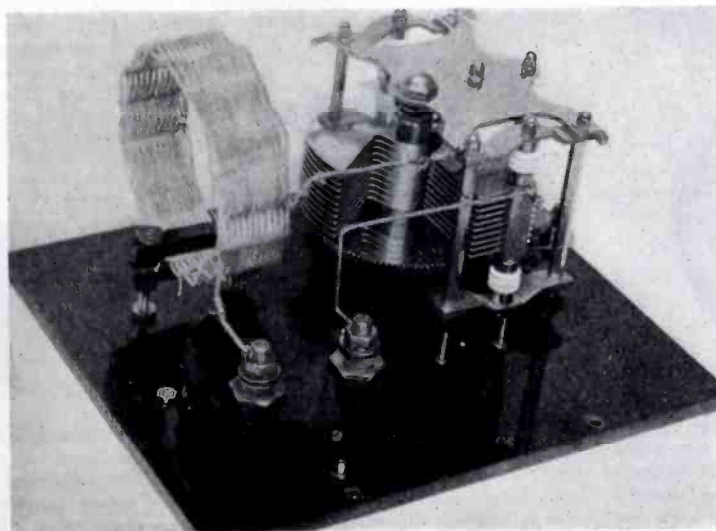
The coil is mounted on the small hard rubber strips, which are in turn fastened to the panel

so with the many possible different kinds of condensers to be had, we can only say—use the template which is furnished with most good condensers which are suitable for wavemeter work.

The more detailed construction of the coil—'tis built like the coil used by our good friend Robert Alan in the construction of that wonderful receiver described in October, 1924, issue of WIRELESS AGE with this change—have each turn around the peg instead of jumping two. Tying is not of much importance, but it is best to individually tie each series of crossovers either over the coil or through the centers as we did.

You built that wonderful set so I know you have been down to the region of amateur transmission on 75 to 85.7 and 150 to 200 meters. You have probably heard us. Get busy and join us.

Just a few points to remember—



The connections consist of three wires in all! Make them short, rigid and permanent

every part must be of the best—and installed well—leads to be the shortest possible giving due regard to efficiency and strength and last, but not least, solder properly.

To calibrate this wavemeter you will find the "Dip Method" about the best. Frequently you have wondered why you heard music down in the region of 150 to 200 meters when you knew the broadcasting station was transmitting on its proper wavelength. Yes, every broadcaster has harmonics—that is, practically every one. First is their main wave: then they can be heard

on half their wave, their quarter wave and further if you wish to pursue them. Because of these harmonics we can calibrate our wavemeter without sending it to the Bureau of Standards in Washington. Let's use these harmonics—utilizing an example. One transmitting station in New York City transmits on a wavelength of 455 meters—half wave then is $227\frac{1}{2}$ and quarter wave is $113\frac{1}{4}$. Also Station WEAJ transmits on a wavelength of 492 meters—half wave then is 246 and quarter wave is 123 meters—four out of the six just named falls inside our limits and that gives four points—repeat the procedure for each station that transmits on a known constant wave and you can fill up your meter with points. However, the actual operation is to tune your set to each of these harmonics with your set just oscillating at each one. Tuned to the middle of that familiar slight whistle, place the wavemeter in close proximity

to the coil of your receiver and have the two windings in the same parallel plane and as you turn the wavemeter dial the whistle will suddenly disappear and a "click" will be heard as you come into resonance with the receiver. If no click is heard bring your coils closer and if two are heard then loosen, or move a bit further away until just one is audible and yet clearly defined. Plot it out on the graph paper. The condenser settings on the bottom and the wavelengths up the scale on the left side. When completed, smooth out the lumps and your meter is calibrated.

Appliances and Devices

Antennaphone

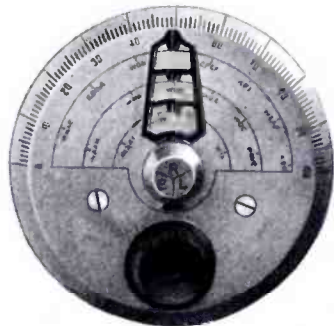
A NEW device called the Antennaphone is now on the market which eliminates any form of outside antenna. The principle of operation of the Antennaphone is the condenser effect between your set and the telephone system. The ordinary desk stand telephone is placed upon the Antennaphone, the latter then being connected to the set.



Sharper tuning, reduced interference, and clear reception is claimed for the Antennaphone. The Antennaphone may be used on any kind of a set with good results except those incorporating a loop antenna. The Antennaphone is manufactured by the Antennaphone Co., 90 West St., New York City.

The Ultra-Vernier Dial

A BIG and notable stride forward in the simplification of tuning in, which will be welcomed by fans who prefer a concert to fishing for stations, is announced in the Ultra-Vernier, a vernier tuning control with hair-splitting adjustment, which practically allows you to forget there is such a thing as wavelength. Once you have located a station with the Ultra-Vernier, you can forever



after get it instantly and surely, without any fishing, fumbling or guessing.

The Ultra-Vernier, which fits all standard condenser shafts and may easily be made to replace old dials, has a beautifully silvered disk. On this, you pencil-record a station you have found and like. Thereafter, whenever you wish to hear it again, you simply

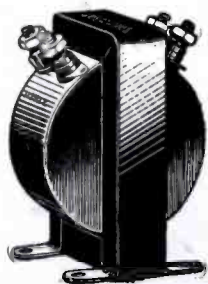
turn the station finder, with its gauge for your pencil markings, to that particular pencil-mark. Without having had to fumble, you instantly hear the station you want, and you may be sure it is that station without waiting for the announcer to tell you so. All pencil-marks may be erased and the dial left like new, if it becomes necessary to revise markings to take care of any changes that may occur in the transmitting or receiving. The Ultra-Vernier operates with a single control, a further ideal simplification. This ingenious tuning control was designed by R. E. Lacault, E.E., A.M.I.R.E. It is manufactured by the Hammarlund Mfg. Co. and produced only for the Phenix Radio Corporation who will furnish any information concerning it, upon request.

A Phonograph Loud Speaker

THE Needlephone is a new type of instrument employing all the perfection in your phonograph and eliminates the necessity of handling and removing the phonograph



reproducer. It is adaptable to any phonograph of standard make. There is no need for removing the reproducer. Simply rest the needle on the Needlephone. The superiority of the Needlephone lies in its ability to transpose electrical energy into sound waves emitted by you on your phonograph reproducer faithfully. The Needlephone is made by J. Thomas Rhamsfine, Detroit, Mich.



A New Transformer

A NEW low ratio audio frequency transformer has just been brought out by the Jos. W. Jones Radio Mfg. Co., Inc., New York City.

It is scientifically designed to afford distortionless tone frequency amplification throughout the entire band, maintaining the

audibility amplification at maximum value. In other words, the volume is increased without distorting the received signal, whether it be speech or music. With this new transformer there is always the highest possible value of signal intensity. It may be used in both stages and is adaptable to all tubes.



Reflectone

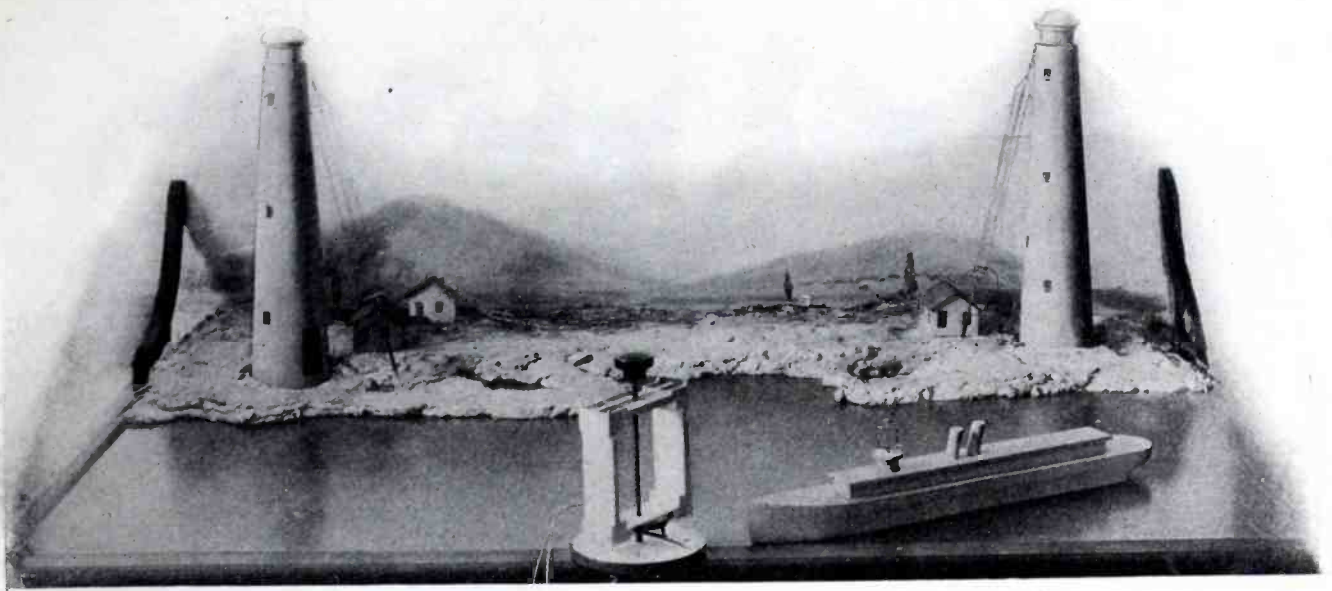
A LOUD SPEAKER resembling milady's jewel box, or a miniature treasure chest—measuring only 6½ inches by 4½ inches—is now on the market. It is a new model of the Reflectone, the novel loud speaker which has been attracting wide attention in the trade. The front face of this new Reflectone model has an artistic cut-out design to allow the passage of sound, with a dark-red moire silk lining to conceal the unique interior construction and to add to the attractiveness of the box. The cover of this new, chest-like model lifts to disclose a cedar tray which offers itself as an excellent receptacle for cigarettes or other items. This practical use of the tray does not affect the quality nor the volume of the tone which are entirely as satisfactory as that of the smaller, five-inch high model. Except in shape and size, the construction of this new model is identical with that of the original Reflectone model. Rice & Hochster of New York City are the manufacturers.

Power Amplifying Transformer

THE Thordarson Electric Mfg. Co., of Chicago announces something new in the amplifying field—an Interstage Power Amplifying Transformer. Inserted in a power amplifying circuit between a pair of standard input and output power amplifying trans-



formers, it is said to give a quality of reception that more than compensates the user for the additional expense. Two stages of this power amplification necessitate the use of four tubes. The manufacturer supplies wiring diagrams and full directions with each transformer.



Model used by the Bureau of Standards to demonstrate the working of the radio fog signaling and radio compass system

Radio Compass Bearings

The radio compass system described—Use of azimuth tables, the Gnomonic Chart and Mercator's projection chart in calculating ship's bearings

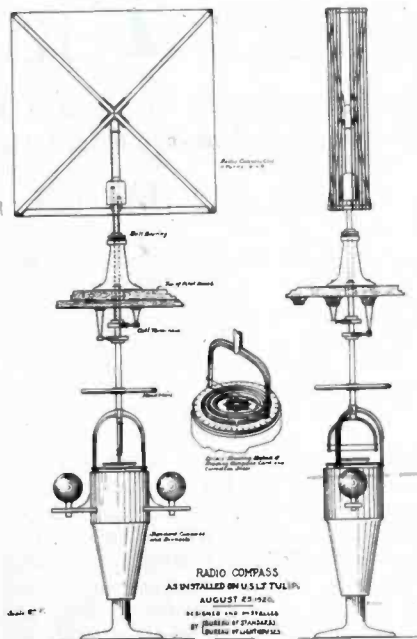
By *J. H. Walker*

RADIO direction finding, or radio compass bearings, have repeatedly been the instrument for prevention of disaster at sea, proving its usefulness to the practical navigator.

All radio enthusiasts are more or less familiar with the loop and its functions in a circuit employing radio frequency amplification. Attach an azimuth scale, marked in fractions of a degree from 0-360, with zero at true north, with a micrometer adjustment on the pointer, and a sensitive current-indicating device—the directional system is complete.

It is absolutely essential to have a spark transmitter adjusted to a degree of quenching which will emit a "pure wave," as then only may a reliable bearing be secured. In the adjustment of the spark transmitter, the greatest care should be exercised in using a minimum of power and coupling, providing a pure wave and a smooth spark. A broad wave is largely the fault of the operator who incorrectly adjusts his open circuit to resonance with the closed oscillating circuit. Either of these faults are a handicap to the shore operator giving the bearing, and will be shown by a "doubtful bearing" by the shore station, or erratic projection on the charts.

There are two types of charts mentioned here which are used in navigation;



A diagram of the radio compass installed aboard the United States Lightship Tulip as a part of the tests conducted by the Bureau of Standards

the Gnomonic chart and the Mercator's projection chart. The latter is in most common use for deep-water navigation. A Gnomonic chart having an especially arranged compass rose to facilitate the plotting

of true bearings is essential for accurate work, but the navigator provided with a Mercator chart may, however, plot the cross bearings and find an approximation to the line of position upon which the vessel is at the time the radio station receives its signal.

The Gnomonic chart shows the exact intersection of the latitudes and longitudes on the curvature of the earth's surface. The Mercator chart shows meridians parallel and equidistant at the poles, and diminishing parallels of latitude north and south of the equator.

The radio compass cross bearing, being a great circle, is laid down on the Mercator chart as a curve concave to the equator, but curving most when bearing east or west, and straightening out as the bearing changes to the north and south, so that when the bearing is due north and south, it becomes a straight meridian line of the chart. Fixing positions by radio bearings is not unlike the well-known method of a fix by cross bearings on near visible objects, differing mainly in that radio towers are invisible at widely separated distances, and the vessel generally much further off shore; hence it becomes necessary, when these bearings are plotted on the distorted Mercator chart to take into account the curvature of the earth, and determine a correc-

(Turn to page 87)



Between the acts with the WGY players

Radio Plays

Broadcasting the drama in a realistic manner so that the listener can visualize the scenery

By S. R. Winter

IT is a far cry from the "Little Theatre," with its small circle of attendants, to that of an invisible audience of millions listening to drama through the medium of radio broadcasting. When Shakespeare said "all the world's a stage" he never contemplated that literally an entire continent and outlying possessions could hear a single dramatic production without the hearers leaving their firesides.

Radio, with all its limitless possibilities and magical performances, is credited with nothing quite so wonderful as bringing the theater to millions of homes. The voice of the speaker, the vocal music of the singer, and even the strains of an entire orchestra, or other musical organization, are broadcast by radio with comparative ease—or, at least, the achievement is commonplace. However, the dispersion of a dramatic production—dependent upon action, sound, and scenery for effect—to a vast invisible audience is extremely difficult of attainment.

This very thing is being done frequently. If you own a radio receiving set, your own home may be temporarily converted into a theater. "The Fortune Hunter," "The Happiness Expert," "Tweedles," "The Storm," and other plays having intriguing titles may be heard under the comfortable fire-side environments of father smoking his pipe and mother darning trousers. Uncle Silas whose name and occupation savor of the soil, is reported to have remarked after listening to a play by radio: "In the movies we can see them, but can't hear them; with the radio we can hear them, but can't see them; seems like the modern drama is following everything else now-a-days, and the slogan seems to be 'Give them half as much and charge them double.'"

WGY, the General Electric broadcasting station at Schenectady, New York, is, however, striving to broadcast the drama in such a realistic manner that the listener can visualize the

scenery in his imagination. For instance, you can hear the rain pattering upon the roof and perceive the crackling of a forest fire in such a vivid manner that your imagination almost leads you to the point of feeling the drops of rain and the scorching effect of the conflagration. These realistic scenes are possible by means of an ingenious arrangement of devices—"tricks of the trade," if you will. Rain is simulated by rolling dried peas through a paper tube, and the forest fire is produced by means of a plumber's gasoline torch, the breaking of match sticks and the crushing of paper. The torch produces the effect of rushing wind and flame, and the matches and paper sound like the crackling of burning tree limbs.

Sound properties are essential to the success of a drama broadcast by radio; a broadcasting station recently awarding a prize of \$500 for the drama best exemplifying this quality. Atmosphere is created and action is simulated by

sound, a variety of devices being employed for this purpose. Most common among these are the door and bell board. Strangely enough, the door is one of the peculiar conventions necessary in the broadcasting of drama. "Close the door gently," is almost an axiom in homes, yet when a play is being given for the benefit of the invisible radio audience it is necessary to shut the door with a sufficient bang and click of the lock to operate the microphone.

A door used for this purpose is, preferably, constructed of thin oak and its resonant quality should faithfully produce the sound of a door. It is necessarily portable. A bell board, another commonly used device for producing realistic sounds, consists of an arrangement of five bells of different tones and a buzzer. All of these bells are connected to dry-cell batteries and may be operated by merely pressing a button. These consist of a door bell, telephone bell, and an alarm bell which may be sounded for fire, ambulance or as a burglar alarm. A clock chime and a tap bell are also included on the bell board. A telegraph key, tin pans, a bucket of coal, knives, forks and plates, and a horn are among the other devices needful in the transmission of sound properties.

"We are at the birth of a new form of literary expression," declares Martin P. Rice, who is probably the first person in the world to broadcast drama by radio. "The radio dramatist—unhampered by the restrictions of the theater, and with an immense audience of sympathetic and attentive listeners—has only to enter his kingdom," continues Mr. Rice. "The possibilities are alike his opportunity and his inspiration. The actor's finest interpretation of a part is faithfully transmitted to the ears of a great audience without the loss of a syllable or the blurring of an inflection and under conditions that enable the listeners to concentrate their entire attention on the spoken lines.

"Drama, however, carries the inherent suggestion of action, and the ques-

tion, 'How can action be broadcast?' is promptly presented. Before attempting to answer it, we should consider the essentials of dramatic art.

"In common with all other fine arts, the drama consists not in a mere reproduction of nature, but in an orderly arrangement of certain factors chosen because of their pleasing or appealing qualities. Supplementing these elements in the presentation of dramatic art, stage settings in the modern theater appear to have reached their maximum development. In fact, it is a question whether they have not in



The devices used in a radio broadcasting station in broadcasting drama. Note the portable door and bell-board for delivering sound properties

some cases been so heavily emphasized that they overshadow the dramatic interest rather than contribute to it.

"The early drama was produced with little or no scenery and without the present-day wealth of costume. The addition of scenery limits the action and at the same time restricts the imagination by confronting it with rigidly defined forms. Perhaps it is on this account that one derives more pleasure from the reading of a Shakespearean drama than from an indifferent performance with elaborate scenery.

"In the absence of such conventional forms the play of the imagination meets no barriers save those erected by

the individual's own personality—his own power to comprehend and appreciate. His imagination is capable of unlimited expansion; it envisages the finest subtlety, the deepest sadness, or the highest joy. This fact is recognized by authors who, instead of describing a scene or an action in every detail, leave it to be completed by the imagination. Here radio broadcasting enters a dramatic field in which it can attain a unique prominence.

"Radio drama has the subtle power of staging or suggesting action without being under the necessity of actually reproducing it. So long as there is an ear to hear and an imagination to construct and color, there are no scenic limitations to the radio play and very few as to action. Deftly written lines can carry the listener across the wilderness and overseas, through torrential rains and to the frozen North, into deep mines and on the wings of speeding aircraft. Every mechanical device for imitating sounds is at the disposal of the radio dramatist—the midnight stroke of a great clock, the roar of a waterfall, the moan of wind, and a stealthy step in the dark. Situations impossible of presentation on an actual stage are conjured before the listener's mind in a single phrase.

"Small wonder, then, that radio is developing an entirely new type of play, almost as free of limitations as is life itself! Small wonder if a new type of actor find in it opportunity for new forms of artistic expression! Swept of

conventional properties and scenery, the radio stage is as wide as the world—as free in its permitted action as the whole range of human experience. If it makes no appeal to the eye, it falls the more intimately on the finer perception of the mind; if it must enlist the imagination, it carries an emotional thrill to which only the imagination can respond.

"We are only at the beginning of these things, but that beginning is rich in promise—the promise of an art that shall contribute mightily to the cause of culture and more especially to the appreciation of fine dramatic expression that has reached us through the ages."



Miss C. Smelker

R DOES YOUR Radio=X?

With inexpensive radio sets, moderate leisure time, all the free air in the world and a wide range of programs it is certainly your own fault if radio equals an unknown quantity to you

By Miss C. Smelker

THE radio is acclaimed, far and wide, as the greatest instrument of general education the age has produced.

It is hailed as an invaluable contribution in this field through its broadcasting of symphony concerts, informative lectures, weekly talks by national and international correspondents, book reviews, and frequent addresses by individuals prominent in world affairs.

True, all true, with a big IF. And that IF hinges on the individual thirst for information and upon the degree of emotional appeal involved.

Most of us still look upon the radio as a source of entertainment only. If we are not entertained we tune out or remove our head pieces. Most of us run from it as a source of education for education's sake. Many broadcasters, on the other hand, ignore the psychology of emotional appeal in the presentation of their features. Until these two elements, the receiver and the sender, listen and broadcast upon a compromise basis, arrived at through an altered viewpoint and a keener human insight, the radio will not accomplish even a fraction of its limitless possibilities.

In the late political campaigns it was particularly eulogized as an agent of incalculable weight in informing the citizens at large concerning the political issues. It was predicted that it would be not only a source of information, but that it would get out the voters and go far in influencing those voters in their choice of candidates.

It would be worth any amount of trouble to ascertain, even approximately, how many votes were really influenced or reversed by the radio

spellbinders of the various political camps. My guess would be surprisingly few. This may meet with prompt contradiction—but wait a minute.

For argument's sake, I am a Republican and you are a Democrat.

I LISTENED earnestly and self-righteously to innumerable speeches by Republican candidates, Republican incumbents, and speakers from the Republican Speakers Bureau. I was told, to my perfect satisfaction, any number of reasons why I should vote the Republican ticket as I had intended to do all along. I glowed with enthusiasm over the expounded virtues of my party as they were whispered or shouted into my receptive ears. I chuckled with glee over the fun poked at members of other political parties. I trembled with apprehension over the probable fate of this country, and the world at large, if any other party should come into power. I oozed gratification over the soothing pats administered to my womanly shoulders by the men who told me how much my party owed to its noble women. I beamed over the promises made to me if I'd be good and regular and voted *the* ticket. And, after the last gun was fired, the last gas bomb exploded, and the last air raid over, I gallantly marched to the polls and cast my vote for the very party I had made up my mind, over a year ago, to vote for.

And you, Mr. or Mrs. Democrat, did the same thing.

Those "Whatsits" probably read the newspapers very diligently during the late unpleasantnesses and decided nothing could be worse, and thereupon

hopped on the LaFollette Bandwagon. The going proved so rough, however, and the band was so poorly conducted that most of those professional Antis were either jiggled off or jazzed off, while the few remaining never fully regained consciousness until the race was over and they "came to" in the ditch.

