The WIRELESS AGE

"America's Foremost Radiophone Review"

July
25 Cents

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Broadcasting Americanism
Stars Who Entertain You
The Radio Pictorial

Short-Wave Radio Frequency That Work

MARCONI'S RADIO BEACON. ARMSTRONG'S NEW CIRCUIT
AND A SCORE OF EXCLUSIVE ARTICLES

Medal and Diploma received at World's Columbian Exposition Chicago. 1893

ELECTROSE

TRADE

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INSULATION "MADE IN AMERICA"

Louis Steinberger's Patents

Medal and Diploma received at World's Fair, St. Louis, 1904

"Electrose" is made in a number of grades for various requirements, each grade possessing special characteristics

Insulators and Insulating parts and devices of special sizes and forms, designed and made to order.

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Brooklyn, N. Y., America

VOLUME 9

THE WIRELESS AGE

NUMBER 10

Edited by J. ANDREW WHITE

Contents—July, 1922

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Owing to the fact that 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 signalling, the owners and publishers of this magazine positively and emphatically disclaim any privity or responsibility for any statements of opinion or partisan expressions if such should at any time appear herein.

Printed in U. S. A.

Advertisers' Index

CROSLEY RADIO PRODUCTS

"Better—Costs Less"

The Sheltran

Audio Frequency Amplifying Transformer

The CROSLEY SHELTRAN AUDIO FREQUENCY AMPLIFYING TRANSFORMER. High grade materials and excellent workmanship combine to give the CROSLEY SHELTRAN great efficiency and attractive appearance so often lacking, except in the most expensive transformers. Incorporated in the design of the SHELTRAN are all the characteristics necessary to obtain maximum amplification from the modern vacuum tubes. The ratio of turns is 9/1. The CROSLEY SHELTRAN has a base area of 1¼"x2½". Net weight 12½ ounces. The over-all length is 2½"; the over-all height is 2-7/16"; and the over-all width is 2-11/16".

Price, complete ready to mount—$4.00