Now if the radio was supposed to give me a liberal political education it failed because I listened to what I wanted to hear and nothing else. I wished to be entertained, not annoyed. My thirst for information concerning all sides of the question was conspicuous by its absence.

To wit:

I chose friends with loud speakers as the ones on whom to inflict calls the evenings President Coolidge took the air. I passed up a bridge party to hear Secretary Hughes at Baltimore. I strained two perfectly good ears to catch every one of Secretary Mellon's diffident words.

Did I miss anything to hear John W. Davis, Pat Harrison, or any of the LaFollette cheer leaders? I did not!

AND your position was just that—reversed. You decided that, if there was any danger of your being afflicted with Republicans for another four years, you at least could spare yourself the added cross of voluntarily listening to them tell why the country could not be properly run without them at the throttle.

Am I pleased as I look back? I am not.

I threw away golden opportunities to hoard material for innumerable

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BROADCASTING STATION DIRECTORY

KDKA	Westinghouse Electric & Mfg. Co.	East, Pittsburgh, Pa.	326	KFFN	Westinghouse Electric & Mfg. Co.	East, Pittsburgh, Pa.	326	KYQ	Electric Shop	Honolulu, Hawaii	270
KDPM	Westinghouse Electric & Mfg. Co.	Cleveland, O.	245	KFFO	Latter Day Saints University	Salt Lake City, Utah	242	KYW	Westinghouse Elec. & Mfg. Co.	Chicago, Ill.	536
KDPT	Southern Electrical Co.	San Diego, Cal.	250	KFFP	David City Tire & Electric Co.	David City, Neb.	226	KZC	Kansas Gas & Elec. Co.	Neosho Power Plant, Parsons, Kan.	
KDYL	Newhouse Hotel	Salt Lake City, Utah	250	KFFQ	College Hill Radio Club	Wichita, Kan.	231	KZM	Preston D. Allen, 13th & Franklin Sts.	Oakland, Cal.	241
KDYM	Savoy Theatre	San Diego, Cal.	250	KFFR	Hionnell Manufacturing Co.	Ridgeland, Miss.	248	WAAB	Valdemar Jensen, 137 S. St. Patrick St.	New Orleans, La.	268
KDYZ	Oregon Institute of Technology	Portland, Ore.	360	KFFS	Technical High School	St. Paul, Minn.	252	WAAC	Tulane University	New Orleans, La.	268
KDZB	Frank E. Belfert	Bakersfield, Cal.	209	KFFG	Beacon Radio Service	Omaha, Neb.	248	WAAD	Ohio Mechanics Institute	Cincinnati, Ohio	258
KDZE	Rhodes Department Store	Seattle, Wash.	270	KFFH	Leon Hudson Real Estate Co.	Fort Smith, Ark.	233	WAAG	Chicago Daily Drovers' Journal	Chicago, Ill.	286
KDZR	Bellingham Publishing Co.	Bellingham, Wash.	241	KFFI	Garrett & Dennis	Los Angeles, Cal.	238	WAAM	I. H. Nelson Co.	Newark, N. J.	263
KDZS	Nebraska Buick Auto Co.	Lincoln, Neb.	248	KFFJ	Howard C. Mallander, 992 Lake St.	Salt Lake City, Utah	242	WAAN	University of Missouri	Columbia, Mo.	254
KDZT	McArthur Bros. Mercantile Co.	Phoenix, Ariz.	272	KFFK	C. C. Baxter, 205 Grafton St.	Dublin, Texas	242	WAAP	Omaha Grain Exchange	Omaha, Neb.	227
KFAE	State College of Washington	Pullman, Wash.	330	KFFL	New Furniture Co.	Greenville, Texas	242	WABA	Lake Forest University	Lake Forest, Ill.	276
KFAF	Western Radio Corporation	Denver, Colo.	278	KFFM	Missouri National Guard, 70th Infantry Brigade	Jefferson City, Mo.	242	WABB	Lakeside Sporting Goods Co.	Harrisburg, Pa.	266
KFAG	University of Colorado	Boulder, Colo.	360	KFFN	Colorado National Guard, Forty-fifth Division	Fort Collins, Colo.	231	WABC	Lakeside Tire Co.	Sandusky, Ohio	244
KFAN	The Electric Shop	Moscow, Idaho	360	KFFO	G. & G. Radio & Electric Shop	Olympia, Wash.	236	WABD	Connecticut Agricultural College	Storrs, Conn.	280
KFAR	Studio Lighting Service Co.	(O. K. Olsen)	280	KFFP	Los Angeles County Forestry Department	Los Angeles, Cal.	236	WABE	F. E. Doherty Automotive & Radio Equipment Co.	Saginaw, Mich.	206
KFAU	Independent School District of Holywell, Cal.	Holywell, Cal.	280	KFFQ	Cope & Johnson	Salt Lake City, Utah	268	WABF	Hickson Electric Co.	Rochester, N. Y.	277
KFAW	The Radio Den	Boise, Idaho	500	KFFR	Heintz & Kohlmoos	San Francisco, Cal.	268	WABG	Robert Wehlig, 522 Wooster Ave.	Dover, Ohio	266
KFAY	Virgin's Radio Service	Medford, Ore.	283	KFFS	St. John's Episcopal Church	Cartersville, Ga.	254	WABH	Haverford College Radio Club	Haverford, Pa.	261
KFBB	F. A. Buttrey & Co.	Hayward, Mont.	360	KFFG	First Presbyterian Church	Pine Bluff, Ark.	242	WABI	Scott High School	Toledo, Ohio	263
KFBC	W. K. Abill	San Diego, Cal.	242	KFFH	Synonis Investment Co.	Spokane, Wash.	283	WABT	Holiday Hall	Washington, Pa.	226
KFBE	Reuther Bros.	San Francisco, Cal.	242	KFFI	The Principia, 5539 Page Ave.	St. Louis, Mo.	261	WABU	Victor Talking Machine Co.	Woonsocket, Ohio	276
KFBG	First Presbyterian Church	Tacoma, Wash.	360	KFFJ	Searchlight Publishing Co.	Fort Worth, Texas	232	WABV	College of Wooster	Wooster, Ohio	276
KFBK	Kimball-Upon Co.	Sacramento, Cal.	283	KFFK	Kild Brothers Radio Shop	Anchorage, Alaska	280	WABW	Henry B. Joy	Mount Clemens, Mich.	245
KFBL	Leese Bros.	Everett, Wash.	224	KFFL	Dickenson, Henry, Radio Laboratories	Colorado Springs, Colo.	224	WABY	John Magaldi, Jr., 815 Kimball St.	Phila., Pa.	242
KFBS	Trinidad Gas & Electric Supply Co. and Chronicle News	Wyo.	280	KFFM	Donald A. Boulton, 2544 Pleasant Ave.	Minneapolis, Minn.	224	WABZ	Collaquin Place Baptist Church	New Orleans, La.	263
KFBU	The Cathedral	Laramie, Wyo.	270	KFFN	Southern California Radio Association, Army Exposition Park	Los Angeles, Cal.	228	WABT	A. H. Grebo Co.	Stur, Tex.	316
KFBB	Nilsen Radio Supply Co.	Phoenix, Ariz.	236	KFFO	Albert Sherman, Hillsborough Box 51	Burlingame, Cal.	220	WBAF	Purdue University	West Lafayette, Ind.	283
KFCF	Frank A. Moore	Walla Walla, Wash.	258	KFFP	Thomas H. Ince Corp.	San Francisco, Cal.	234	WBAH	The Dayton Co.	Minneapolis, Minn.	244
KFCL	Leslie E. Rice, Los Angeles Union Stock Yards	Los Angeles, Cal.	236	KFFQ	Democrat Leader	Fayette, Mo.	236	WBAJ	Wireless Phone Corporation	Paterson, N. J.	275
KFCP	Ralph W. Flygare	Los Angeles, Cal.	208	KFFR	Oklahoma Free State Fair Association	Muskogee, Okla.	252	WBAK	James Millikin University	Decatur, Ill.	244
KFCV	Fred Mahaffey, Jr.	Houston, Texas	360	KFFS	Texas Highway Bulletin	Austin, Texas	268	WBAW	Wortham-Carter Publishing Co.	Fort Worth, Texas	476
KFCY	Western Union College	Le Mars, Iowa	252	KFFG	Third Baptist Church	Omaha, Neb.	261	WBAV	Erner & Hopkins Co.	Columbus, Ohio	294
KFCD	Omaha Central High School	Omaha, Neb.	258	KFFH	Walter L. Ellis, 625 East 6th St.	Oklahoma City, Okla.	250	WBBX	John H. Stenger, Jr., 66 Gildersleeve St.	Willesbarre, Pa.	256
KFCE	St. Michael's Cathedral	Boise, Idaho	252	KFFI	Walter L. Ellis, 625 East 6th St.	Oklahoma City, Okla.	250	WBBY	The Western Electric Co.	New York, N. Y.	492
KFCH	University of Arkansas	Fayetteville, Ark.	258	KFFJ	Marvin S. Olson	Carver, Minn.	270	WBBZ	Plymouth Congregational Church	Newport, Mich.	214
KFCJ	Oregon Agricultural College	Corvallis, Ore.	360	KFFK	Radioart Studio	San Francisco, Cal.	242	WBBW	Harvey Battery Service Co.	Reading, Pa.	234
KFCG	Knights-Campbell Music Co.	Denver, Colo.	226	KFFL	Cleveland High School	St. Louis, Mo.	236	WBBX	Georgia School of Technology	Atlanta, Ga.	270
KFCM	Magnolia Petroleum Co.	Beaumont, Texas	360	KFFM	The Radio Shop	Grafton, N. D.	268	WBBY	Irving Vermilya	Mattapoisett, Mass.	248
KFCN	First Baptist Church	Shreveport, La.	360	KFFN	Reynolds Radio Co., 1534 Glenarm St.	Denver, Colo.	224	WBBH	J. Irving Bell, 1511 Gordon St.	Port Huron, Mich.	205
KFCO	South Dakota State College	Brookings, S. D.	360	KFFO	Guy Simmons, Jr., 515 Clifton St.	Denver, Colo.	250	WBBJ	Grace Covenant Church	Richmond, Va.	283
KFCP	Early D. Treason	Minneapolis, Minn.	241	KFFP	Mon's Club of First Presbyterian Church	Grand Forks, N. Dak.	240	WBBK	Protestant Episcopal Church	Rockville, Md.	273
KFCQ	Meyer & Frank Co.	Portland, Ore.	238	KFFQ	Lieut. James P. Boland, U. S. A.	Grand Forks, N. Dak.	240	WBBL	People's Baptist Association	Rossville, N. Y.	273
KFCR	Winner Radio Corp.	Denver, Colo.	254	KFFR	M. Laurence Short	Fort Hill, Okla.	263	WBBM	First Baptist Church	New Orleans, La.	252
KFCS	Scroggin & Co.	Bank, Oak, Neb.	268	KFFS	Curtis Printing Co., 1109 8th Ave.	Hanford, Cal.	224	WBBN	Lyons Brothers	Philadelphia, Pa.	234
KFCT	Auto Electric Service Co.	Fort Dodge, Iowa	231	KFFG	Trinity Church	Fort Worth, Texas	246	WBBP	Jeans Motor Sales Co.	Monmouth, Ill.	224
KFCU	Augsburg Seminary	Minneapolis, Minn.	261	KFFH	Bristow	Redlands, Cal.	206	WBBQ	Johnstown Radio Co.	Johnstown, Pa.	222
KFCV	Bunker Hill & Sullivan Mining and Concentrating Co., Kellogg, Idaho	Idaho	360	KFFI	J. Gordon Klengward	Oklahoma		WBBR	Ruffner Junior High School	Norfolk, Va.	268
KFCW	Jenkins Furniture Co.	Boise, Idaho	240	KFFJ	Echo Park Evangelistic Association	Los Angeles, Cal.	277	WBBW	Noble B. Watson, 233 Iowa St.	Indianapolis, Ind.	227
KFCX	Eastern Oregon Radio Co.	Pendleton, Ore.	360	KFFK	W. D. Corley, 114 W. Del Norte	Colorado Springs, Col.	549	WBBX	Southtown Economist Station	Chicago, Ill.	266
KFCY	First Baptist Church	Monticello, Mo.	226	KFFL	Concordia Seminary	St. Louis, Mo.	549	WBBY	The Baxter Laundry Co., 747 Fountain	St. N. E., Grand Rapids, Mich.	256
KFD0	North Central High School	Spokane, Wash.	252	KFFM	Fitzsimmons General Hospital	Denver, Colo.	234	WBBZ	T & H Radio Co.	Grand Rapids, Mich.	234
KFD1	Graceland College	Lamoni, Iowa	250	KFFN	Pery & Redfield	Ogden, Utah	223	WBBW	Baltimore Radio Exchange	Willesbarre, Pa.	231
KFD2	Louisiana College for Women	Baton Rouge, La.	278	KFFO	Louis Sherman & Church	Salt Lake City, Utah	260	WBBX	Penn. State Police	Butler, Pa.	258
KFD3	Louisiana State University	Baton Rouge, La.	268	KFFP	Julius Branton Sons	San Francisco, Cal.	236	WBBY	D. V. May (Inc.)	Newark, N. J.	252
KFD4	Oklahoma College for Women	Claremore, Okla.	270	KFFQ	G. Pearson Ward	Springfield, Mo.	232	WBBZ	Southern Radio Corp.	Charlotte, N. C.	360
KFD5	LeLand Stanford University	Stanford, Cal.	270	KFFR	Carl W. Lewis	Moberly, Mo.	253	WBBW	Westinghouse Elec. & Mfg. Co.	Springfield, Mass.	337
KFD6	Snell & Irvy	Arlington, Iowa	234	KFFS	Tacoma Daily Ledger	Tacoma, Wash.	252	WBBX	Alfred P. Danted, 2504 Bagby St.	Houston, Tex.	263
KFD7	Craty Hardware Co.	Boone, Iowa	226	KFFG	Hallock & Watson Radio Service	Portland, Ore.	260	WBBY	St. Olaf College	Northfield, Minn.	360
KFD8	First Presbyterian Church	Orange, Texas	250	KFFH	General Electric Co.	Oakland, Cal.	312	WBBZ	The Sanders and Stayman Co.	Baltimore, Md.	275
KFD9	Western State College of Colorado	Fort Collins, Colo.	250	KFFI	Marion A. Mulrony	Honolulu, Hawaii	360	WBBW	Chesapeake & Potomac Telephone Co.	Washington, D. C.	469
KFE0	State Teachers College	Warrensburg, Mo.	234	KFFJ	ST. Martin's College	Lacey, Wash.	492	WBBX	Washington Light Infantry	Charleston, S. C.	268
KFE1	Penn College	Oskaloosa, Iowa	240	KFFK	Times Mirror Co.	Los Angeles, Cal.	395	WBBY	Noble B. Watson, 233 Iowa St.	Indianapolis, Ind.	227
KFE2	Star Electric & Radio Co.	Seattle, Wash.	283	KFFL	Walter Henrich	Kukuk, Ky.	263	WBBZ	T & H Radio Co.	Grand Rapids, Mich.	234
KFE3	Earle C. Anthony, Inc.	Los Angeles, Cal.	469	KFFM	C. O. Gould	Stockton, Cal.	273	WBBW	Baltimore Radio Exchange	Willesbarre, Pa.	231
KFE4	Benson Polytechnic Institute	Spokane, Wash.	252	KFFN	Northwest Radio Service	Seattle, Wash.	282	WBBX	Penn. State Police	Butler, Pa.	258
KFE5	North Central High School	Spokane, Wash.	252	KFFO	Bible Institute of Los Angeles	Los Angeles, Cal.	253	WBBY	D. V. May (Inc.)	Newark, N. J.	252
KFE6	First Methodist Church	Yakima, Wash.	242	KFFP	Reorganized Church of Jesus Christ of Latter Days Saints	St. Joseph, Mo.	268	WBBZ	Southern Radio Corp.	Charlotte, N. C.	360
KFE7	Alaska Elec. Light & Power Co.	Juneau, Alaska	226	KFFQ	Warner Bros. Radio Supplies Co.	Oakland, Cal.	241	WBBW	Westinghouse Elec. & Mfg. Co.	Springfield, Mass.	337
KFE8	Daily Commonwealth and Oscar A. Ruelman	Fond du Lac, Wisconsin	273	KFFR	Tribune Publishing Co.	Oakland, Cal.	509	WBBX	Alfred P. Danted, 2504 Bagby St.	Houston, Tex.	263
KFE9	Marshall Electric Co.	Marshall, Wash.	248	KFFS	Reynolds Radio Co.	Denver, Colo.	283	WBBY	St. Olaf College	Northfield, Minn.	360
KFE0	Seattle Post Intelligencer	Seattle, Wash.	270	KFFG	San Joaquin L. & Power Corp.	Fresno, Cal.	234	WBBZ	The Sanders and Stayman Co.	Baltimore, Md.	275
KFE1	National Radio Mfg. Co.	Oklahoma City, Okla.	261	KFFH	Love Electric Co.	Pasadena, Cal.	228	WBBW	Chesapeake & Potomac Telephone Co.	Washington, D. C.	469
KFE2	Liberty Theatre	Astoria, Ore.	252	KFFI	Walter Henrich	Kukuk, Ky.	263	WBBX	Washington Light Infantry	Charleston, S. C.	268
KFE3	Delano Radio & Electric Co.	Delano, Calif.	280	KFFJ	C. O. Gould	Stockton, Cal.	273	WBBY	Noble B. Watson, 233 Iowa St.	Indianapolis, Ind.	227
KFE4	University of North Dakota	Grand Forks, N. D.	280	KFFK	Northwest Radio Service	Seattle, Wash.	282	WBBZ	T & H Radio Co.	Grand Rapids, Mich.	234
KFE5	Electric Construction Co., Valley Radio Division	Grand Forks, N. D.	280	KFFL	Bible Institute of Los Angeles	Los Angeles, Cal.	253	WBBW	Baltimore Radio Exchange	Willesbarre, Pa.	231
KFE6	Ashley C. Dixon & Son	Stevensville, Mont.	258	KFFM	Reorganized Church of Jesus Christ of Latter Days Saints	St. Joseph, Mo.	268	WBBX	Penn. State Police	Butler, Pa.	258
KFE7	Iowa State Teachers College	Cedar Falls, Iowa	246	KFFN	Warner Bros. Radio Supplies Co.	Oakland, Cal.	241	WBBY	D. V. May (Inc.)	Newark, N. J.	252
KFE8	Tunwall Radio Co.	Fort Dodge, Iowa	246	KFFO	Tribune Publishing Co.	Oakland, Cal.	509	WBBZ	Southern Radio Corp.	Charlotte, N. C.	360
KFE9	Texas National Guard, 112th Cavalry	Fort Worth, Texas	254	KFFP	Reynolds Radio Co.	Denver, Colo.	283	WBBW	Westinghouse Elec. & Mfg. Co.	Springfield, Mass.	337
KFF0	Colorado State Teachers College	Greeley, Colo.	273	KFFQ	San Joaquin L. & Power Corp.	Fresno, Cal.	234	WBBX	Alfred P. Danted, 2504 Bagby St.	Houston, Tex.	263
KFF1	Brinkley-Jones Hospital Association	Billard, Ark.	286	KFFR	Love Electric Co.	Pasadena, Cal.	228	WBBY	St. Olaf College	Northfield, Minn.	360
KFF2	Conway Radio Laboratories	Billard, Ark.	250	KFFS	Walter Henrich	Kukuk, Ky.	263	WBBZ	The Sanders and Stayman Co.	Baltimore, Md.	275
KFF3	University of Kansas	Lawrence, Kan.	283	KFFG	C. O. Gould	Stockton, Cal.	273	WBBW	Chesapeake & Potomac Telephone Co.	Washington, D. C.	469
KFF4	F. F. Gray, 3200 Richardson St.	Butte, Mont.	283	KFFH	Northwest Radio Service	Seattle, Wash.	282	WBBX	Washington Light Infantry	Charleston, S. C.	268
KFF5	Westinghouse Electric & Mfg. Co.	Hastings, Neb.	341	KFFI	Bible Institute of Los Angeles	Los Angeles, Cal.	253	WBBY	Noble B. Watson, 233 Iowa St.	Indianapolis, Ind.	227
KFF6	Nassour Bros. Radio Co.	Colorado Springs, Colo.	234	KFFJ	Reorganized Church of Jesus Christ of Latter Days Saints	St. Joseph, Mo.	268	WBBZ	T & H Radio Co.	Grand Rapids, Mich.	234
KFF7	Abner R. Willson, 1321 W. Blinn	Butte, Mont.	283	KFFK	Warner Bros. Radio Supplies Co.	Oakland, Cal.	241	WBBW	Baltimore Radio Exchange	Willesbarre, Pa.	231
KFF8	Signal Electric Mfg. Co.	Menominee, Mich.	248	KFFL	Tribune Publishing Co.	Oakland, Cal.	509	WBBX	Penn. State Police	Butler, Pa.	258
KFF9	National Educational Service	Denver, Colo.	268	KFFM	Reynolds Radio Co.	Denver, Colo.	283	WBBY	D. V. May (Inc.)	Newark, N. J.	252
KFF0	Bizzell Radio Shop	Little Rock, Ark.	261	KFFN	San Joaquin L. & Power Corp.	Fresno, Cal.	234	WBBZ	Southern Radio Corp.	Charlotte, N. C.	360
KFF1	University of New Mexico	Albuquerque, N. M.	254	KFFO	Love Electric Co.	Pasadena, Cal.	228	WBBW	Westinghouse Elec. & Mfg. Co.	Springfield, Mass.	337
KFF2	Ro Grande Radio Supply House	San Benito, Texas	236	KFFP	Walter Henrich	Kukuk, Ky.	263	WBBX	Alfred P. Danted, 2504 Bagby St.	Houston, Tex.	263
KFF3	Swedish Evangelical Mission Church	Rockford, Ill.	229	KFFQ	C. O. Gould	Stockton, Cal.	273	WBBY	St. Olaf College	Northfield, Minn.	360
KFF4	Missoula Electric Supply Co.	Missoula, Mont.	234	KFFR	Northwest Radio Service	Seattle, Wash.	282	WBBZ	The Sanders and Stayman Co.	Baltimore, Md.	275
KFF5	George R. Clough, 1214 40th St.	Galveston, Tex.	240	KFFS	Bible Institute of Los Angeles	Los Angeles, Cal.	253	WBBW	Chesapeake & Potomac Telephone Co.	Washington, D. C.	469
KFF6	Atlantic Automobile Co.	Atlantic, Iowa	271	KFFG	Reorganized Church of Jesus Christ of Latter Days Saints	St. Joseph, Mo.	268	WBBX	Washington		

WDAY	Radio Equipment Corp.	Fargo, N. D.	244	WIK	K. & L. Electric Co.	McKeesport, Pa.	238	WSL	Hatfield Elec. Co.	Utica, N. Y.	242
WDBB	A. H. Waite & Co.	Taunton, Mass.	229	WIP	Gimbel Brothers	Philadelphia, Pa.	509	WSOE	School of Engineering of Milwaukee	Wisconsin	246
WDBD	Kirk Johnson & Co.	Lancaster, Pa.	238	WJAB	American Electric Co.	Lincoln, Neb.	229	WSRF	Harden Sales and Service	Broadland, Ill.	236
WDBF	Herman F. Burns	Martinsburg, W. Va.	258	WJAD	Jackson's Radio Engineering Laboratories	Waco, Texas	353	WSUI	State University of Iowa	Capitol and Wash- ington Sts., Iowa City, Ia.	360
WDBH	Robert G. Phillips	Youngstown, Ohio	252	WJAG	The Norfolk Daily News	Norfolk, Neb.	270	WSY	Alabama Power Co.	Birmingham, Ala.	360
WDBI	C. T. Sherer & Co.	Worcester, Mass.	254	WJAK	Clifford L. White	Greenwood, Ind.	254	WTAB	Penn. River Daily Herald Pub. Co.	Fall River, Mass.	266
WDBJ	Richardson-Wayland Electrical Corp.	St. Petersburg, Fla.	226	WJAM	D. M. Perham, 332 Third Ave.	Greenwood, Ind.	254	WTAC	Penn. Traffic Co.	Fall River, Mass.	266
WDBK	M. F. Broz, Furniture Hardware & Radio Co.	Roanoke, Va.	229	WJAN	Peoria Star	Peoria, Ill.	273	WTAF	Louis J. Gallo, 3222 Layportway St.	Johnstown, Pa.	269
WDBN	Malino Electric Light & Power Co.	Bangor, Me.	252	WJAO	The Outlet Co.	Providence, R. I.	360	WTAL	Toledo Radio & Elec. Co.	Toledo, Ohio	262
WDBP	Rollins College	Winter Park, Fla.	240	WJAX	Pittsburgh Radio Supply Co.	Pittsburgh, Pa.	275	WTAM	Willard Storage Battery Co.	Cleveland, Ohio	354
WDBQ	Superior State Normal School	Superior, Wis.	261	WJBD	Richard Howe	Cincinnati, Ohio	390	WTAP	Cambridge Radio & Elec. Co.	Cambridge, Mass.	242
WDBR	Morton Radio Supply Co.	Salom, N. J.	234	WJBE	Moogheart	Moosetown, Ill.	278	WTAR	S. H. Van Gorden & Son	Roanoke, Va.	254
WDBS	Tremont Temple Baptist Church	Salom, N. J.	234	WJBF	Moogheart	Moosetown, Ill.	278	WTAT	Charles E. Erbstein, R. F. D. 6, Box 75	Elgin, Ill.	286
WDBT	S. M. K. Radio Corp.	Dayton, Ohio	275	WJBG	Moogheart	Moosetown, Ill.	278	WTAW	Edison Electric Illuminating Co.	Boston, Mass.	242
WDBU	Strand Theatre	Hattiesburg, Miss.	236	WJBI	Moogheart	Moosetown, Ill.	278	WTAX	Ruerg Battery and Electric Co.	Tecumseh, Neb.	242
WDBV	The Radio Den	Columbia, Tenn.	258	WJBK	Moogheart	Moosetown, Ill.	278	WTAY	Agricultural & Mechanical College	College Station, Texas	280
WDBW	Otto Baur, 139 Dyckman St.	New York, N. Y.	258	WJBL	Moogheart	Moosetown, Ill.	278	WTBZ	Williams Hardware Co.	Streator, Ill.	231
WDBX	North Shore Congregational Church	Chicago, Ill.	258	WJBM	Moogheart	Moosetown, Ill.	278	WTCA	Oak Leaves Broadcasting Station	Oak Park, Ill.	250
WDBY	Boy Scouts of America, Ulster County Council	Kingston, N. Y.	233	WJBN	Moogheart	Moosetown, Ill.	278	WTCD	Thomas J. McGuire	Lambertville, N. J.	261
WDBZ	Boy Scouts of America, Ulster County Council	Kingston, N. Y.	233	WJBO	Moogheart	Moosetown, Ill.	278	WTCE	Gloucester Co. Civic League	Faterson, N. J.	231
WDM	The Church of the Covenant	Washington, D. C.	233	WJBP	Moogheart	Moosetown, Ill.	278	WTCH	The Travelers Insurance Co.	Manhattan, Kan.	273
WDMF	Dutee W. Flint	Flint, Cranston, R. I.	500	WJBS	Moogheart	Moosetown, Ill.	278	WTCL	H. G. Baal Co.	Hartford, Conn.	248
WDY	Ford Motor Co.	Flint, Cranston, R. I.	500	WJBT	Moogheart	Moosetown, Ill.	278	WTDL	Wright & Wright, Inc.	Chicago, Ill.	368
WDZ	J. L. Bush	Turlock, Calif.	275	WJBU	Moogheart	Moosetown, Ill.	278	WTDE	Lawrence J. Crowley (Alamo Ball Room)	Philadelphia, Pa.	360
WEAA	Frank D. Palfin, Police Building	Flint, Mich.	234	WJBV	Moogheart	Moosetown, Ill.	278	WTDF	Michigan College of Mines	Houghton, Mich.	244
WEAB	Standard Radio Co.	Fort Dodge, Ia.	254	WJBW	Moogheart	Moosetown, Ill.	278	WJEW	Ford Motor Co.	Dearborn, Mich.	265
WEAF	American Telephone & Telegraph Co.	New York, N. Y.	492	WJBY	Moogheart	Moosetown, Ill.	278	WJFD	Detroit News	Detroit, Mich.	517
WEAH	Whitla Board of Trade	Wichita, Kan.	285	WJBT	Moogheart	Moosetown, Ill.	278	WJFE	Loyola University	New Orleans, La.	280
WEAI	Cornell University	Ithaca, N. Y.	254	WJBU	Moogheart	Moosetown, Ill.	278	WJFG	Alaska Electric Light & Power Co.	Juneau	226
WEAJ	University of South Dakota	Vermillion, S. D.	278	WJCV	Moogheart	Moosetown, Ill.	278	WJFH	Chovin Supply Co.	Anchorage	280
WEAM	Borough of North Plainfield	North Plainfield, N. J.	261	WJCT	Moogheart	Moosetown, Ill.	278	WJFI	Walter Heinrich	Kukuk Bay	263
WEAN	Shepard Co.	Providence, R. I.	373	WJCH	Moogheart	Moosetown, Ill.	278	WJFJ	Canada		
WEAO	The Ohio State University	Columbus, Ohio	270	WJCI	Moogheart	Moosetown, Ill.	278	WJFK	The Calgary Herald	Calgary, Alta.	430
WEAP	Mobile Radio Co.	Mobile, Ala.	360	WJCM	Moogheart	Moosetown, Ill.	278	WJFL	Star Publishing & Printing Co.	18 King St. W., Toronto, Ont.	400
WEAQ	Davidson Bros. Company	Sioux City, Iowa	275	WJCN	Moogheart	Moosetown, Ill.	278	WJFM	Marconi Wireless Telegraph Co. of Canada, Ltd.	Canada Cement Bldg., Phillips Square, Montreal, P. Q.	440
WEAR	Chicago Radio Laboratory	Chicago, Ill.	364	WJCO	Moogheart	Moosetown, Ill.	278	WJFN	Abitibi Power & Paper Co., Ltd.	Ironducks Falls, Ont.	400
WEAY	Iris Theatre	Chicago, Ill.	364	WJCP	Moogheart	Moosetown, Ill.	278	WJFO	Radio Supply Co., Ltd., 1022 1/2 St. W., Edmonton, Alta.	410	
WEBA	Heurwood Co.	Houston, Texas	360	WJCS	Moogheart	Moosetown, Ill.	278	WJFP	Centennial Methodist Church	Victoria, B. C.	400
WEBC	The Electric Shop	Highland Park, N. J.	233	WJCT	Moogheart	Moosetown, Ill.	278	WJFQ	W. W. Grant Radio, Ltd., 708 Crescent Rd., N.W., Calgary, Alta.	430	
WEBD	Walter C. Bridges	Superior, Wis.	242	WJCU	Moogheart	Moosetown, Ill.	278	WJFR	Radio Specialties, Ltd., 791 Dundas Ave. E., Vancouver, B. C.	450	
WEBE	Electrical Equipment Service Co.	Anderson, Ind.	246	WJCV	Moogheart	Moosetown, Ill.	278	WJFS	Laurentide Air Service, Ltd., Nickle Range Hotel, Sudbury, Ont.	410	
WEBF	Edgewater Beach Hotel	Chicago, Ill.	370	WJCH	Moogheart	Moosetown, Ill.	278	WJFT	The Victoria City Temple, 1110 Douglas St., Victoria, B. C.	410	
WEGB	Walter Gibbons	Hollywood, Cal.	278	WJCI	Moogheart	Moosetown, Ill.	278	WJFU	Jack V. Elliot, Ltd., 123 King St. W., Victoria, B. C.	410	
WEGC	Third Ave. Ry. Co.	New York City	273	WJCM	Moogheart	Moosetown, Ill.	278	WJFV	London Radio Company	London, Ont.	430
WEGD	Grand Rapids Radio Co.	Grand Rapids, Mich.	242	WJCN	Moogheart	Moosetown, Ill.	278	WJFW	Sparks Company, Wallace & Fitzwilliam Sts., London, Ont.	430	
WEGE	H. C. A. United States (portable)	Hamilton, Ohio	252	WJCO	Moogheart	Moosetown, Ill.	278	WJFX	Heark Birk & Sons, Ltd., Nanaimo, B. C.	430	
WEGF	Radio Company	Hamilton, Ohio	252	WJCP	Moogheart	Moosetown, Ill.	278	WJFZ	708 Crescent Road N. W., Calgary, Alta.	440	
WEGA	Spanish Fort Amusement Park	Buffalo, N. Y.	244	WJCT	Moogheart	Moosetown, Ill.	278	WJGA	D. J. Fendell, Patricia Theatre Bldg., Thorold, Ont.	295	
WEGB	Tate Radio Co.	Harrisburg, Pa.	280	WJCV	Moogheart	Moosetown, Ill.	278	WJGB	Chas. Guy Hunter, 551 Adelaide St., London, Ont.	430	
WEGC	H. H. Howell	Buffalo, N. Y.	244	WJCH	Moogheart	Moosetown, Ill.	278	WJGC	The Electric Shop, Ltd., 144 Second St. N., Saskatoon, Sask.	400	
WEGD	Dayton Cooperative Industrial High School	Dayton, Ohio	270	WJCI	Moogheart	Moosetown, Ill.	278	WJGD	Queen's University (Dept. of Electrical Engineering), Fleming Hall, Queen's University, Kingston, Ont.	450	
WEGE	De Land Piano & Music Co.	De Land, Fla.	258	WJCM	Moogheart	Moosetown, Ill.	278	WJGE	Westminster Trust Co., Columbia Building, New Westminster, B. C.	448	
WEGF	Beloit College	Beloit, Wis.	263	WJCN	Moogheart	Moosetown, Ill.	278	WJGF	Victor Wentworth Odium, Mercantile Bldg., Vancouver, B. C.	400	
WEGG	Nashville, Tenn. H. R. No. 9, Franklin Pike	Franklin Pike, Tenn.	263	WJCO	Moogheart	Moosetown, Ill.	278	WJGG	The Alberta Publishing Co., Ltd., 708 Crescent Road N. W., Calgary, Alta.	440	
WEGH	Hobart Radio Co.	John E. Cain, Jr., Rollandale, Mass.	226	WJCP	Moogheart	Moosetown, Ill.	278	WJGH	Western Canada Radio Supply, Ltd., 919 Fort St., Victoria, B. C.	400	
WEGI	Savannah Radio Corp.	Savannah, Ga.	234	WJCT	Moogheart	Moosetown, Ill.	278	WJGI	Hiley & McCormick, Ltd., 708 Crescent Road N. W., Calgary, Alta.	440	
WEGJ	Edmonson Co.	Savannah, Ga.	234	WJCV	Moogheart	Moosetown, Ill.	278	WJGJ	The Hamilton Spectator, Spectator Bldg., Hamilton, Ont.	410	
WEGK	Edmonson Co.	Savannah, Ga.	234	WJCH	Moogheart	Moosetown, Ill.	278	WJGK	Northern Elec. Co., Toronto, Ont.	350	
WEGL	Edmonson Co.	Savannah, Ga.	234	WJCI	Moogheart	Moosetown, Ill.	278	WJGL	International Bible Students Association, Cor. Main and 2nd Sts., Saskatoon, Sask.	400	
WEGM	Edmonson Co.	Savannah, Ga.	234	WJCM	Moogheart	Moosetown, Ill.	278	WJGM	J. R. Booth, Jr., 28 Range Rd., Ottawa, Ont.	435	
WEGN	Edmonson Co.	Savannah, Ga.	234	WJCN	Moogheart	Moosetown, Ill.	278	WJGN	Northern Electric Co., Ltd., 121 Shearer St., Montreal, P. Q.	341	
WEGO	Edmonson Co.	Savannah, Ga.	234	WJCO	Moogheart	Moosetown, Ill.	278	WJGO	The Edmonton Journal, Ltd., Journal Bldg., Edmonton, Alta.	450	
WEGP	Edmonson Co.	Savannah, Ga.	234	WJCP	Moogheart	Moosetown, Ill.	278	WJGP	The T. Eaton Co., Ltd., Queen St. W., Toronto, Ont.	410	
WEGQ	Edmonson Co.	Savannah, Ga.	234	WJCT	Moogheart	Moosetown, Ill.	278	WJGQ	Spratt Shaw Radio Co., Room 1804, Tower Bldg., Vancouver, B. C.	400	
WEGR	Edmonson Co.	Savannah, Ga.	234	WJCV	Moogheart	Moosetown, Ill.	278	WJGR	The News Record, 39 South Cameron St., Kitchener, Ont.	295	
WEGS	Edmonson Co.	Savannah, Ga.	234	WJCH	Moogheart	Moosetown, Ill.	278	WJGS	Radio Corporation of Calgary, Ltd., 223 Second Ave. N. E., Calgary, Alta.	316	
WEGT	Edmonson Co.	Savannah, Ga.	234	WJCI	Moogheart	Moosetown, Ill.	278	WJGT	J. L. Phillips Laundry, 440 J. P. Q. 312, Montreal, P. Q.	312	
WEGU	Edmonson Co.	Savannah, Ga.	234	WJCM	Moogheart	Moosetown, Ill.	278	WJGU	Simons, Agnew & Co., 401 J. P. Q. 312, Montreal, P. Q.	312	
WEGV	Edmonson Co.	Savannah, Ga.	234	WJCN	Moogheart	Moosetown, Ill.	278	WJGV	London Free Press, 440 Richmond St., London, Ont.	430	
WEGW	Edmonson Co.	Savannah, Ga.	234	WJCO	Moogheart	Moosetown, Ill.	278	WJGW	The Evening Telegram, 81 Bay St., Toronto, Ont.	430	
WEGX	Edmonson Co.	Savannah, Ga.	234	WJCP	Moogheart	Moosetown, Ill.	278	WJGX	La Presse Publishing Co., Ltd., Cor. St. James St. & St. Lawrence St., Montreal, P. Q.	430	
WEGY	Edmonson Co.	Savannah, Ga.	234	WJCT	Moogheart	Moosetown, Ill.	278	WJGY	Vancouver Daily Province, 142 Quebec St., Vancouver, B. C.	410	
WEGZ	Edmonson Co.	Savannah, Ga.	234	WJCV	Moogheart	Moosetown, Ill.	278	WJGZ	Canadian Independent Telephone Co., Ltd., Wallace Ave. & Ward St., Toronto, Ont.	450	
WFAA	Carl C. Woese	Dallas, Texas	476	WJCH	Moogheart	Moosetown, Ill.	278	WFAA	Le "Soleil" Limited, C. W. Lindsay Bldg., Cor. St. John & St. Eustace St., Quebec, P. Q.	295	
WFAB	Carl C. Woese	Dallas, Texas	476	WJCI	Moogheart	Moosetown, Ill.	278	WFAB	Leader Publishing Co., Ltd., Regina, Sask.	420	
WFAC	Times Publishing Co.	Syracuse, N. Y.	273	WJCM	Moogheart	Moosetown, Ill.	278	WFAC	Dr. G. M. Geldert, 282 Somerset St. W., Ottawa, Ont.	400	
WFAD	Hutchinson Electric Service Co.	Hutchinson, Minn.	286	WJCN	Moogheart	Moosetown, Ill.	278	WFAD	P. Burns & Co., Ltd., 708 Crescent Rd. N. W., Calgary, Alta.	400	
WFAG	Hutchinson Electric Service Co.	Hutchinson, Minn.	286	WJCO	Moogheart	Moosetown, Ill.	278	WFAG	First Congregational Church, Vancouver, B. C.	353	
WFBA	University of Nebraska	Lincoln, Neb.	273	WJCP	Moogheart	Moosetown, Ill.	278	WFAG	Winthrop Radio Supply Co., Ltd., 400 J. P. Q. 312, Montreal, P. Q.	312	
WFBB	Eureka College	Eureka, Ill.	240	WJCT	Moogheart	Moosetown, Ill.	278	WFBA	Manitoba Telephone System, Sherbrooke St., Winnipeg, Man.	450	
WFBC	First Baptist Church	Eureka, Ill.	240	WJCV	Moogheart	Moosetown, Ill.	278	WFBA	Canadian Nat'l Railways, Calgary, Alta.	450	
WFBD	John Van De Walle, P. O. Box 41, Seymour	Tenn.	250	WJCH	Moogheart	Moosetown, Ill.	278	WFBA	Canadian Nat'l Railways, Edmonton, Alta.	450	
WFBE	William F. Gable Co.	Altoona, Pa.	277	WJCI	Moogheart	Moosetown, Ill.	278	WFBA	Canadian Nat'l Railways, Montreal, P. Q.	341	
WFBF	Concourse Radio Corp.	New York City	273	WJCM	Moogheart	Moosetown, Ill.	278	WFBA	Canadian Nat'l Railways, Ottawa, Ont.	435	
WFBG	William F. Gable Co.	Altoona, Pa.	277	WJCN	Moogheart	Moosetown, Ill.	278	WFBA	Canadian Nat'l Railways, Saskatoon, Sask.	400	
WFBI	Garvin Radio Supply Co.	Camden, N. J.	236	WJCO	Moogheart	Moosetown, Ill.	278	WFBA	Canadian Nat'l Railways, Toronto, Ont.	400	
WFBJ	Dartmouth College	Hanover, N. H.	256	WJCP	Moogheart	Moosetown, Ill.	278	WFBA	Canadian Nat'l Railways, Winnipeg, Man.	450	
WFBL	Onondaga Hotel	Onondaga, N. Y.	252	WJCT	Moogheart	Moosetown, Ill.	278	WFBA	Canadian Nat'l Railways, Moncton, N. B.	315	
WFBM	Merchants Heat & Light Co., 519 Guaranty Building	Indianapolis, Ind.	268	WJCV	Moogheart	Moosetown, Ill.	278	WFBA	Canadian Nat'l Railways, Moncton, N. B.	315	
WFBN	Radio Sales & Service Co., 1 Broad St.	Bridgewater, Mass.	226	WJCH	Moogheart	Moosetown, Ill.	278	WFBA	Canadian Nat'l Railways, Moncton, N. B.	315	
WFBO	Wynne Radio Co., 226 Fayetteville St.	Raleigh, N. C.	252	WJCI	Moogheart	Moosetown, Ill.	278	WFBA	Canadian Nat'l Railways, Moncton, N. B.	315	
WFBP	Fifth Infantry, Maryland N. G., Fifth Regiment Armory	Baltimore, Md.	254	WJCM	Moogheart	Moosetown, Ill.	278	WFBA	Canadian Nat'l Railways, Moncton, N. B.	315	
WFBS	Gloucester County Civic League	Pittman, N. J.	231	WJCN	Moogheart	Moosetown, Ill.	278	WFBA	Canadian Nat'l Railways, Moncton, N. B.	315	
WFBT	Commonwealth Radio Association	Boston, Mass.	273	WJCO	Moogheart	Moosetown, Ill.	278	WFBA	Canadian Nat'l Railways, Moncton, N. B.	315	
WFBU	Signal Officer, Fifth Corp Area	Corpus Christi, Tex.	273	WJCP	Moogheart	Moosetown, Ill.	278	WFBA	Canadian Nat'l Railways, Moncton, N. B.	315	
WFBY	Signal Officer, Fifth Corp Area	Corpus Christi, Tex.	273	WJCT	Moogheart	Moosetown, Ill.	278	WFBA	Canadian Nat'l Railways, Moncton, N. B.	315	
WFCA	Knox College	Ft. Hayes, Columbus, Ohio	273	WJCV	Moogheart	Moosetown, Ill.	278	WFBA	Canadian Nat'l Railways, Moncton, N. B.	315	
WFCC	Strawbridge & Clothier	Philadelphia, Pa.	395	WJCH							

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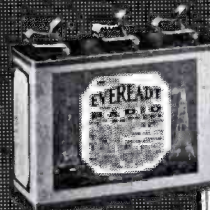
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Continental Broadcasts

(Continued from page 19)

NEW broadcasting developments are also due. The general manager of the British Broadcasting Company was in Paris recently and discussed with the manager of the Compagnie Française de Radiophonie the possibility of an international agreement between the broadcasting company regarding the re-transmission of concerts given in one country to other countries. This is certainly the legitimate thing for European broadcasting stations to do in view of their proximity, and some of the experiments along these lines have been most successful. Publicists

and politicians have been interested in this development for the reason that international understanding is certain to follow the closer contacts which such broadcasting must, necessarily, bring about.

The fact that by far the greater proportion of receiving sets in Europe today are crystal and single tube sets makes this particularly important. Those with multi-tube sets can listen in at will to various Continental stations, but the great majority must depend on the material from the nearest national station, and they therefore look forward with particular interest to this new development of foreign re-

transmitted radio broadcast programs.

The French, English and German languages are fairly universally understood—at least far more so than in America—among Continental countries, and therefore the language barrier is not so important.

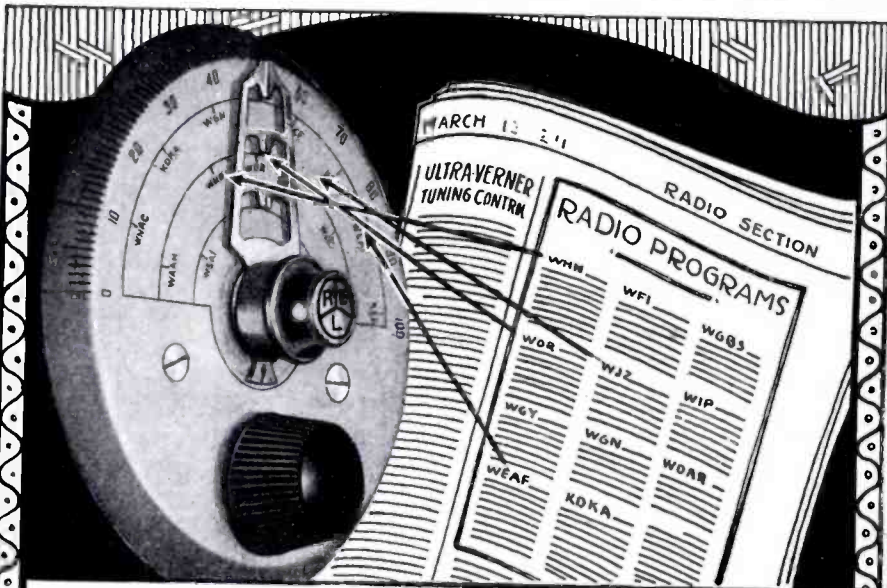
As is usual in European countries, the interest of royalty in a matter greatly heightens popular interest. During their recent visit to London, the King and Queen of Belgium paid an unofficial visit to Station 2LO. King Albert is reported to be an enthusiastic radio fan. The Prince of Wales has also exhibited a real radio interest and others of high rank in England are known to be especially interested in radio.

There is available in England nothing like the reading matter on radio that abounds in America. The newspapers do not issue tabloid radio sections, nor are there the radio magazines in profusion that we have. There are but five radio magazines in England, trade and general, as compared to 35 or more here. The newspapers do carry the radio programs; but as there are so relatively few stations, these programs bulk very small. The English newspapers do not seem to know the art of making lively radio news and dressing up the subject—an art which has done much in America to build up the business. There is nothing like the variety of circuits and technical information presented in American newspapers.

As England is a country with a well developed international sense, there is much interest in the radio developments on the Continent, in view of the re-transmission plans maturing.

For instance, there is to be an international wireless exposition held in Geneva, in the Electrical Palace during September, 1925—a time selected because the Plenary sessions of the League of Nations will then be in progress. It is expected that the sessions will be broadcast, and many are hoping that the re-transmission plans will be completed so that the League sessions will be made as familiar to Europe via radio as were the Democratic and Republican Conventions in the United States. Politically, this would be very desirable, and from a radio development standpoint especially so; for the League is a real and vital organization to Europe.

THERE is also an international connection in another way. The new high-powered station being erected at Chelmsford, England, is expected to be a very powerful link for England with not only the rest of Europe, but even with England's prize colony, India. At Bombay a high-powered receiving set is being installed which will receive and re-transmit the Chelmsford programs for the benefit of all West-



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ern India. There is lively agitation in India at present on the subject of broadcasting, which is just beginning to be a factor there. The Bengal Chamber of Commerce and the Indian Government are slightly at odds as to whether broadcasting should be public or private.

It has now been announced by the General Post Office, reports our American Consul, that from January 1, 1925, receiving licenses issued by the Post Office will not contain the former condition that the licensee "Shall not knowingly use any set or component part manufactured elsewhere than in Great Britain, Northern Ireland, the

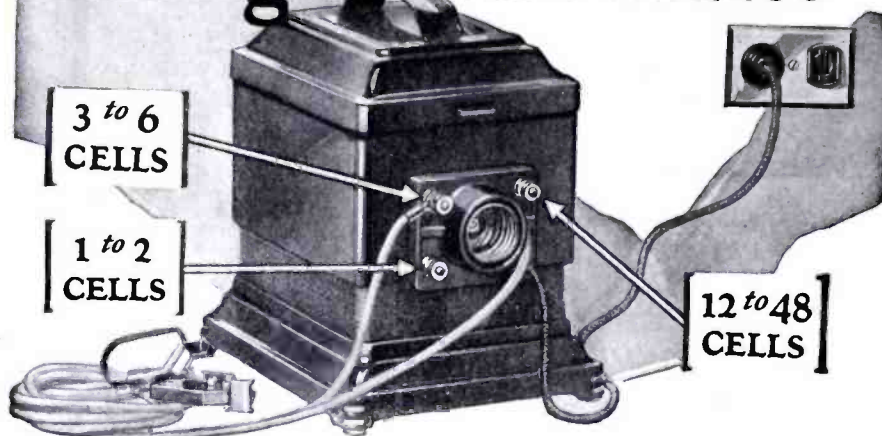
Channel Islands, or the Isle of Man."

As a result of the removal of this ban, it is believed that there will be greatly increased imports of foreign tubes, telephones, condensers, transformers, and other parts, as well as complete crystal receiving sets, although it is understood that patents covering the use of the apparatus will have the effect of continuing the ban on complete tube sets. Certain radio material, mainly of Continental origin, has been put on the market at much lower prices than British goods. For instance, it is understood that German, Dutch, Austrian and French tubes are available at prices varying from 4s.6d.

(\$1.04 at \$4.70 to the £) to 15s.6d. (\$3.57), while British made tubes cost from 12s.6d. (\$2.88) to 30s. (\$6.90); while German telephones were sold a year ago at prices as low as 10s. (\$2.30) a pair, while British telephones were then costing a minimum of £1 (\$4.70).

There is a keen demand for radio material in England and an increasing interest in radio, the number of listening-in licensees having recently passed the 1,000,000 mark. Competitive conditions are such, however, that an American firm wishing to establish their products there would be well advised to make a careful study of the situation before formulating any plans for the development of this market.

New Model Tungar charges all batteries



On the back of the Tungar, there are three terminals. Slip the wire into one and charge your radio "A" battery, 2 or 4 volt size. Use the second to charge your radio "B" battery, 24 to 96 volt size. Or the third will charge a 6 volt "A" battery or 6 to 12 volt auto battery.

Just clip on the Tungar, and plug it into any electric outlet in the house or garage. Then leave it overnight to charge while you sleep. Very simple.



The Tungar is a G-E product, developed in the great Research Laboratories of General Electric.

The New Model Tungar charges radio A and B batteries, and auto batteries. Two ampere size (East of the Rockies) \$18.00

The Tungar is also available in five ampere size (East of the Rockies) . . . \$28.00

60 cycles—110 volts

Tungar

REG. U. S. PAT. OFF.

BATTERY CHARGER

Tungar—a registered trademark—is found only on the genuine. Look for it on the name plate.

Merchandise Department
General Electric Company
Bridgeport, Connecticut

GENERAL ELECTRIC

"Quality Goods for Quality Readers"



WHEN Dr. Ralph L. Power completed his first year as the Sky Crier, or announcer, for The Los Angeles Examiner station KFI, he presented an anniversary high jinks program that radioland awaited patiently for many weeks.

Although there was a large array of orchestral and vocal talent, the piece de resistance on the musical menu was the singing of the Sky Crier for the first and positively last time via radio.

After various trumped up delays, the program was nearly over when the Sky Crier burst into song and gave two popular numbers. The following days were times of nightmares for the studio staff, which was swamped with fan mail.

Dr. Power, who is a former college professor, sadly looked at the heap of applause cards and letters and then told radioland he didn't know whether the applause was for his singing or because it was his last, as well as first, appearance.

The Lodge on Baldtop

(Continued from page 23)

better make tracks. Know how to use snow shoes?"

"A little," said the girl. "It's really dangerous, you think?" She was undeniably anxious and perhaps bewildered at her predicament.

"I'm afraid it is," said Bobbie soberly. "But don't worry. They shan't get you. They'll have to kill me first."

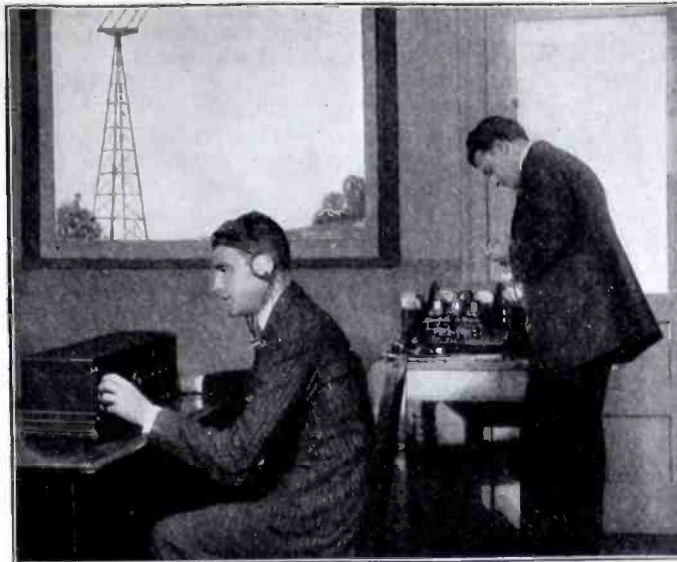
She turned pale. "Would they go that far? I—I suspected that they were—that there was a conspiracy of



I am averaging anywhere from \$75 to \$150 a month more than I was making before enrolling with you. I would not consider \$10,000 too much for the course.
(signed) A. N. Long,
Greensburg, Pa.



No sooner had I received my discharge (as a buck private) than I opened a radio shop of my own. I earned over \$3500 in 1 year. I wouldn't have missed the N. R. I. course for a million dollars.
John P. Ziano,
Corona, L. I.



Before I enrolled with you I was making \$15 a week on a farm a year. Now I earn from \$2,080 to \$1,420 a year. And the work is a hundred times easier than before. Since graduating a little over a year ago, I have earned almost \$1,000 and I believe the course will be worth at least \$100,000 to me.
(signed) Geo. A. Adams,
Tamaqua, Pa.



I can very easily make double the amount of money now than before I enrolled with you. Your course has benefited me approximately \$3,000 over and above what I would have earned had I not taken it.
T. Winder,
Grand Junction, Cal.

Prepare Yourself For Radio — the New Profession

Many N.R.I. Graduates Now Earning From \$5000 to \$20000 a Week

THE biggest, best-paying field open to ambitious men today. Thousands needed at once for pleasant, interesting jobs. High Pay—Short Hours. No experience required. Learn in your spare time at home.

Here is work that is fascinating, new and easy—an industry which is growing more rapidly than any other in the world today—an industry that offers you the chance of a lifetime to "get in on the ground floor" and make big money. Right now, thousands of trained men are needed in all branches of the business. Radio operators, radio engineers, salesmen, mechanics and Radio executives are scarce and receive wonderful pay. Are you going to shut your eyes to this golden opportunity when there is a quick, easy way to get one of these splendid positions?

You can train for this "big money" field right in your own home—in your spare time. No matter how little you know about electricity or Radio, the National Radio Institute—the largest and best school of its kind in the world—will guarantee to give you a thorough Radio training in a few short months.

Salaries Doubled and Tripled

Since the National Radio Institute was founded in 1914 over 15,000 men and young

men have taken this short-cut to Success in Radio. They are enthusiastic about this wonderful Course.

E. W. Barnes, Norfolk, Va., writes: "During my spare time, I make about as much repairing radio sets and building them as my regular salary."

In a letter from Arthur Ruse of Toronto we read that he has doubled his income since mastering Radio and that he earns from \$50 to \$100 a month in his spare time.

This page contains only a few of the thousands of letters we receive from successful graduates. Hardly a week goes by without our receiving urgent calls for our graduates. "We need the services of a competent Radio Engineer."

"We want men with executive ability in addition to radio knowledge to become our local managers." "We require the services of several resident demonstrators"—these are just a few small indications of the great variety of opportunities open to our graduates.

This is an absolutely complete Radio Course which qualifies you for a Government First Class Commercial License and

really gets you the bigger paying jobs in Radio.

Send Today for Free Book and Special Short-time Offer

Don't rely on this announcement for a true picture of the opportunities in Radio. Simply mail the coupon and we will send you a big free book "Rich Rewards in Radio," which will show you actual proof of the big money being made by our graduates today. It will describe the course in full detail, it will tell you just how much you can earn in this fascinating profession.

Best of all, you will get the details of our Special Reduced rate which is being offered for a short time. So, mail the coupon now! Make this your lucky day! **The National Radio Institute, Dept. 46EB, Washington, D. C.**

Study In Your Spare Time at Home

This is the time to go into radio. Big opportunities are now open in every branch of the work, and salaries were never so high. The thing to do is to begin studying at once, in whatever time you can spare, so that you will be able to qualify for the position you want when the time comes. Only an hour or so every evening will quickly prepare you for radio—a profession you cannot fail to find fascinating and pleasant. Don't handicap yourself; start at once and advance with the others.

The National Radio Institute,
Dept. 46EB, Washington, D. C.

I am interested in radio as a profession. You may send me, free and without obligation, your interesting book, "Rich Rewards in Radio," all information about your spare time, home-study plan and about your free employment service. Also, the details of your Special Offer.

Name.....Age.....
Street.....Occupation.....
City.....State.....

"Quality Goods for Quality Readers"

some sort—but not that they were so determined. It must be very valuable."

Bobbie winced slightly. This was bringing it home, with a vengeance. But he rose undaunted. His not to question his love!

"Yes," he assented gloomily. "Fifty thousand, they say. And a thousand offered for you."

"For me!" she gasped, her eyes wide. "For me—dead?"

"They'd as soon have it that way, I guess," he said, bitterly.

For quite a few minutes she stared at him, her face pitiful in its terror and abasement. And with each moment, the big heart of Bobbie swelled and his sympathy mounted ever higher

and nearer to that pinnacle which is the love that knows no limit. And then she shuddered and her hand went out gropingly to him.

"Don't!" said he. "Please don't. No matter what you've done, Sadie, I love you and I'll die before they lay a finger on you."

"My name is isn't Sadie—and I don't know yours!" she said tearfully.

"I don't care what your name is and mine is Bobbie."

She sobbed in answer to this and leaned against his shoulder. Her arms even clung to him.

"Oh, Bobbie!" she said. "I—I don't want them to get me."

"They shan't," he assured her. And pretty soon she looked up shyly, looked

down again and then, in some manner, their eyes met—and they met.

WELL, the fat was in the fire now. Bobbie was committed to a criminal career, and, somehow, he was not at all depressed at the thought. He looked at Shingle Sadie and wondered what her real name was. He knew it must be a pretty name. But he would never ask her. Her confidence would always be respected by him. He wouldn't even embarrass her further tonight. She must be terribly upset and it was needful to distract her.

The radio offered the means and once more he went fishing through the air for a suitable program. And then an idea occurred to him. If they were to plan wisely, they should be conversant as far as possible with the enemy's moves and Rutland might again be sending news about Shingle Sadie. If so he ought to be listening in on it.

So he dialed for VRU and pretty soon the voice of the announcer rolled out of the horn. But he was merely reporting a series of tabloid news items of the day and Bobbie hardly listened to them.

"As soon as your ankle can stand it," he said, "we'll head North with a sled. We can make it—"

The announcer interrupted at this moment. "Boston, Massachusetts," he declaimed. "The police report the capture, at New Haven, Connecticut, of the female bandit known as Shingle Sadie, who was wanted for the robbery of jewels from the Baroness Irma Montalga. She waived extradition and was taken back to Boston to stand trial this morning."

Bobbie sat with mouth open for a half minute. Then he slowly swung around on the girl who was looking at him in puzzled and shy reproach. She first flushed and then paled at sight of his glaring eyes.

"Who in the name of Pete are you?" he said and grabbed her by both arms. She rose, frightened.

"Why—why, I'm Marion Whistler!" she stammered. "What—what is the matter, Bob—Bobbie?"

Bobbie wrapped her in both arms and hugged her up to him, and shouted with laughter.

"Nothing! Nothing at all, you blessed dear!" he declaimed. "Oh, Marion, Marion! What were you doing up here?"

"Bobbie! Let me go! You're strangling me! I don't know what is the matter with you. I came up to look at the farm, of course. Someone was trying to buy it—and I thought there must be something of value about it or it wouldn't attract a purchaser. So I came up to see—and those terrible brutes tried to stop me, and shot at me, and drove me right into—into your arms, I guess. Please! Bob!"

McCormack—More Clearly on the FRESHMAN MASTERPIECE

WHEREVER you are in this country you can easily tune in John McCormack, Bori, Alda and the host of other Metropolitan Opera artists, now broadcasting every other Thursday evening from WEA F and other stations.

The Freshman Masterpiece assures true to life reproduction with real loud speaker volume. Brings out every single note distinctly, with matchless tonal qualities.

The easiest of all sets to operate.

A five tube tuned radio frequency receiver, made of the finest low loss materials and in a beautiful genuine solid mahogany cabinet, that is attractive enough for the most pretentious room, and at sixty dollars, economical enough for the most modest. Combining all points essential to the perfect receiver, it is the greatest value ever offered in a radio receiving set.

Chas. Freshman Co. Inc.
Radio Receivers and Parts
FRESHMAN BUILDING
240-248 WEST 40TH ST.—NEW YORK, N.Y.

These artists broadcasting through courtesy of Victor Talking Machine Co.

Every genuine Freshman Masterpiece has the serial number and trade mark riveted on the sub-panel. Sets are not guaranteed if number has been removed or tampered with. Beware of imitations. Insist upon the genuine.

"Quality Goods for Quality Readers"

Rural Life Modernized

(Continued from page 27)

will see in this newest electrical wonder a valuable piece of equipment.

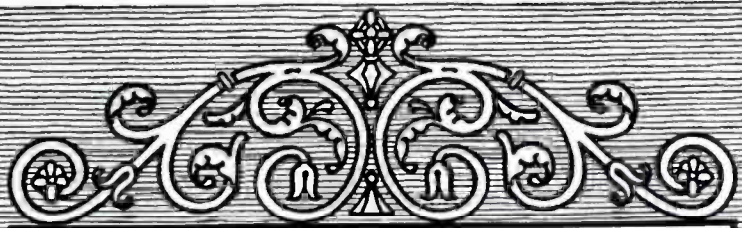
The electrical trade, through which the bulk of radio equipment is handled, has no little contact with farmers. This will have to be developed. It can be brought about easily and quickly by any agency that is interested, and has knowledge of the problems of distribution and of the proper approach to the rural leaders, the extension forces of the agricultural schools, and the farm organizations.

In a southern state recently the director of extension of the agricultural college built a fine broadcasting station at the college and then equipped each county agricultural agent in the state with a good receiving set. If the local dealer of radio equipment in each county had the vision of a radio set on every farm he could come near realizing it by tying up with the county agent, arranging for demonstrations at farmers meetings and by pushing good equipment that would bring in the news, reports and entertainment that farmers want.

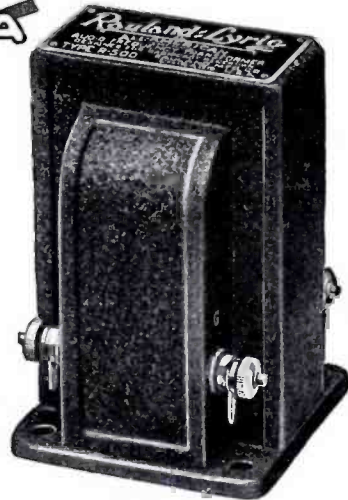
THE one big question in the minds of those who build broadcasting stations is "Can this be made to bring us in any sort of a return." As has already been said in this article, the only sort of return they have had so far is the return that comes from general or good will advertising. There are plenty of reasons why some of the larger public service corporations would look on the indirect results of broadcasting as justification for the expense. for their continued success pretty largely depends on the good will of the people.

The great electrical companies and the newspapers are examples of those who need the effect of good will advertising. Schools and colleges, however, might reasonably have even a more altruistic attitude toward broadcasting for the education and entertainment of the public. In the case of public schools and colleges it is the public which directly pays the bill anyway. Private schools, however, probably will broadcast for the advertising they get out of it.

In the case of the manufacturers and dealers of radio equipment the continuation of broadcasting is vital. No broadcasting, no sale of equipment. The dwellers in cities and the fairly large towns are not dependent on any form of long distance communication for news, report service, or entertainment, and the broadcasters cannot look to them for the continued support for their enterprise. From those whose location has made radio broadcasting a vital thing to them, will come a great protest against any mention of discon-



MEMBER
RMA



**Radio Music
for the Critical**

Music lovers find an especial delight in Rauland-Lyric. Used in all audio stages of a radio receiver, it reproduces with fidelity those elusive refinements of tone quality which, to the trained ear, mean artistic excellence.

Rauland-Lyric is a laboratory-grade audio transformer designed especially for music lovers. The price is nine dollars. Descriptive circular with amplification curve will be mailed on request. All-American Radio Corporation, 2674 Coyne Street, Chicago.

Rauland-Lyric
AN

ALL-AMERICAN
TRADE MARK
TRANSFORMER

The Choice of Noted Music Critics



"Quality Goods for Quality Readers"

FOR THE ONE-CONTROL 3-CIRCUIT TUNER

Described by Mr. R. A. Bradley in the January issue

**EASTERN
Low Loss Coupler
THE IDEAL TUNER!**

Minimum of losses—no tubing—large wire—perfect design.

The wonderful popularity of this coupler in the 3-circuit tuner is due to the ease of construction and single dial control of a receiver that brings in distance with exceptional volume for three tubes. It surpasses many standard multi-tube sets in range, power and dependable efficiency.

EASTERN LOW LOSS COILS

are incomparable for efficiency in whatever circuit they are used.

COILS for the IMPROVED SUPERDYNE

- Circuit \$8.00
- Radio Broadcast Knockout ROBERTS Circuit* 8.50
- TUNED R. F. Coils—2 types—to be used with .0005 or .00035 condensers. Single Coils, \$2.00 each. Set of 3 6.00



Price \$6.00



EASTERN COIL CORP.

22 WARREN STREET Dept. W. A. NEW YORK CITY

AT YOUR DEALERS OR DIRECT POSTPAID

tinuance of the service. Once the majority of the farmers have installed radio sets they will demand service and be willing even to pay for it if some method of payment can be devised.

Just how expensive it is to broadcast we cannot say. No general record over a period long enough to set a standard has been kept. The cost will vary with the amount of the entertainment and the service rendered. Certain types of broadcasting, such as speeches at great gatherings, sporting events, etc., will require the co-operation of special telephone wire lines and equipment. The Bell System of telephone companies is giving such services in a limited way.

To the farmers this means much as also it does to the whole country. It will be a great uniting force binding the ends of our great commonwealth together. The voice of the President has been heard in all parts of the country; great musicians, educators, speakers, from all the world have also been heard in the most remote farm house in the land.

THOUSANDS of letters come to the broadcasting stations daily bearing messages of approval and thanks for the entertainment, the news, and the various reports. What do the farmers think of it and what do they want, are two questions most often asked. The broadcasting stations that are putting out programs of weather and market reports for farmers send in to the department many letters from their country listeners. Many letters come direct. All voice the belief that a new day has dawned for those who live in the country. Here are a few of the thousands of letters which have come to the Department during the past year:

"Gentlemen:

I am a farmer living in Central Illinois, and receive the markets and United States weather report daily by radio. The market reports are perfect, and are the grandest thing that has been inaugurated in recent years. In my opinion the Department of Agriculture should take the necessary steps to place the broadcasting of these reports on such a foundation as would insure their being broadcasted in the future, because having tried them out we could not get along without them in the future.

Yours Truly,

J. W. Rose,
Bluff City, Illinois."

"I have the only radio outfit in this section. Everyone around here calls me up every day to get the reports.

"As early as eight-thirty in the morning we get live stock market reports and from ten o'clock on the grain reports. The market reports will revolutionize the farming business. The farmer gets it "off the bat" about markets, has not got to take the buyer's word about any-

★
\$10

Complete with cord



**RHAMSTINE ★
NEEDLEPHONE**

"All Alone"

When your favorite radio orchestra is playing "All Alone," tune it in on the Needlephone and your phonograph. You'll be surprised at the wonderfully sweet reproduction—the clear tender strains—and the full rich notes.

Magnified Reproduction

No other type of loudspeaker can possibly give equal reproduction, because no other type of speaker takes advantage of the principle of "magnified reproduction" and the perfection of the entire phonograph reproducer.

The Needlephone picks up the delicate impulses that come in over your radio and transmits them through, by vibrations of a flexible reed (more sensitive than a metal diaphragm) to the point of the phonograph needle. These small vibrations at the point are then transmitted through the pivoted needle to the mica diaphragm where they are enlarged and transformed into sound. As a result, the most delicate variations of tone are enlarged and given fuller value. It is adapted for use on any phonograph, including the Edison with Victor reproducer.

Send No Money. Take No Risk

Send the coupon today, pay on delivery, and try the Needlephone on your own phonograph and radio. Try it with a soft needle on local broadcasting and see what pleasures await you. Try it with a loud needle and see what volume you get without distortion or metallic noises. Then if you are not entirely satisfied—if you do not think it is the best loudspeaker for the money you ever saw—if you cannot say you get better reproduction, sweeter, clearer music—Rhamstine® does not want you to keep it. Return it and he will gladly return your money in full.

J. Thos. RHAMSTINE★

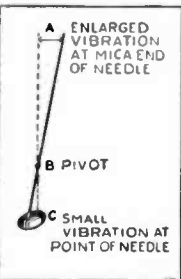
J. THOS. RHAMSTINE* (3)

504 E. Woodbridge, Detroit, Mich.

Send me the Needlephone. I'll pay the postman \$10 upon its arrival. It is distinctly understood I may return it if I desire, within 5 days and receive a refund in full.

Name

Address



Magnified Reproduction

Mail This Coupon To-day

"Quality Goods for Quality Readers"

thing. The broadcasting of markets make the radio as essential to the farm as the auto is in this age.

Yours truly,
Fred Buchanan,
Granger, Ia."

That radio broadcasting has dispelled the dread loneliness of one isolated farm home is surely proved by this letter.

"I am on a farm 100 miles northwest of St. Louis, 15 miles to the nearest railway station. We have all dirt roads and six months out of the year we consider a trip to the railroad station a 16-hour job. Our mail is 2 to 4 days old when it reaches us. We have not had service at our church since August, 1921. I have been using a home made crystal set for receiving. We feel we could hardly get along any more without these reports, and besides we are passing the good work along to neighbors over our community telephone line.

"We 'Hill Billies' out in the 'Sticks' look on radio as a blessing direct from God.

"Besides the reports on live stock, eggs, cream, butter, hay and all kinds of grain, etc., we usually listen in to the good sermons on Sundays and good lectures which we could never hear any other way.

C. C. Windsor, Minneola, Mo."

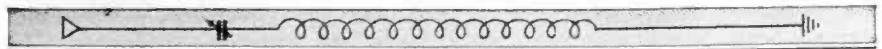
With literally thousands of such letters coming to the Department and to the broadcasting stations, can any one wonder at the enthusiasm with which the broadcasters are continuing the work without any sort of actual compensation except the good will of those who listen in and write their appreciation.

THE successful development of the field for radio will depend upon the establishment of satisfactory broadcasting, and upon placing in the hands of the farmer a receiving set that will fulfill his wants.

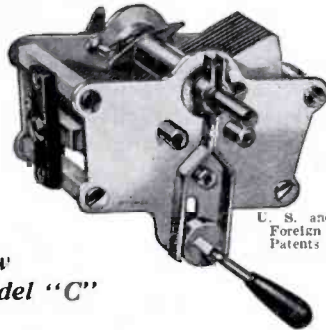
Satisfactory broadcasting consists of two principal elements, subject matter and transmission. To insure the lasting interest of the farmer the subject matter transmitted from each station must be such as to meet and satisfy the needs of the rural population.

The farmer is keen for news, both general and specific; general news because it can be delivered to him by radio while it is still news, and specific news of interest to him because of his business. The latter can be classified as weather, crop and market reports, and financial news.

From an entertainment and educational standpoint the farmer will become just as exacting in regard to the types of entertainment as one living in the cities, and perhaps more so, for his future daily entertainment will be delivered to him by radio. Religious instruction by radio he will want and without a doubt will demand.



For Better Radio Hammarlund PRECISION CONDENSER



New Model "C"

U. S. and Foreign Patents

AN increased knowledge of radio leads naturally to the use of better parts. Every experienced amateur knows that *quality* should be the chief consideration in selecting radio equipment. In no other field does *quality* count for so much. This applies particularly to variable condensers.

The new Model "C" Hammarlund Condenser is the product of 14 years' experience, making precision instruments. It is a masterpiece of engineering efficiency; acclaimed by experts everywhere.

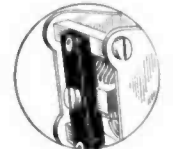
And yet, it is no higher priced than you are asked to pay for inferior instruments.

Use only Hammarlund Condensers in your construction work and you will have the best the radio world affords.

Made in all capacities; plain and vernier. Sold by the better radio dealers.

9 points of superiority

- 1—Soldered brass plates, chemically treated against corrosion; perfect alignment.
- 2—Stator plates specially shaped for easy tuning on low waves.
- 3—Adjustable ball-bearing rotor shaft grounded through metal end-plates.
- 4—Soldered clock-spring pig-tail, with automatic stop.
- 5—Minimum dielectric losses too small to be measured.
- 6—Rugged, compact construction; cannot warp.
- 7—Micrometer cam vernier moves all plates; no backlash.
- 8—Takes any size dial up to 4 in.
- 9—The product of 14 years' experience, making precision instruments.



Write for interesting folder

HAMMARLUND MANUFACTURING CO.

424-438 West 33rd Street, New York

Canadian Distributors, Radio, Ltd., Montreal

Pacific Coast Representatives:

Atlantic-Pacific Agencies Corp., 204-212 Rialto Bldg., San Francisco



Dulce-Tone and your Talking Machine —the BEST Loud Speaker

WITHIN your talking machine is the finest radio amplifying unit that money can buy—link it to your radio with a Dulce-Tone. Radio will be reproduced with the same clear, undistorted precision you get in playing a record. No substitute will give equal results.

Hear Dulce-Tone today at your favorite radio or music store. If they have not Dulce-Tone in stock, order direct. Price complete \$10.00. (In Canada, \$14.00).

THE TEAGLE COMPANY, 1125 Oregon Avenue, Cleveland, Ohio
Canadian Representative: The Otto Higel Co., Ltd., Toronto

Dulce-Tone



"Quality Goods for Quality Readers"

On Patrol

(Continued from page 29)

Sir," upon which he recognized my voice and asked: "Any word from the convoy?" Replying in the negative and passing whatever information I had intercepted by radio to him, we exchanged a few remarks regarding the gale and its increasing force after which I continued forward, with his final words impressing me: "Chief, do your utmost to get them on the radio."

Reaching the forward end of the deck house, I held on while the ship buried its bow into a smothering "green-back" and then, as the fo'c'sle rose high in the air on the crest of the wave and just before the wall of water which we had shipped came rushing aft, I made a mad dive for the hatchway leading into the petty officer's quarters, scrambling down the ladder into utter darkness again—no lights being permitted in the forepart of the ship. Groping my way to my relief's bunk, I gave him a none too gentle shake, accompanied by the lowly uttered words, "Jim! Hey Jim! Time to go on watch," "Snap out of it old timer!" Then, turning over the "watch" to him, I stretched out on the settee built into the after bulkhead of the radio room to catch as much sleep as possible before going on watch again at 4 A. M. How long I had been sleeping I do not know, when I was rudely awakened by Jim, who rather excitedly called, "Chief, I've raised 4-AL." This was the special radio call of the convoy for which we were searching and I instantly told him "to ask their operator to 'stand by' for message." while I made a dash up to the emergency cabin located under the bridge, where the "Skipper" held forth while at sea. "Wild Bill" as the crew had nicknamed the Captain, was perched thwart-ships with his legs braced against the roll of the ship on the roomy, cushioned settee, with the inevitable black cigar gripped between his teeth. I gave him the news for which he had been waiting so many weary hours: "Sir, we are in touch with the convoy," to which he instantly replied, "Good work, Chief, send the senior vessel a message in "Sigcode" asking for their position, course and speed and let me know as soon as you get a reply!" This was done in short order and I at once reported to the "Skipper," "message sent and acknowledged Sir."

Some few minutes later while Jim and I were enjoying a steaming cup and a sandwich in the radio room, he abruptly shoved his cup toward me and held up his hand for silence. Reading the question in my eyes, he responded, "Convoy calling us," and as the call was completed threw over his switches and told the operator to

"go-ahead." He was soon busily engaged in copying the five letter code groups sent speeding through the ether to his ears at a good "thirty word per minute" clip, while I, in the meantime, had disposed of our mess gear in one of the desk drawers and started to decode the message group by group, as he jotted them down on the log sheet. XDABO—Cipher E—BAFGH—Position MAKPO—Latitude—KLOQJ—Forty-six fifty—MEVTP—Longitude—JKRES—Ten twenty-three—HBNMY—Course 42 degrees true—FDSA E—Speed 14 knots. 05300, the latter group signifying the time the message had originated.

Delivering the message to the "Skipper" resulted in increased activity throughout the ship. A brief comparison of the position of the convoy with that of our own by the navigator, Lieutenant Tod, revealed that the vessels for which we had been seeking lay at least 80 miles to the southwest and were way off their course. A course was at once plotted which would result in our intercepting the convoy at the earliest possible time and a change in course laid out for the convoy vessels, which would further aid this accomplishment.

An hour later we came within flag signaling distance of the three giant ships, which were literally swarming with Yanks and cheer after cheer was faintly wafted to us by the wind as we "came up" as close as we dared in the still heavy sea that was running, and signaled instructions pertaining to the convoy formation.

On the new change of course, which was to take us to the mouth of the Gironde, the entire formation immediately started "Zig-zagging," that delicate and dangerous sea strategy, which was used for the purpose of disconcerting and preventing the enemy submarines from determining the "Base course" of the convoy, without somewhat lengthy observation, which latter maneuver might result in discovery and hence was undesirable.

The sea was now a "following one," permitting of further increased speed and the long afternoon passed, bringing evening with a beautiful sunset, which forecast a clear day for the morrow and a much smoother sea. Although the air was very chilled the majority of the crew were on deck getting a breath of air after a "real" meal, the first which we had really enjoyed in two days. Aft, number four gun crew was lounging about their gun with one of their number alertly scanning the sea to starboard, for one of their members was constantly performing duty as lookout. On the long "skids" mounted on the "fan-tail" were secured row on row of depth bombs, affectionately termed "ash-

cans" and standing by them, a gunners-mate, ready to instantly release one or a dozen of them on command of the officer-of-the-deck. Stretched out on the deck nearby was a group of "Harmonists" lustily chanting "The Breton Patrol,"

"If we sail on request of the C. O. at Brest,

To pick up a convoy that's bound for its goal;

If it's wind, rain, or snow, the escort must go,

That's the job of the Breton Patrol.

If an "ashcan" goes adrift and falls in the sea,

And next moment your stern is no more,

There's only one thing to do,—"Prenez vite le you-you,"

And pull,—pull for the Brittany shore."

As darkness once more closed down upon us, the deck again became deserted except for those on watch.

Rarely, if ever, was it possible to get an uninterrupted night's sleep when at sea in the "zone" and this night was not an exception, for it seemed as though I had hardly fallen asleep when I was suddenly awakened by the jangle of the "general quarters" alarm gongs followed at once by the peal of the bugle sounding "Battle Stations." Half-asleep, I jumped to my feet, opened the safe, took out the code books which it was my duty to sink in the event of our vessel being destroyed or captured, placed them in the canvas lead weighted bag on the desk and then, buckling on my pistol and grabbing my kapok life preserver—which I used for a pillow—noting as I did so that the chronometer indicated that it was 1:50 A. M., and that Jim was on watch, I made a dash for the bridge which was my battle station. Arriving, I reported to the "Skipper" as was my duty and then received the report of Jim over the voice tube on the bridge, "Radio Force at battle stations," which I communicated to the Officer-of-the-deck. I then had time to ascertain what all the excitement was about. The Chief Quartermaster, who was busily engaged in peering through his long-glass into the night, informed me that "the lookout had sighted what appeared to be a small boat about 2000 yards distant on the port bow. We had instantly changed course and were now headed toward the spot at full speed." Hardly had he finished telling me this, when the gloom of the night was pierced by the brilliant streamers of two green rockets, absolutely startling in their suddenness of appearance, coming apparently from nowhere as they did. The light of the rockets disclosed two small boats dead ahead and distant about 1000 yards, the occupants of which, now having seen us were frantically making signals with flashlights.

(Turn to page 91)

The Women's Hour

(Continued from page 35)

a woman knows about fashions is nothing if it is not applied with good taste."

These talks are particularly valuable because Mrs. Hitchcock has no axe to grind from the business point of view. "Women's Wear" sells nothing to the retailer or to the consumer as it is a paper which circulates among the wholesale industry so all information disseminated in this fashion is given in good faith and may be relied upon. Mrs. Hitchcock, by the way, can do this particularly well because she has an acquaintance with a great variety of people. She is the daughter of a Spanish professor, brought up in an unworldly home, where she heard nothing of the lack of idealism in business, and among the trade people who are engaged in what has been sarcastically termed the "rag business," she has found more romance than in any of the university towns in the world.

Programs of this type might be duplicated in practically all of the big stations of the country. In Philadelphia, for instance, at Station WDAR, we find a series of regular afternoon talks for women; for instance, on Monday afternoon at 4:30 there is always a talk on "Brushing up on Etiquette" by Katherine Hastings and an educational magazine article on travel or science, etc., read by the program manager, Mrs. Mascal. On one of the good women's magazine. On Wednesday at 2:30 under Mrs. Lewis Love, there is a social service corner. Mrs. Love is a graduate nurse specializing in children's work and in this mothers' club, she tells everything that is helpful for children. On Thursday at 4:30, Mrs. Anna B. Scott, who is the food expert of the "North American Magazine," has a special feature which she calls the "market basket." Here she plans the marketing for the week, telling much as Mrs. Heath does, at WJZ, of the things that are reasonable, what is reasonably priced, and giving menus which will use these products to the best advantage during the coming week. Mrs. Mascal who manages the women's programs at WDAR is a musician of real ability who began her career as a soloist in her home church at Mount Carmel at the age of eleven. She combines her love of music with a love of home life as her three grown sons and her husband will testify. For three years Mrs. Mascal was program manager for the "Matinee Musical Club" in the east with a membership of sixteen hundred. She is now on the Board of Directors and on the Board of Directors of the "Philadelphia Civic Opera Company."

Another feature of the afternoons at WDAR are occasional concerts by this "Matinee Musical Club."

At WEAF in New York we find Mrs. Natalie Godwin who was really a pioneer in the women's program movement as she started them two years ago. Mrs. Godwin has been with the Health Speakers Bureau of the American Red Cross as chief of the bureau. In this capacity she arranged talks all over the city and those over the radio. In this way she made connection with WEAF and when this work was discontinued she was asked to join the studio force. The most unusual feature of the WEAF schedule which runs from eleven to twelve every morning is the young mother's program. This is arranged by Dr. Patty Hill who prepared the syllabus. All lectures are given by instructors in Teachers' College, Columbia, and the Horace Mann School. They have

worked with both children and students and so know their subject from two angles. Teachers' College, by the way, considers these talks so valuable that they have arranged to have the lecturers talk by wire from the Macmillan Academic Theatre at the college itself. Some of the subjects covered are how mothers may keep in touch with their children's interests, including the child's religious problems, songs, biographical facts, books, etc. The February program includes problems of character building in childhood. This will be a series of short talks on civic responsibilities, discipline problems, children's feelings and how they may be regulated, etc.

Another unusual feature at WEAF is the Thursday afternoon program arranged by Mrs. Natalie Godwin. The



RADIO CABINET BY DONEHUE



For Radio Beauty and Safety

Today's Fashion says "Radio Console". And the most select environment bids gracious welcome to a distinctively panelled mahogany or walnut ADAPTO Radio Cabinet.

Encloses every radio accessory—safely out of sight, yet easily accessible when desired. A drawer on the side accommodates your battery, charger, distilled water and hydrometer. Batteries easy to inspect, easy to recharge. Simply throw a built-in switch which puts your charger in operation. Insert your own set—*adapto* it with the adapter frames. Horn inbuilt at top, needing only loud speaker unit. But read about it in detail.

Send—today—for circular.

L. R. DONEHUE COMPANY
 304 State Street Perth Amboy, N. J.

"Quality Goods for Quality Readers"

program of lectures and dramatic monologues is broadcast through the courtesy of the Institute of Arts and Sciences direct from Columbia, and many women's clubs use these talks to supplement their own programs. They are ordinarily more entertaining in manner than the serious schedule of the morning.

Out at KYW in Chicago, we have Mrs. Anna J. Peterson broadcasting her table talks five times a week at 11:30 in the morning. This is done under the auspices of the People's Gas,

Light, Heat and Coke Company. Mrs. Peterson is head of the Home Service Bureau of that organization. Her talk has grown to be one of the most popular regular features of the station. She gives daily recipes for the table as well as recipes for preparing various dishes, relishes, cakes, cookies and other things kindred to the cuisines. She is sometimes assisted by Miss Viveite Gorman also of the People's Gas, Light, Heat and Coke Company.

Even further out west at WOC in Davenport, Iowa, the women get plenty

of attention. Here we find the "Happy Homes Club" which is the outcome of almost two years of broadcasting. The countless listeners-in were invited to send in their own ideas on all subjects. These were very carefully tabulated and the ideas receiving the most interest on the part of those submitting their ideas are the subjects chosen for broadcasting. For example, in the middle west the average housewife knows little or nothing about fresh sea fish. Therefore, the service makes no mention of the methods used in the preparation of sea fish, but devotes considerable time to the cooking of such species as are caught in the lakes and rivers. A decided effort is made not to mention the names of manufacturers of any products in their broadcasting of recipes and they favor no particular style, nationality nor method of economics for the home. They are absolutely impartial and their work covers items of interest to Bohemians, Swedes, rural housewives, city dwellers and in fact the entire mass of critical cooks and near-cooks that comprise their audience.

Another feature of the "Happy Homes Service" is that they do not confine their service to culinary matters only, but also cover catalogues, children's health, etc. Any one writing in may receive a copy of a pamphlet entitled "Helpful Hints for Happy Homes," which is the WOC cook book.

But the most interesting feature of the entire program is that it is entirely conducted by a man, Mr. Gilson W. Willetts, Announcer GWW. The "Happy Homes Club" has certainly not lost any of its effectiveness by having a man as its guiding spirit.

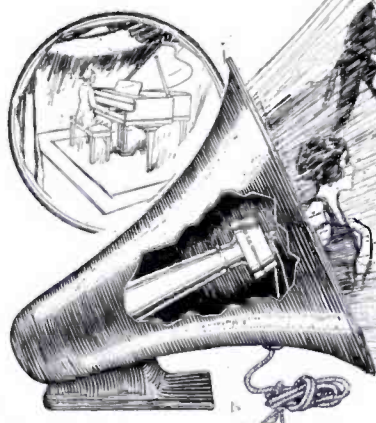
Probably very few of the American men fully appreciate the benefits which they receive from this broadcasting for women, but if your wife, Mr. Listener-in, has stopped asking you for new furniture and has begun to remodel the old, if you have new dishes for dinner two or three times a week and if your household budget is being handled as economically as it never has been before, just breath a prayer and send in an applause card to the nearest broadcasting station.

Cushioning the Radio Set

AN improvement of small cost for radio sets using UV199 tubes with loud speaker output is to add four small air cushion feet such as are used on typewriter machines. This stops undesired ringing noises from microphonic pickup action, and also prevents audio sound feedback through the table carrying the set and the loud speaker.

The rubber air cushions can be placed under the receiving cabinet without use of screws.

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S E R V I C E

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"Must admit such courtesy is very seldom accorded a purchaser by other companies. It is a real pleasure to deal with a firm which meets one more than halfway—I believe that your product will be a decided advantage to my line of cabinet sets."

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PRICES

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- Electro-magnetic unit (fits almost any horn or phonograph) with cord, nickel plated.....4.00
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Orders.—If your dealer cannot supply, order direct.

Transportation.—Single shipments, strictly F.O.B., factory. Free on two or more orders for each item.

Guarantee.—One year from date of purchase or money back in ten days.

The MOZART GRAND CO.

Manufacturers of Fine Instruments

NEWARK, N. J.

U. S. A.

Loudspeakers

(Continued from page 41)

fundamental mode and represents how the diaphragm moves over its whole surface. That is, every part of the surface moves in phase, so to speak. If one part moves up, every other part of it moves up. 'b', 'c', 'd' and 'e' represent the second mode of vibration and the frequency at which this occurs is calculated by complicated mathematics, to be 1.58 times the fundamental frequency.

In the case of this mode of vibration the shaded area or region is always vibrating in the opposite direction to the unshaded portion. Consequently, the dividing line between the two portions are stationary and are called nodal lines because of this.

Although in each of the various modes of vibrations of these higher orders the deflections are relatively large yet, except for the fundamental, the sound may, perhaps, be relatively weak. This is because the various out-of-phase-ports of the diaphragm send, or give, off sound waves which are exactly out of phase. The tendency is for these portions to cancel their effects and make the sound weaker rather than louder. This is not usually the case, however. In 'f' is shown the third mode of vibration and the frequency at which this occurs is twice the fundamental frequency. In 'g', 'h', 'i' and 'j' is shown the fourth mode and for any of these the frequency is 2.24 times the fundamental. In all of them except under special conditions, the sound should be weaker than the fundamental mode, because in this latter mode there is no cancellation of sound from the diaphragm surface. The fifth mode corresponds to k and the frequency at which this occurs is three times the fundamental.

Having described a few of the various modes of vibration for a square diaphragm, I need not go into a detail description of those we obtain for a circular diaphragm. In figure 4 is shown some of those modes which are obtained for this kind of a diaphragm. The figures give the frequencies of the various modes in terms of the fundamental expressed as unity. The second group of numbers gives the radii of the nodal circles expressed as fractions of the radius of the diaphragm. These two groups of figures, then, indicate the physical or vibratory characteristics of diaphragms which are used in loud speaker units. When we place these diaphragms in a loud speaker unit then it becomes necessary to consider further these characteristics and see how they are modified and how they affect radio reception.

We naturally ask, what is a natural period of a vibrating diaphragm? The answer is, that it is that frequency at

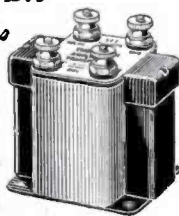
They say~ (continued from last month)

9 THEY SAY OF THE ADLER-ROYAL NEUTRODYNE:
 "A Royal will reproduce the tones perfectly . . . without discordant noises. Compare it . . . in quality of tone reproduction."
Royal amplifies with Thordarsons!

10 THEY SAY OF THE THERMIODYNE:
 "If it's in the air, Thermiodyne will get it regardless of distance. No distortion, no howling."
Thermiodyne amplifies with Thordarsons!

11 THEY SAY OF THE PATHÉ:
 "Pure tone—remarkably clear and sweet reproduction."
Pathé amplifies with Thordarsons!

12 THEY SAY OF THE MICHIGAN:
 "Gives any degree of volume desired—without distortion. Exceptionally mel-low tone quality—a tone charm that eliminates harsh or mechanical notes."
Michigan amplifies with Thordarsons!

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 For the "Best" 45,000 Cycle Super-Heterodyne, "RADIO" and other leading publications recommend in highest terms the Thordarson 2-1 ratio transformers. Take no others!

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which the diaphragm, when vibrating as a whole, executes the maximum amplitude of vibration. That is, at this particular frequency, the diaphragm vibrates most vigorously. But this is not fundamental. We want to know why it vibrates so much more vigorously at one definite frequency than at some other frequency.

The answer to this particular question is not so easily given. This answer is important, however, and can be understood by all. When once we understand the answer, then we can comprehend the action of all diaphragms, cones, etc., no matter what their size or shape. We learn of enough ideas, as expressed in various

loud speakers, to baffle all of us, perhaps. The following discussion, however, will clarify the whole field for us, and remove the mystery which hangs over it.

To begin with, let us take on ordinary circular diaphragm, say three inches in diameter and clamped around the edge as in an ordinary loud speaker unit. As shown in figure 5, let us imagine that the small sector $o a b$ is taken out of the diaphragm and clamped at the edge $a b$ while the end at o is free to shake back and forth just as a rope would be when tied to a solid object. This is exactly what the magnetic force does to the diaphragm, but it is a little easier for us

to understand if we grasp the analogy of the rope.

If we give the rope a sudden jerk to one side a kink will be started and we can see it move along the rope to the farther end and return again to the loose end held by the hand. If we move the rope back and forth, beginning at a low frequency and gradually increase the frequency by moving the hand faster, we shall pass through a very definite frequency at which the rope moves up and down with the largest amplitude of vibration. This is the frequency corresponding to the natural frequency of the rope, or a frequency corresponding to the lowest (sometimes called gravest) mode of vibration. During the time the hand has moved from a to b , as shown in figure 5a, the kink, or the impulse, has moved to k . While the hand moves from a to c the kink has moved from a to p . During the time the hand moves back to a the kink returns along the rope, back to a . At f the kink is shown on its way back. When the kink, on its return journey, reaches a it arrives in phase, as we call it, with the impulse or force on the end of the rope caused by the hand. Under this condition the maximum amount of energy can be given to the rope by the hand and hence we obtain the maximum amount of amplitude of vibration.

This is the state of affairs we have in diaphragms used in loud speakers. We simply have a whole lot of these small ropes connected together, not end to end, but side to side. All of them vibrate alike and in unison, and hence act as a whole. This is all a diaphragm is.

When a rope is caused to vibrate faster and faster we pass through certain frequencies where we have stationary points. These correspond to interference between the kinks traveling out and those coming back. In figure 6 are shown several of these states. The stationary points are

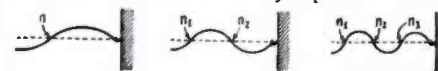



Figure 6

called nodal points. In a diaphragm, as already stated, the small ropes are imagined as sections of the diaphragm. They are all vibrating together and for this reason we have nodal circles instead of nodal points. These have already been illustrated in the figure for circular diaphragms. In the case of square diaphragms we have to do mostly with nodal squares as indicated by the figures for such diaphragms. Along these nodal circles and squares the diaphragm is not vibrating, but between them the diaphragm motions are quite vigorous and the name loop is applied to these regions.

There is no sudden transition from one of these modes of vibration to an-



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With the extreme acuteness of the bloodhound's scent, the Model L-2 Ultradyne detects the faintest broadcast signals—signals that are "dead" to other receivers—regenerates and makes them audible on the loud speaker. It's here, where the development of other super-radio receivers has halted; the Ultradyne forges ahead.

The unusual sensitivity of the Model L-2 Ultradyne is due to the successful application of regeneration, to the famous Modulation System of radio reception, recently perfected by R. E. Lacault, E.E., A.M.I.R.E., Chief Engineer of this Company and formerly Radio Research Engineer with the French Signal Corps Research Laboratories.

It's this development, an exclusive feature of the Model L-2 Ultradyne, that makes it possible to receive greater distance on the loud speaker.

In addition the Ultradyne is the most selective receiver known. Regardless of close similarity in wavelength, it selects any station within range—brings in broadcasting clearly, distinctly, faithfully.

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other. The change is a gradual and continuous one. I have sprinkled light carbon particles over diaphragms to be able to view these figures. The patterns are beautiful to see and are often of striking appearance. This is particularly true of thin diaphragms which can readily break up, so to speak, into these various modes of vibration. As an example, in figure 7 are illustrated the changes or variations in the nodal figures of a square diaphragm when we pass from the form *j* to that of *k* as shown in the figure 3, for the square diaphragm.

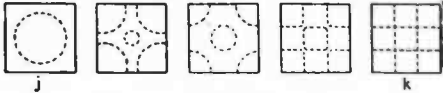


Figure 7

The following figures for a circular diaphragm show, as an example, what are frequently observed when we pass from the fundamental mode of vibration to say one and two nodal diameters.

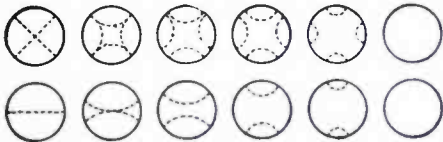


Figure 8

In passing, it may be of interest to my readers to know that it is possible to calculate the velocity or speed at which these kinks (transverse vibrations) move along the diaphragm when we know the natural, or fundamental, frequency and the radius of the diaphragm. For example, if the radius of the diaphragm is 1 inch and its natural frequency is 500 cycles, then the speed of the kink in the diaphragm is 2,000 inches per second. This corresponds to an iron diaphragm. If the diaphragm is made of paper, its natural period would be perhaps 300 cycles and the speed of the kink would be 1,200 inches per second. If it were a stretched steel diaphragm with a natural period of, say, 7,000 cycles, then the velocity of the kink would be 28,000 inches per second. This kind of a diaphragm, however, is never used for a loud speaker. The first case cited is more nearly the average. The velocity of sound in air is about 13,500 inches per second and this is quite large compared with the speeds of the transverse vibrations met with in ordinary diaphragms.

These figures indicate that the speed of the kinks, or transverse vibrations, moving out along a diaphragm determines the natural period of it. We have seen that stretching a diaphragm raises its natural period (see the last case cited just above). This is because the kinks travel faster in a tightly stretched diaphragm than in a loosely stretched one. Try this with an ordinary rope tied to a heavy piece of

Daily Broadcasting Programs

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Although only 3 tubes are used, all the efficiency of 4 tubes is attained by reflexing one tube. The circuit is one stage of radio frequency, two stages of audio frequency and detector.

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Real distance right through the strongest local interference with very simple tuning.

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Only two dials, the readings of which are always the same for each station, so that tuning is practically automatic.

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Your set cannot interfere with your neighbors'.

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All power from dry cell batteries, contained in the handsome mahogany cabinet. Easily portable.

NEW—not in price, because there are plenty of low priced radio sets—but **NEW** in the value represented by the radio treasures it unfolds, and the sterling character of instruments and workmanship. A **MU-RAD** Receiver in every detail that has made the name **MU-RAD** trusted and respected everywhere.

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THIS COMPLETE UNIT enables those who want to use the loud speaker in other parts of the house to do so without removing set. Insert plug from loud speaker into jack; place plug on end of cord, into set. This can be done readily and saves the trouble of using tools or soldering iron.

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10 ft. cord \$2.25 40 ft. cord \$3.00
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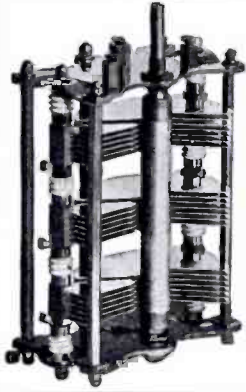
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NEW YORK CITY

furniture for your own satisfaction. In fact the speed of these kinks is directly proportional to the square root of the stretching or stiffness factor. That is, if the stretchings are proportional to 4, 16, 64, etc., the speeds will be proportional to 2, 4, 8, etc.

The speed is determined by another factor, namely the weight of the diaphragm. The greater the weight the less the speed of these transverse vibrations. The proportion is an inverse square root one. That is, if the weights are proportional to 4, 16, 64, etc., the speed will be as 1/2, 1/4, 1/8, etc. Because of this phenomenon, heavy diaphragms, other factors being equal, have lower natural periods than light ones. Because of the importance of these various factors, we have developed methods to measure them with great precision. We have also developed the connections between these physical characteristics of diaphragms and the performance of loud speakers all of which make use of diaphragms in one form or another. The method of measuring these quantities and their precise relationship to loud speaker performance, however, are too technical to be of interest even to laymen who are scientifically inclined.

On the other hand, the layman is interested to have some basis for judging the numerous loud speakers on the market. Because of this, let us see in a general way what the diaphragms do with the radio signals. If the sound-cancellation due to sectional vibrations of the diaphragm is negligible, then the sound intensity, in the theoretical case, varies with the frequency as illustrated in the accompanying curves. In these curves the nodal circles only are

NOKORODE FOR EASY SOLDERING

Clean with file or emery cloth all four pointed sides of soldering iron. Heat soldering iron. Avoid pointed end of iron coming in contact with flame as illustrated.

Apply some NOKORODE and some solder to sloping points of iron. While iron is still hot rub with cloth quickly on all four sides until iron is bright like new tin.

Apply a little NOKORODE with stick, brush or end of solder to both parts to be soldered.

Whenever possible hold hot soldering iron underneath parts to be soldered, applying solder above parts.

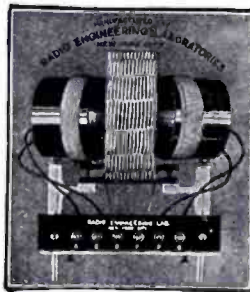
When the solder is running freely take away soldering iron and let soldered parts get cold. Do not waste your NOKORODE. NOKORODE is so thoroughly efficient that only a little is required for perfect results.

M. W. Dunton Co.
PROVIDENCE, R. I., U. S. A.

Perfectly soldered joints in the building of radio sets is a prime essential for best results. Perfect soldering the easy way has been achieved by amateur builders everywhere who have used NOKORODE, the Soldering Flux which is recommended by leading electricians and radiolibrarians throughout the world. Insist that your dealer sell you NOKORODE. The man who takes a pride in building his set cannot afford substitution.



Minnesota Man Claims 2-Tube Reception Record With LOPEZ LOW LOSS TUNER



Edward C. Connelly, of Breckenridge, Minn., claims the greatest reception record in the Northwest during International Radio week with a two-tube set. His reception record is as follows: Madrid, Aberdeen, Birmingham, Lyons, Newcastle, Rome and stations in Porto Rico and Mexico City. Mr. Connelly assembled the set himself. (Reprint from Minneapolis Tribune)

As he used dry cell tubes, which give about 75% of the signal strength secured with 6 volt tubes, he attributes his record to the

LOPEZ LOW LOSS TUNER

Exceptionally well made No short-circuited turns
Rigid Inspection Rugged
Minimum Insulation Super Selectivity
Perfect Quality

Recommended by R. A. Bradley for the 3 circuit tuner, described in last month's issue.

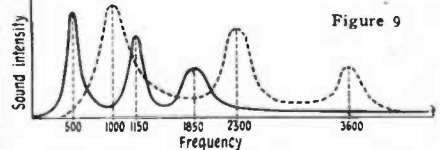
Broadcast Type, 200 to 600 meters
Regular Amateur, 40 to 205 meters

Circuit diagram, panel drilling template and instructions with each tuner.

Price \$10.00 Each, at your dealer's or sent direct postpaid

A. C. LOPEZ & CO.

334 Fifth Ave., Dept. W-2 New York City



considered and the fundamental frequencies of the diaphragms are assumed to be 500 and 1,000 cycles. As shown by the curves, all those sounds whose frequencies are in the region, in one case, of 500, 1150, 1800, etc., and, in the other case, of 1000, 2300, 3600, etc., cycles will be much louder than those sounds away from these regions. In other words, these loud speakers will distort greatly the relative sound intensity of the various frequencies in the original sound, say at the studio. The ideal curves, as has been stated frequently, is a curve absolutely flat from the lowest to the highest frequencies met with in speech and music.

The person who would desire a good loud speaker, then, should listen carefully, to a wide variety of music and speech, for the low intermediate and high notes and see how uniformly these notes are reproduced. His selection should be based pretty largely on his own best judgment.

NAA Get 'Em 60¢

The only scientifically selected detector minerals on the market today are the genuine N.A.A.

METER TESTED RADIO CRYSTALS

Full, clear rectification insured by newly developed visible laboratory meter-testing. Perfect for reflex. Price 60¢ at your dealer or direct. Recommended by Radio News, Popular Radio, Acme Apparatus Company, etc.

Newman Stern

1740 East Twelfth Street
Cleveland, Ohio
Pioneers in Test Crystals

Nuggets of Sensitiveness

The Standard of the World

The base-type
Freshman Variable Grid Leak
is the standard for those who build their own sets. It is the most compact and being entirely sealed it always remains unaffected by any climatic conditions. Complete with either .0025 or .0005 Freshman Condenser—\$1.00 without condenser.....75¢
At your dealer's, otherwise send purchase price and you will be supplied postpaid

Chas. Freshman Company, Inc.
240-248 W. 40th St., New York

Atlantic Coast's Popular Broadcasters

(Continued from page 49)

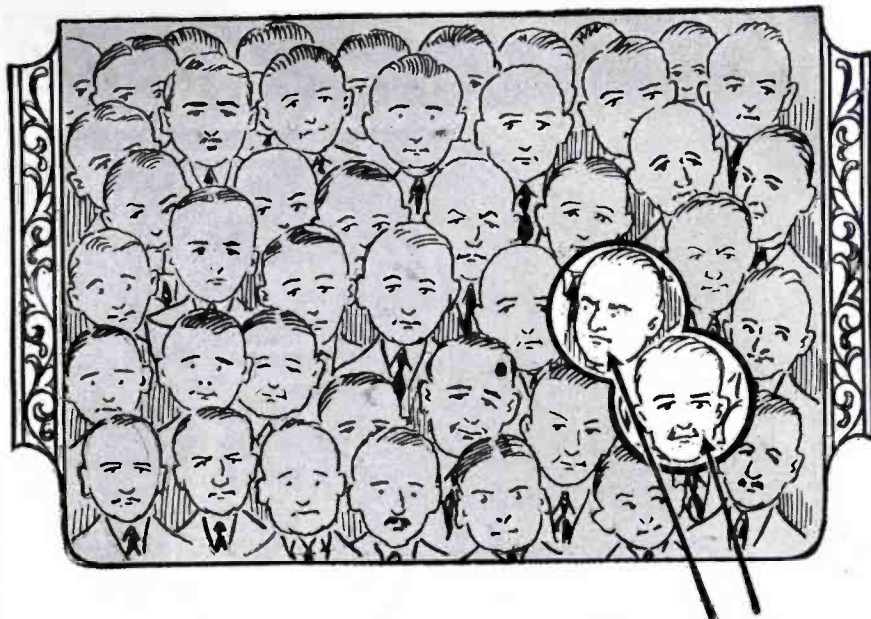
dren's stories, verses and music, and knows how to tell a story that makes the children and their papas and mamas listen in. She takes you into her confidence, and by finding out what children like, gives it to them in a way that they understand it—but gives, back of it her more mature understanding. "All children," says Miss Jean, "like music, and some music should be included on a program for the youngsters. I always receive an enormous response when the songs from my book 'A Merry Menagerie' are sent over the air."

Miss Jean is well known in the children's field, having contributed to the leading children's magazines and collaborated with Walter Damrosch and Dr. George Gartlan in a new music school series. She has written a number of delightful children's records and Miss Jean herself is much merrier than her picture. That serious look was put on only to have her picture "took"! She has a romping spirit—the kindred spirit that children understand—and there is much of this, together with an appreciation of small persons, that carry through her music and stories.

IF YOU want to "listen in" on a sport talk that will make you feel the tingling of the air currents, tune in some Monday evening on Harold Anson Bruce, WGY, Schenectady, New York. Mr. Bruce is justly known as the "king of small college track coaches" and is now director of physical training at Union College, Schenectady. Several years prior to coming to Union this past Fall he was track coach at Lafayette. Give yourself the "air treat" of hearing Mr. Bunce!

Another "good fellow" to meet is Oliver M. Sayler, who broadcasts a weekly review of plays and books from WGBS. He was born in the Hoosier state, and has been interested in the theatre since he was 14 years old. He has traveled all over this country and Europe in his study of the theatre, and has written many books on the theatre, including "Our American Theatre," "Max Rheinhardt and His Theatre," "The Russian Theatre," "The Moscow Art Theatre Plays," and many others. Many of his books are illustrated by his wife, Lucie R. Sayler. His talk from WGBS every Thursday evening, called "Footlight and Lamplight," is tremendously interesting.

"I believe," said Mr. Sayler in answer to my question about the radio public taste, "that the American taste for music and literature is constantly getting better, and there is no doubt of the educative force back of radio broadcasting to bring up the average taste."



Manufacturers—

Your Best Appeal!

An analysis of publications of general circulation, shows—that only 2% of their readers are interested in radio. In fact, many general periodicals contain no news to inspire radio interest.

This Association is comprised of the leading Radio Magazines



Radio Magazines offer 100% Attention Value—a concentrated group of people, looking for information to guide their Radio activities and purchases.

RADIO MAGAZINE PUBLISHERS' ASSOCIATION, Inc.

"Quality Goods for Quality Readers"

MAGNAVOX Radio



**ONE hand on ONE dial
for Tuning in!**

**Magnavox
Receiving Sets**

TRF-5 (as illustrated)
encased in carved
mahogany cabinet; price
includes M4 Reproducer . . . \$125.00

TRF-50 in carved
mahogany period cabi-
net with dust-proof
doors and built-in
Magnavox Reproducer
\$150.00

Reproducers

M4—the most efficient
unit ever designed to
operate without external
battery, \$25.00

The original radio re-
producer, famous
throughout the world.
With Volume Control.

R3, \$35.00
R2, \$50.00



EVEN though the Magnavox single dial Station Selector has displaced the "old style" complicated tuning arrangements, this remarkable feature alone would not have merited the praise which every owner gives his Magnavox Set.

It is by its sheer musical quality, in addition to its unusual simplicity, that the Magnavox 5-tube tuned radio frequency circuit retains the user's lasting admiration.

If you already own a receiving set, a Magnavox Reproducer will wonderfully enhance its daily usefulness for family and friends.

Magnavox Radio Products are carried by Registered Magnavox dealers. Illustrated booklet on request.

**THE MAGNAVOX COMPANY
OAKLAND, CALIF.**

New York: 350 W. 31st St. Chicago: 162 N. State St.
Canadian Distributors: Perkins Electric Limited,
Toronto, Montreal, Winnipeg

Mr. Saylor as literary adviser to Mr. Morris Gest has been closely in touch with the Moscow Art Theatre. In fact, when he went there some years ago to study the theatre, he traveled 17,000 miles over the Pacific and Siberia, arriving in Moscow the day of the Bolshevik revolution, while the shooting was still going on, and passed a week there before the theatre opened. Mr. Saylor, too, has an infectious radio broadcasting personality and knows how to make "talk" over the air, something that is listened-in on with joy.

NOW all is not music nor literature among the broadcasters of interest. Miss Helen M. Haney (WGI, Medford Hills, Mass.) makes "Fashions-in-Footwear" something that fans listen to—especially the feminine contingent! "With skirts of the ladies at seven, eight and even more inches from the ground, feminine feet are no longer, as a poet once described them, 'Like little mice which from beneath her petticoats stole in and out.' Feet and lower limbs are in these twentieth century days very much in evidence, and so they must be fashionably 'clothed.'" And so Miss Haney, a student of what the "well dressed foot will wear," gives us talks on a subject that might not be interesting in such a manner that she gets our attention. Miss Haney is Associate Editor of the Boot and Shoe Recorder, and it is one of her missions in life to tell the American public how well the footwear of these good old United States is made.

While we are meeting radio broadcasters, there is Mr. Robert E. Golden, director of the WOO orchestra, Philadelphia. WOO was the first station to arrange a transoceanic dance program, which was done on December 10th. Utilizing the short wave relay system of KDKA, they broadcast, from 5:30 to 6:30, which was picked up and re-broadcast by the British Broadcasting Company, taking the place of the regular Wednesday evening dance program of the Hotel Savoy, and were advised that in a number of places in England there was dancing to the music from Wanamaker's. This music was furnished by the WOO orchestra.

Another well known gentleman to radio fans is Dr. Henry Hallam Saunderson, Editor, Author and Preacher. Dr. Saunderson from WGI, Medford Hillside, Mass, gives original stories, makes entertaining comments, reviews current events and discusses live subjects that are in the minds of many. In effective ways, he reads and analyzes good literature, including his own books. Dr. Saunderson is the inventor of a world-wide institution, the Wayside Pulpit, a system of bulletin boards which he keeps supplied with

FARAWAY RADIO

\$29.50
 Gets stations Far and near Loud and Clear

FARAWAY Radio Sets are amazing values at bargain prices. Users get stations from New York to Princeton loud and clear. Operate with either dry cells or storage batteries. Beautiful cabinet finished in mahogany with new platinum-finished panel. **SATISFACTION GUARANTEED**—Don't pay \$100 to \$150. Write for our money-saving plan and literature.

2-Tube Set . . . \$29.50
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Dealers - Agents: Highest possibilities you ever heard of. Write for plan and territory quickly.

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**THE NEW PARAGON
RADIO RECEIVERS**

Introducing the new non-radiating Paradyne Circuit, new simplified tuning, and new low prices. Write for Folder.

ADAMS-MORGAN CO., Inc., 8 Alvin Ave., Upper Montclair, N. J.

"Quality Goods for Quality Readers"

sheets printed in large attractive type. The sentences are original or quoted, and he has more than three million readers every week—the largest audience that any man in the world addresses. His friends say humorously that “he preaches all day, every day, and that he has audiences of thousands of people in many cities all at the same time.” He has a perfect radio voice and is a very successful broadcaster. Dr. Saunderson is a Harvard graduate, has traveled widely in America and Europe, and is a member of various clubs in Boston. His latest books are “The Power of an Endless Life,” and “The Living Word: The Bible Abridged.”

Back of the grand organ at station WOO, Philadelphia, is Miss Mary E. Vogt, one of the most charming radio broadcasters one could meet. As you can see from her picture, Miss Vogt is a girl who it would be nice to know, and when you hear her play the organ, you feel you do know her. She has among the radio fans, an audience that will “root” for her every time.

And now that you have met some of the best broadcasters of the Atlantic coast, you’ll surely be friends with them!

One Tube Transmitters

(Continued from page 51)

ance in the grid circuit is not advisable because the same effect may be secured without wasting energy by loosening the grid-plate coupling. The grid coupling should always be made adjustable or else fixed at the lowest point possible. For these reasons it is not good engineering practice to have the grid impedance function in a dual role, which would necessitate closer coupling to the plate circuit or make it impossible to adjust the grid impedance exactly to the desired wavelength.

The reader will note that all three of the points enumerated thus far provide for conservation of otherwise wasted energy. Each point alone is of much greater importance than the comparatively small low loss design of sockets, coils, etc.

Fourth: as the coupling to the grid is very loose, and as the grid circuit controls the wavelength, a swaying antenna or slight changes in the antenna or plate circuit will not cause a change in the frequency of the radiated wave. This is of special importance in short wave work.

Fifth: and of greatest moment to the experimenter and student is the fact that the circuit is not all mixed up with “dofunnies” and unnecessary parts. It is the best arrangement we know of for one tube.

CONSTRUCTIONAL DATA

The two photographs show the circuit made up in experimental or labo-

don't you want the best when you can have it?

TROPADYNE

The Superadio Circuit



6 TUBES do the work of 8! No wonder the world is hailing this marvel circuit. Consider the saving in the original investment and in the upkeep.

This powerful, sensitive circuit sweeps in all stations on an indoor loop. It puts you in command of everything that is going on all over the country.

And it is so simple to build. The TROPADYNE KIT contains full instructions. Anyone can do it. The 4 Tropafomers (Tuned), 1 Oscillator Coil and 1 Tuner Coil are in the kit. These are the basis of this clever circuit.

People are realizing the great possibilities of TROPADYNE. At \$28.75 it is a remarkable buy.

\$28.75

MELOTONE

Cabinet Loud Speaker



The very personality of the singer or player come right over MELOTONE. This is due to its wonderful resonance and scientific reproduction of tone value.

This speaker is a beautiful specimen of modern cabinet work. It harmonizes with the most beautiful surroundings.

There is one thing about buying the finest there is—you are never sorry. It gives you more fun from the start, always looks better and lasts longer. MELOTONE is the result of endless experiment. Today it stands supreme.

Ask your dealer to demonstrate a MELOTONE. Compare it with any other speaker no matter at what price. You'll appreciate the reasons for MELOTONE's fame.

\$35.00

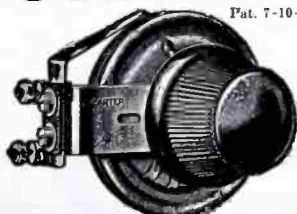
RADIO INDUSTRIES CORPORATION

133 Duane Street

New York City

CARTER

Pat. 7-10-23



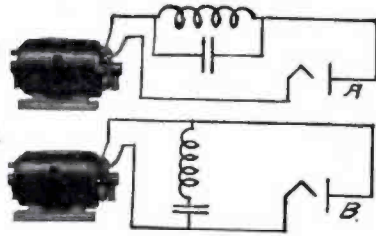
3-6-10
20-25-30 ohms **\$1.75** Any dealer can supply
In Canada—Carter Radio Co., Limited—Toronto

The resistance is wound on specially designed Carter Machinery. Noiseless—smooth—positive contact. Vernier control with but one knob or dial. Clock spring, small pigtail connection. Single hole mounting. Complete with Pointer and Knob.



“Quality Goods for Quality Readers”

No 4 of a series of 10
"FILTER FACTS"
Follow them thru monthly



$$f_r = \frac{1}{2\pi\sqrt{LC}}$$

$f_r = \text{Resonance } f.$

$L = \text{Henries}$

$C = \text{Farads.}$

SERIES AND PARALLEL RESONANCE. Inductance or capacity when used separately as outlined in No. 2 and 3 of this series are indiscriminate in their action with the exception of the general rule, the higher the frequency the more effective. The combined use of them will result in a filter that will either stop, or pass, one or several frequencies or bands of frequencies. The two basic forms for such combinations are Series Resonance and Parallel Resonance.

SERIES RESONANCE. A choke and a condenser connected in series as shown in B will offer high impedance to all frequencies except one, i. e. resonant frequency (f_r). This frequency, practically speaking, will pass with an impedance of the resistance of the choke only, i. e. better than condenser alone if R is small, but the impedance will be high for frequencies above and below resonance.

PARALLEL RESONANCE. When inductance and capacities are connected in parallel as in A the reverse characteristic of B will prevail. It will pass all frequencies except those near resonance. For resonance frequency it will be a dead stop except to supply the losses which are, practically speaking, negligible.

The effective application of these resonant circuits in their basic forms to generators is rather limited. One for slot ripple and one for commutator ripple will be required, neither one of which will be very effective in reducing moving contact disturbances. Also they are so very discriminate that slight variation in speed, such as caused by varying the load, would require readjustments.

ELECTRIC SPECIALTY COMPANY

TRADE "ESCO" MARK

231 SOUTH STREET

STAMFORD, CONN., U. S. A.

Makers of Motor Generators and Dynamotors with the least ripple and the most miles per watt.

ratory fashion with the parts arranged neatly on a plain wood base.

There are three coils or impedances; the largest is for the plate circuit, the smaller one coupled to the plate coil is for the antenna circuit, while the third coil, which is placed at right angles to the other two, is for the grid circuit.

The coils are wound on thin cardboard forms which were cut to size with a razor blade, dried out in a warm oven for ten minutes and then given a coating of varnish.

The plate coil is wound with 45 turns and is tapped at every fifth turn. The grid coil has 20 turns and is also tapped at every fifth turn. The antenna coil has 15 turns and is tapped at every third turn. All the coils are wound with No. 18 bare soft drawn copper wire, which is spaced with waterproofed twine (fishing cord) of a thickness about equal to that of the wire. Approximately 15 turns of wire (including the cord insulation) can be wound in the space of an inch. So the antenna coil form should be about 1 1/2 inches in length, the grid coil form about 2 inches in length and the plate coil form about 4 inches. All forms should be about 4 inches in diameter.

The taps are made by soldering a small length of No. 18 wire to the turns to be tapped. These small tabs of copper should be bent up so they may be reached easily with a clip connector. The taps need be only about 1/2 inch in length altogether.

In the set shown the plate and grid coils are provided with plugs to fit into small jacks which are fastened to the base. This serves both as a mounting for the forms and also for connection to the rest of the circuit. It may be possible to distinguish the small jacks in the photograph in which the coils are shown alongside the base. The plugs on the forms are merely 3/4 6-32 machine screws, which make a snug fit in the miniature jacks. These jacks may be secured from the Radio Specialty Co. in New York.

The antenna coil, which must be in adjustable inductive relationship to the plate coil, is fastened to a small block of wood which is left free to be moved about in order to vary the coupling. This is about the simplest arrangement possible.

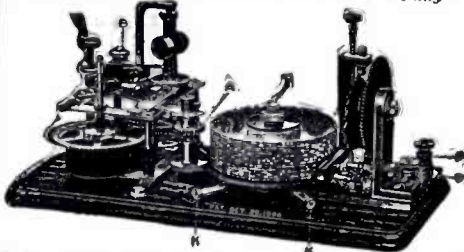
The grid circuit variable tuning condenser is fastened to the base directly in front of the grid coil. This condenser may be of the .0005 or .00025 mfd. type.

The rheostat and battery switch are omitted from the set shown as we use a centralized battery control panel.

The only extra part that may be found of advantage is a small fixed condenser of .0001 mfd. capacity for connection in series with the antenna circuit in case the antenna is too large.

Learn the Code at Home with the Omnigraph

"Just Listen—The Omnigraph will do the teaching"



THE OMNIGRAPH Automatic Transmitter will teach you both the Wireless and Morse Codes—right in your own home—quickly, easily and inexpensively. Connected with Buzzer, Huzzer and Phone or Sounder, it will send you unlimited messages, at any speed from 5 to 50 words a minute. **THE OMNIGRAPH** is not an experiment. For more than 15 years it has been sold all over the world with a money back guarantee. **THE OMNIGRAPH** is used by several Depts. of the U. S. Govt.—in fact the Dept. of Commerce uses **THE OMNIGRAPH** to test all applicants applying for a radio license. **THE OMNIGRAPH** has been successfully adopted by the leading Universities, Colleges and Radio Schools.

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Big, complete stock. Standard prices. And you're sure it's reliable if it comes from Andrae.

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ANDRAE In Business Since 1860

Small Ads of Big Interest

80 cents a line. Payable in advance.
Minimum space 7 lines

IMPERIAL Four Tube Radio Frequency Receiver—\$45.00. Guaranteed one year. To see or hear the **IMPERIAL** means to buy it—and buying it means satisfaction. Write for literature on this and other types of receivers. Agents wanted—full or spare time. Write for our proposition. **IMPERIAL RADIO COMPANY, BINGHAMTON, N. Y.**

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RADIO GENERATORS—500V 100 watt \$28.50. Battery Charging Generators \$8.50. High Speed Motors, Motor Generator Sets, all sizes. **MOTOR SPECIALTIES CO., Crafton, Penna.**

"Quality Goods for Quality Readers"

Ware

NEUTRODYNE
Receivers

Type T
\$65.00
without accessories

WARE RADIO CORPORATION, N. Y. C.

YOUR CRYSTAL SET

will work 400 to 1000 miles if made by my plans. No tubes or batteries. Copyrighted plans \$1.00; or furnished **FREE** with complete parts for building set, including special coil and panel correctly drilled for only \$5.00. Satisfaction guaranteed or money refunded. Satisfied customers everywhere. Particulars free.

LEON LAMBERT

674 Kaufman Bldg., Wichita, Kansas

The antenna may be a single wire from 40 to 75 feet in length.

The socket is of the bakelite type (Na-ald) with good spring contacts.

Fahnestock clips are used for antenna and battery connection.

The vacuum tube may be a UV-201A or a UV-202. The UV-201A may be used with about 150 volts of B battery for short distance work. The larger UV-202 may be used with any voltage from 150 to 500. With the latter tube, when the set is properly tuned and working into a good antenna, an astonishingly great range may be covered.

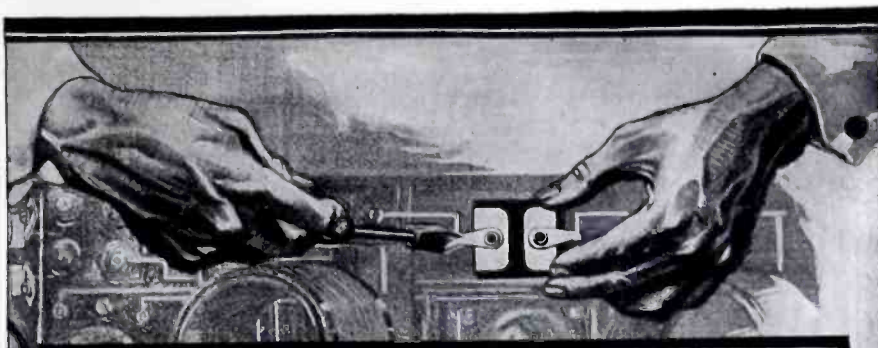
The best plan for adjusting the set is to use a calibrated wavemeter which incorporates an indicator of some sort. This permits one to adjust the grid circuit to the proper wavelength and make antenna and plate adjustments for maximum output.

In tuning the transmitter remember that the grid circuit is the wavelength controlling circuit and that its adjustment is practically independent of the rest of the set. In general, use as many turns of the plate coil as possible. The antenna circuit should be adjusted for maximum radiation as registered by the wavemeter indicator. In case difficulty is experienced in making the tube oscillate at any wavelength additional capacitive coupling may be provided between the plate and grid circuits. This additional coupling may take the form of two short insulated wires twisted together with one end of one wire connected to the plate terminal of the tube socket and one end of the other wire soldered to the grid terminal of the socket. A regular small variable condenser may be used for this purpose if desired and if necessary.

For a one-tube transmitter the arrangement for 'phone work is a bit difficult. One of the simplest and at the same time poorest methods is to connect the microphone directly in series with the connection from the antenna coil to ground. This may be modified by shunting the microphone across a few turns of the antenna impedance. Sometimes good results may be had by winding a single turn of insulated wire around the antenna coil and connecting the microphone to the ends of the turn.

A much better scheme is to use the antenna circuit magnetic modulator as put out by the RCA.

The best arrangement when worked out properly with suitable transformer constants is in the use of grid voltage control modulation. This, as well as the other systems and a great deal of other interesting information about transmitters, transmitting aeri- als, A and B voltage supply, etc., are described in Mr. Stuart Ballantine's "Radio Telephony for Amateurs," which may be secured from the Wireless Press.



Nine out of ten sets use MICADONS

NINE out of every ten sets made use Micadons —the standard fixed radio condenser. Set builders choose them for many reasons.

They know that the Micadon is a Dubilier product: hence supreme in quality and efficiency.

They know that Micadons can be obtained in accurately matched capacities and the capacity is permanent.

They know that Micadons are easily installed, equipped as they are with extension tabs for soldering and eyelets for set screw assembly.

They know that Micadons are made with type variations to meet every possible requirement.

For best results use Micadons

Dubilier

CONDENSER AND RADIO CORPORATION

14-inch Bell Polished Pyralin



Aluminum sound column

Burns A Speaker of Distinctive Lines

All the volume you want with no sacrifice of clearness or naturalness. The full true tones of voice or music are reproduced. Equal to hearing the original. Speaker Unit only supplied for use on phonographs —fits any make.

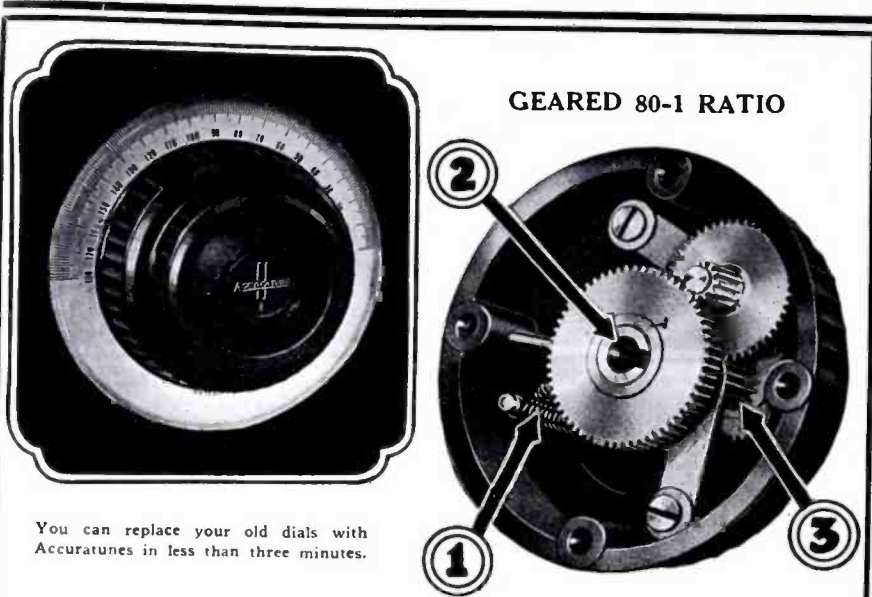
No. 205B—Polished black flare.....\$22.50
No. 205D—Shell pyralin flare..... 25.00
No. 100—Unit for phonograph use..... 10.00

Makers of telephones for 30 years.

Manufactured by

American Electric Company

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CHICAGO



You can replace your old dials with Accuratunes in less than three minutes.

Dominating Accuratune Features

1. No Back Lash—A new principle takes up all lost motion and back lash and produces a very smooth operating instrument.
2. Long center bushing eliminates all dial wobble and takes all standard condenser shafts. Permits dial mounting flush with panel. No cutting of condenser shafts.
3. Gear mesh and alignment perfected to the same degree of accuracy as the mechanism of a watch. Ratio 80-1.

Canadian Representatives:
RADIO, Ltd.
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You can change from ordinary dials to ACCURATUNE Micrometer Controls in an instant, no set alterations necessary. More efficient than built in verniers—a revelation in fine tuning.

At your dealers, otherwise send price (\$3.50) and you will be supplied postpaid.

Write for descriptive folder.

Mydar Radio Company, 9-A Campbell St., Newark, N. J.

ACCURATUNE

REGISTERED GEARED 80:1 U.S. PAT. OFF.
MICROMETER CONTROLS

Does Your Radio=X?

(Continued from page 60)

articles by my partisan attitude, for it is conceded that we are more stimulated by opposition to than by agreement with our pet theories. A debate has lots more pep to it than a love feast.

One choice alien speech I am keeping for future dissection, however, and that held my attention only through a sense of humor and amazement—through outraged emotions. Even that choice morsel very nearly found me missing for, after listening a few moments, I tore the receivers exclamation, and demanded of the world in general and my family in particular "how they got that way," and who would waste their time listening to such stuff! But the last wild statement kept repeating itself to me and I decided to listen. To put it mildly I got an earful, and nearly all of my emotions were aroused before it was finished.

I rashly stated that few votes were influenced during the campaign by radio spellbinders. How, then, do I account for the signal defeat of the Democrats, oil and all?

The Democratic defeat was mainly an emotional reaction having its origin at the melee which Frederick William Wile calls the Democratic Confusion. The newly hatched radio audience listening in on Madison Square Garden at New York was either filled with dismay over the whole proceeding, stung into taking bitter personal sides through the irreconcilable issues that were dragged in, or just plain disgusted with the rabble, the wasted time, the undignified atmosphere, and the selfishness of it all. Surely a convention anything, but banded together for the national good as taking precedence over personal glory! We will recall that we emoted all over the place about it.

Those hundreds of broadcasters furnished us with emotional appeal all right—they didn't realize it at the time and their psychology was disastrous, but the audience listened long and hard. The effect was demonstrated on election day.

So much for political influence. Let us turn to other things.

I KNOW a dear little woman who never saw a ball game, did not know that a strike was not personal assault, supposed four balls meant just that, and took it for granted that a foul was some kind of a feathered mascot. The world series came along and she happened to listen in on the first game. When it was over she came to me flushed with excitement and exclaimed, "Wasn't it grand! Who won?"

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Then she asked me to make a list of the terms used and what they meant so she would know next time what the announcer was talking about. The result was an ardent fan to every game via her crystal set. She even spoke the language, called all the players by their nicknames, and almost had apoplexy over the final game. As a result I am looking forward to a date I have with her to an early game next season.

Its appeal to her was entirely emotional as she had no previous interest in baseball and knew nothing about it as a scientific game.

The other evening, while awaiting an address on a subject in which I was interested, I tuned in on the station a bit early and caught part of a concert by the New York Symphony—surely a lofty and valuable number. A friend, whose ear for music embraces an almost unfailing recognition of Dixie because every one down this way applauds long and loud when it is rendered, and the Star Spangled Banner because almost everybody stands up clutching their belongings or with their hands folded comfortably across their stomachs, joined me. Did we sit on the edge of our chairs spell-bound, exalted, breathless, and richer by several dollars than the New Yorkers present? On the contrary. We watched the clock, shifted ear phones to discuss clothes, and wondered impatiently when it would be over so our feature could begin. We did mention the fact that we supposed we could appreciate it, but made no attempt to do so.

And there was a free musical education going begging. I am beginning to understand why favored American children play hookey from school in spite of everything we can do, failing to appreciate their free education.

And so much for the over-rated quenching of our thirst for a broader viewpoint, and for an understanding of art for art's sake. Here again the receiver is the loser and the one at fault.

On the other hand there is Roxy—probably the cleverest demonstrator of practical psychology on the air. He gives us a liberal musical education in two-hour doses every week and we ask for more. For here we have the emotional appeal. There is just the difference to the average audience that exists between the popularity of bone-set tea and sulphur and molasses to the average small boy.

The convention shocked our patriotic sensibilities, the world series warmed our sporting blood, and Roxy appeals to yet other emotions, emotions that include joy, exaltation, sympathy and the like. Somehow he has the power to bring his theater to us, to make his Gang ours, and cause us to



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But what of the many, many worthwhile things that go out on the air which are not universal in appeal? Like growing thin by dieting, retaining our tidy contour through exercise, or keeping our teeth by virtue of dental ordeals—it is up to us. Given inexpensive radio sets, a moderate amount of leisure, and all the free air in the world, it is certainly our own fault if we allow our radios to equal "X."

We have absolutely no excuse to offer if, for instance, we in the East are uninformed on the duties and accomplishments of our Coast Guard Service, are unfamiliar with the harmony of our Marine Band, or are too indifferent to listen to scientific discussions on subjects of vital moment. And this holds true all over the country for equally informative material is broadcast throughout the various sections. Of National affairs much is sent out over the whole United States that we, as Americans and enlightened people, just cannot afford to miss.

We, the receiving element of radio, must take ourselves in hand and educate ourselves out of our one-sided or narrow knowledge of affairs of the day. We must be less anxious to be entertained and more eager to be informed. We cannot expect all of our education to be served as conventions, games, and Roxy concerts. Many essentials are of necessity ungarished.

All work and no play makes Jack a dull boy, but all play and no work, on the other hand, makes for intellectual vacuums.

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Radio Compass Bearings

(Continued from page 57)

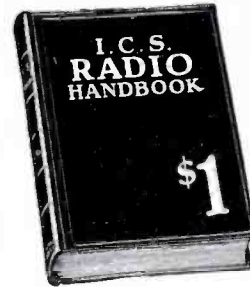
tion for the bearings. Great circles in the locality of the equator are shown on this chart as straight lines, therefore no corrections are required in practice. On the Gnomonic chart the meridians converging at the poles cause all great circles intersecting them to cut every meridian at a different angle. On the Mercator chart these meridians are shown as parallel lines, therefore it follows that the air line bearing being the angle subtended by a great circle passing through the vessel, the radio station and its respective meridian cannot be shown on this particular chart as or by a straight line; consequently a radio bearing plotted as a Mercator bearing will cause the position or fix by cross bearings to be in many cases in error by as much as 100 miles, hence absolutely worthless to the navigator in checking up his position.

Conditions at sea quite frequently hinder navigators in obtaining celestial observations with which to locate their position and shape their course. During days of intense fog, or storms, with the sky and horizon clouded or obscured by haze, it is impossible to obtain an observation of the sun and the navigator is compelled to run his vessel on a course obtained by dead reckoning. Under these conditions the radio compass comes to his aid and provides him with the necessary data with which he can obtain a "time sight" even more accurately, being absolutely as correct as the radio bearings are reliable, by a simple method of computation, requiring no more work than an ordinary navigational problem.

Even with this difference existing, by obtaining a bearing by radio up to 100 miles, I have been able to supply the captain with an incorrect fix enabling him to reach lightships from which he could make port safely. However, a mistake of 1 degree in 60 miles means an error of 1 mile. Recently, by the aid of a scale furnished by the hydrographic office, I found a difference of 3/4 of a degree from the compass station at Canso, Nova Scotia, and a difference of 1/8 of a degree from Halifax in 100 and 129-mile distances respectively. This, however, should not make the navigator sceptical, as it is even more accurate than an observation of the sun, and he could with perfect safety be guided to port where stationary visible bearings could be procured. The variation just outlined is a very small correction, as compared to some bearings, and in itself would suffice for an approximation to the position. This was considered a perfect bearing before being corrected, and the correction applied demonstrated its value, when the ob-

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jective was reached in actual navigation.

I will show here a bearing worked out by the hydrographic office for illustration. It must be remembered that this bearing was given over a 1,200 mile range, and the correction necessarily is greater. In the problem it will be seen that logarithms and sines as well as corrections are used. These differ with each slight change in seconds of time or in observations, and are only obtainable from tables 44 and 46 of Bowditch's manual and the American Nautical Almanac.

It will be seen that the bearing was taken at a distance of 1,200 miles and the Compass Stations were: NBD at Bar Harbor and NDW at Cape Hatteras.

Example: The radio bearing of a vessel in the North Atlantic from the Bar Harbor Station is 118° and the bearing from Cape Hatteras is 74.5°. Find the true position of the vessel on the Mercator Projection Chart.

Plot the radio bearings as cross bearing, and the incorrect fix is found to be in latitude 39°-37' N., longitude 56°-25' W. (It will be noted that this fix is over 115 miles in error.)

Bar Harbor	Lat. 44°-19' N.	Long. 68°-11' W.
Incorrect Fix	Lat. 39°-37' N.	Long. 56°-25' W.
	Difference of Long.	11°-46' = 0 hours 47 mins.
Cape Hatteras	Lat. 35°-14' N.	Long. 75°-32' W.
Incorrect Fix	Lat. 39°-37' N.	Long. 56°-25' W.
	Difference of Long.	19°-7' = 1 hr. 16.5 mins.

Azimuth tables:

Lat. 44°-19' N.	} True Bearing
Dec. 39°-37' N.	
H. A. 0 hr. 47 mins.	
Lat. 35°-14' N.	} True Bearing
Dec. 39°-37' N.	
H. A. 1 hr. 16.5 min.	

Bar Harbor	118°-114° = 4°
Cape Hatteras	74.5°-68° = 6.5°

Since the vessel is East of the Station the correction is "plus."

Bar Harbor Radio Bearing	118°
Correction	4°
Corrected Mercator Bearing	122°
Cape Hatteras Radio Bearing	74.5°
Correction	6.5°
Corrected Mercator Bearing	81°

Since radio bearings are given clockwise from 0 to 360 degrees, the correction in North latitude for curvature is "plus" to the radio bearing sent from the radio station when the vessel is East of the station and "minus" to the radio bearing when the vessel is West of the radio station. In South latitudes, the reverse holds true. A vessel upon receiving radio bearings from two radio stations, first plots the Mercator fix as in ordinary cross bearings. Proceed then to take off the latitude and longitude of this incorrect fix. Find the true bearing of the fix from each radio station as follows: Enter the azimuth tables taking the latitude of the radio station as a latitude, the latitude of the "fix" as the "declination" and the difference of longitude between the fix and the station converted into time as the hour angle (H.A.) and take out the azimuth or true bearing of the fix. The difference between the radio bearing sent and the bearing from the tables is the



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correction applied either as a "plus" or "minus" value as stated above.

The bearing of 122° from Bar Harbor station and 81° from Cape Hatteras station plotted on the Mercator projection as cross bearings will give the nearly correct position of the vessel in latitude 38°-03' N. and longitude 55°-00' W.

Vessels equipped with radio compass may take the bearings of the shore stations, using the same procedure for laying off the trial fix with the Mercator chart. Proceed to find from the azimuth tables in a similar manner the true bearing of the radio station from the incorrect fix, and then apply the correction for curvature in the converse way in both hemispheres to that given in the foregoing example.

The above method is faulty on account of the difficulty to lay down the long lines of a bearing with accuracy. A special plotting sheet is required having fractions of a degree marked increasing in longitude toward each side from a center line similarly marked and increasing from the bottom of the sheet. A portion of the great circle or radio bearing in the locality of the dead-reckoning position may be drawn on the plotting sheet, by first finding in what latitude the great circle bearing from each radio station cuts the meridian, selected about one degree on each side of the dead-reckoning position.

Navigators are indeed indebted to the Hydrographic Office and to the efforts of the Navy Department in the progress of perfection of the radio compass, and its interpolation on charts. Through the efforts of the Hydrographic Office, a special Gnomonic chart, having especially constructed azimuth scales for each American compass station, is now available for practical use in safe passage of the Atlantic seaboard. The use of this chart does not vary from the plotting of an incorrect fix on a Mercator projection, only care must be exercised in picking off the degrees and their quarters given in the radio station's bearing. Where the former bearings laid on the Mercator chart had to be placed by means of a parallel rule, the new scale is fitted with the exact location of the R. C. station with a cross, and the bearings may be placed on by means of a straight rule, and intersecting the azimuth scale at the point of the bearing in degrees.

In some cases, with a properly adjusted transmitter, climatic and mineral conditions cause a deflection and absorption of the radiated waves, especially when the station is located other than on the shore, consequently resulting in an uncertain bearing. These conditions cannot be remedied, and the ship station will be advised according-

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ly. The exact point of bearings are secured when a signal center exists, and must be made accordingly as sharp a signal as possible. When the wavelength is broad, it is extremely difficult to locate a center, and renders a wide girth, impractical for accurate measurement. Too much stress cannot be laid, therefore, to the proper adjustment of the oscillating circuits of the transmitter. In many cases on record, bearings have been rejected as useless, when their plotting meant a saving of time, and relief from anxiety on the part of the master. Other bearings, proving a difference of ten to fifteen miles from a position of dead reckoning have been regarded as useless, because the value of transposition from one chart or type to another was misunderstood, and, in most cases, unheard of. Before proper information was available, the radio compass bearings served merely as an approximate location over long ranges, but within short ranges, the corrections are so small as to be considered non-essential for safe navigation in thick weather.

Under these conditions, masters of vessels have been advised to use their own judgment, and not permit the radio bearings to prejudice their beliefs, but to choose as their position the one which places them nearest the likeliest point of danger, from which they may shape their course with the assurance of comparative safety from disaster.

With the co-operation of the ship operators, and 100 per cent. interest by those concerned with the particular bearing, the radio compass could and will be made and proven an invaluable adjunct to the shipping industries of the world.

Fada Cross Word Winners

A LOT of fun for the contestants and a clean cut demonstration of the publicity value of radio were direct results of the Fada Radio Cross Word Puzzle Contest conducted recently by F. A. D. Andrea, Inc., Station WHN, New York City, did the broadcasting and the contest was restricted to persons who either resided or were employed in New York City. Thousands of commuters were therefore eligible and this fact extended the field of interest into Connecticut and New Jersey and Long Island.

Announcement of the contest and information as to official blanks were made by radio. The records show that no less than 40,000 persons tried to work out the cross word puzzle, of which two definitions and the instructions were broadcast. The neatest correct solution submitted was awarded the prize in each of the five boroughs, the prize being in each instance a Fada Neuroceiver.

The winners were: Frank Wenneis, Manhattan; Mrs. Eva Gutman, Brooklyn; Frank H. Hobson, Queens; Benjamin Schwerin, Bronx, and Alfred V. Larson, Staten Island.

One representative from THE WIRELESS AGE, and F. A. D. Andrea, Inc., and a third person who was chosen by these two acted as judges.

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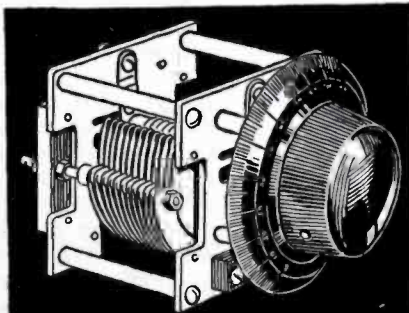
On Patrol

(Continued from page 72)

The "Skipper" instantly changed course again to avoid running them down, uttering as he did so the single word "survivors." This activity had all taken place in the shortest possible space of time and the word "survivors" had scarcely been spoken when the night was again pierced by a brilliant flash, this time coming from the escorting yacht "Wakiva" and repeated three times followed by the wicked "wham-m-m-m" of her 3-inch 50-calibre forward battery as she fired on the flashing lights, the shells, fortunately, falling some 600 yards beyond our port bow and missing the two boats. Bedlam at once reigned as the entire convoy "stampeded" and the "Skipper" emphatically "damned" the "hair-trigger" "Wakiva" and in the same breath ordered her signalled to "cease firing on survivors" and to "Stand by and pick them up." The convoy was now scattered, assuming a submarine attack was taking place and I could not help but liken the *Corsair* to a shepherd dog as we dashed here and there at full speed, signaling each vessel individually "to stand by and resume convoy formation."

The *Wavika* in the meantime signalled "Sea too rough to pick up survivors in darkness. Request permission stand by until dawn," to which the *Corsair* replied "Granted,—Upon completing rescue, rejoin convoy." It was 3:30 A. M. when the convoy was again reformed and steaming along in good order upon which the order "Secure" from "General Quarters" was given and all but those due to go on watch turned in to get what little sleep they could until reveille. I myself returned to the radio room where I relieved Jim, the watch pass-

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ing without incident other than the receipt of a radio stating "the *Wakiva* had been successful in picking up the survivors of the two boats" and "was proceeding at full speed to rejoin the convoy."

At about 11 A. M. the *Wakiva* was again the center of attraction for all hands as she came within flag signaling distance and it was learned that she had picked up the occupants of the two boats without difficulty and that they numbered nine men—survivors of a French barkentine returning from the Grand Banks with a cargo of cod that had been sunk by the gunfire of an enemy submarine the day previous. I laid below for dinner as mess call sounded, followed by the mad scramble of the ever-hungry "gobs" to reach their places at the tables.

As can be imagined, the main topic of conversation in the Chief Petty Officer's mess was debate, for and against, the action of the *Wakiva*, which was progressing lively when the mess attendant appeared with the soup, causing a temporary lull in the conversation. Our "Bo's'n," one R. Budani, a naturalized native of Italy, had just re-opened the argument with the words, "Ain't we gotta orders a'shoota furst an' tak' a'look after you know what you see next?" when suddenly there came to our ears the dull "bo-o-o-m" of a distant explosion which we instantly recognized as that of a heavy calibre naval gun. For the briefest space of a moment there was absolute silence, then one and all made a dash for the ladder leading to the main deck. The first man had scarcely reached the deck when the well known jangle of the "general alarm" gong and the shriek of our siren pealed forth, followed in turn by the sharp listing of the ship to starboard and the increased throb of our main engines for full speed ahead. We seemed to list to starboard for an almost interminable period, to the accompaniment of crashing mess gear which went sliding to the deck along with our dinner, intermingled with "choice selections" from the salt-water vocabulary of the sailor-man for the loss of the "eats." However, this was no time for regret and avoiding as best I could, the mad and yet perfectly disciplined dash of the various members of the crew to their battle stations, I made my way to my own station on the bridge. Meantime the heavy bo-o-o-ming of the gun we had first heard continued and as I gazed toward the convoy I observed that the last ship in the column, the *El Occidente*, was firing her aft 6-inch gun astern as rapidly as the crew could load it, the shells falling about 1,000 yards distant where they exploded on striking the water, sending

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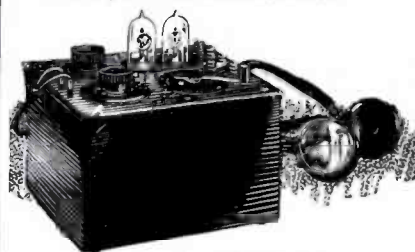
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columns of water shooting skyward. Standing out plainly against the clear sky was a group of signal flags suspended from the yard-arm of the *El Occidente* which read, "Submarine sighted astern." The escort had at once commenced anti-submarine tactics and was tearing through the water at terrific speed, circling the three troop-ships who, now that the alarm had been given, were crowding on speed, zig-zagging and dropping "smoke boxes" in the effort to hide their movements. The escort was also laying a dense, black smoke screen about the convoy, to the accompaniment of repeated explosions of terrific force, as we laid barrage after barrage of depth-bombs in our effort to either "get" the sub, or prevent the torpedoing of one or more of the troop-laden vessels. As the *Corsair* reached the vicinity where the shells of the *El Occidente* had been observed falling, a long "wake" was seen, with an oil slick quite noticeable. This was positive evidence that the alarm had been genuine and we maneuvered to follow this trail of the enemy, dropping "pattern" after "pattern" of depth-bombs containing 120 lbs. of T.N.T. and our own wake was soon one roaring mass of huge geysers as explosion after explosion took place which jarred us from stem to stern, as we combed the depths in our effort to rid the seas of this menace to our convoys. The two destroyers were also circling at terrific speed and their funnels belched the inky, black smoke such as only the oil-burner can produce, at the same time launching literally tons of explosive in the shape of the newer and more powerful American depth-bombs with which they were armed. The force of these were so great that even those of us who were used to dropping a barrage, and who were accustomed to bracing ourselves for the resultant jarring shock, were jolted considerably. Signaling the destroyers to continue intermittent bombing, the *Corsair*, after a vain attempt to discover debris of the enemy submarine rejoined the convoy.

There being little doubt but that the submarine's crew had at least been jarred out of their wits for the time being, the convoy was ordered to resume its normal course, the "Skipper" ordering "Secure from General Quarters." The question of our interrupted dinner at once became paramount as we "rescued" such remains as were still edible and sent them up to the galley for heating.

That evening, as we wearily dropped anchor at Le Verdon and watched the three giant ships with their load of human freight steam slowly in, past the nets and thence on up the river to Bordeaux, safe, in spite of the ele-

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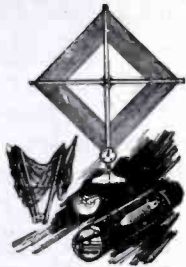
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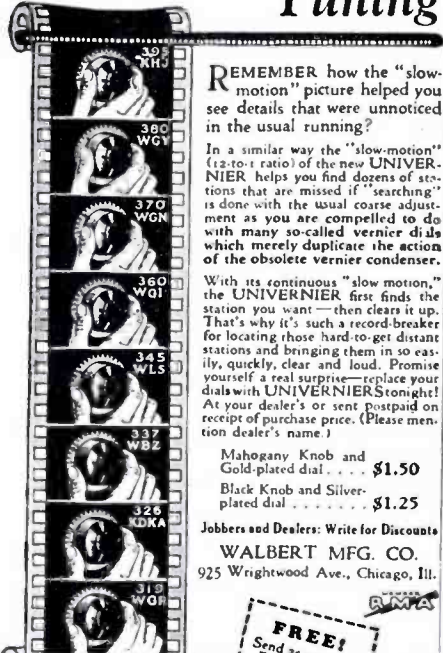


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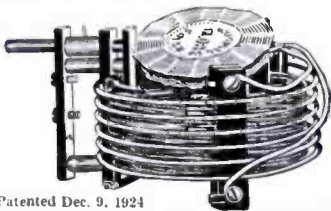
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ments and the enemy, I could not help but experience a thrill—the thrill that comes to every true patriot, as "Colors" sounded and I faced aft, "at salute," as the glorious Ensign was lowered from its staff and the brilliant sunset faded into twilight.

D-Coil and DX

(Continued from page 52)

angle brackets might be used and a more substantial job result, but electrically Dr. Burdette's method is better; besides a set as efficient as his should not be subjected to any rough treatment that would tend to disturb the position of these coils. The panel lay-out is both simple and effective, only those controls necessary to the proper manipulation of the set are exposed. The rheostats once set are forgotten. Therefore he has left them off the front of the panel. There is a phone jack for the first step of audio and one for the second step and an on-and-off filament switch. What could be simpler than this arrangement! Though the effect of the four large dials may be terrifying to the inexperienced operator, the first two dials will read practically the same and the fourth dial will not be far off. The third dial is the tickler and is used only for distant stations. We are sure that Dr. Burdette will be glad to give suggestions to anyone wishing to construct a set similar to this. All in all it is a beautiful job and we compliment him on his work.

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(Continued from page 36)

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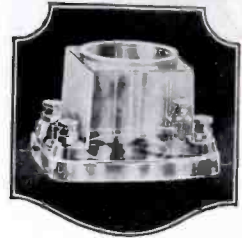
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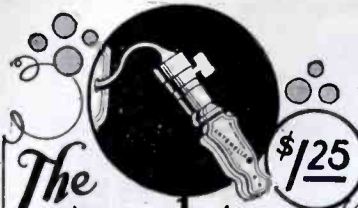
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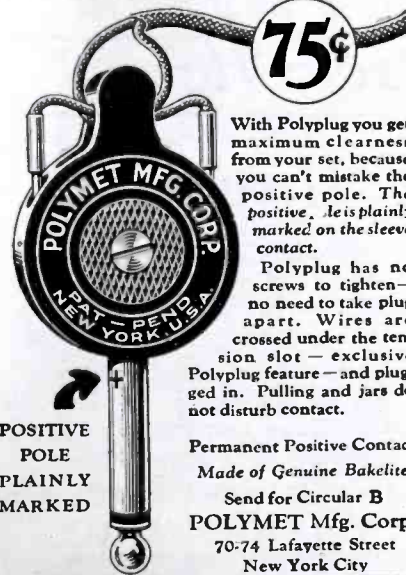
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Make BIG MONEY! —IN RADIO

We Need Men—Can You Qualify?

Ozarka representatives make real money because they give real values and deliver a real service. For instance, there is a 4-tube Ozarka instrument for loud speaker operation, giving wide range of reception at \$39.50. Our men demonstrate Ozarka instruments and install. The instrument makes the sale easy by its performance. We train you to know radio and our methods, make you worthy to wear the Ozarka button as our accredited representative. Previous experience is not necessary. In fact we prefer to do our own educating. If you have a clean record, are industrious, and have saved up a little cash, here's a real opportunity, if you can qualify for an exclusive territory. We already have 2247 representatives. Territory going fast.

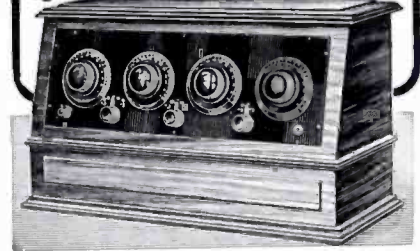


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\$150

now for the Ideal Radio Rheostat

The old story of big demand and quantity production making for price reduction has worked out for the Marshall-stat, the ideal radio rheostat. Its new price is \$1.50 now.

For your money you get the smoothest accurate adjustment rheostat on the market. It gives vernier precision throughout its entire range from 100 to 0.2 ohms. Yet there is only one adjustment to make—only one dial to turn.

In addition, it is compact (illustration above full size), requires only one hole in panel, and can be used with any tube or combination of tubes.

You can't go wrong with the Marshall-stat.

MARSHALL ELECTRIC CO.,
3239 Locust Boul. St. Louis, Mo.

Get the Marshall-stat at radio dealers everywhere. Write us for descriptive literature.



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"MASTER of Every Note in the Orchestral Range" is the proven claim of the Federal No. 65 Audio Frequency Transformer! Volume without distortion is the basis for the beauty of Federal Tone.

From its oversize locking nuts to its heavy brass mounting feet the Federal No. 65 Transformer incorporates the same engineering skill that has made Federal the recognized leader in electrical communication apparatus since 1890.

Insist upon Federal parts for your "pet" hook-up. There are over 130 standard parts bearing the Federal iron-clad performance guarantee.

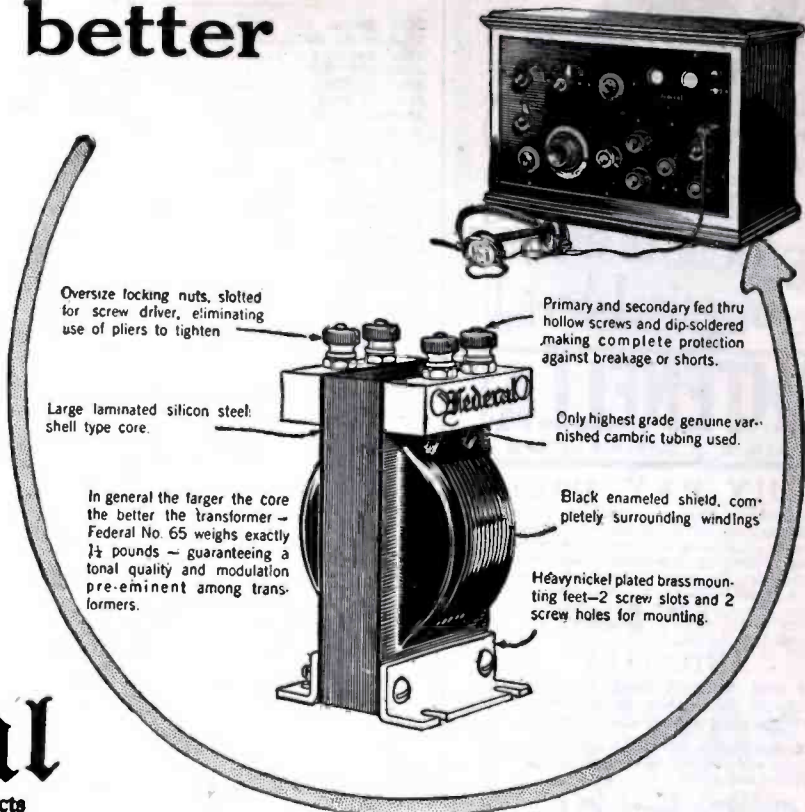
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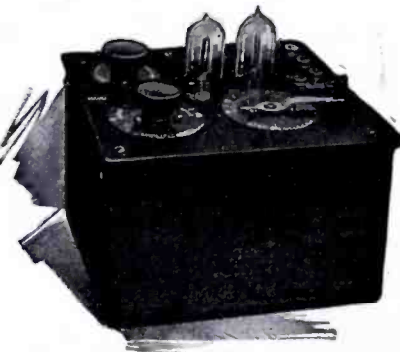
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Sell a standard line of receivers. Tell the buying radio public why Radio Corporation equipment is worth buying—let them know that you carry nothing but standard sets.

Show them the trade mark—"The Symbol of Service," a protection against inferior equipment. Make your prospective buyer feel and know that when he buys a Radiola he gets the best there is to buy.

The receivers you sell are the quality standard your customers judge you by.

Sell standard lines only.

Wholesale Distributors only

2094-Q

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New York, U. S. A.

"Quality Goods for Quality Readers"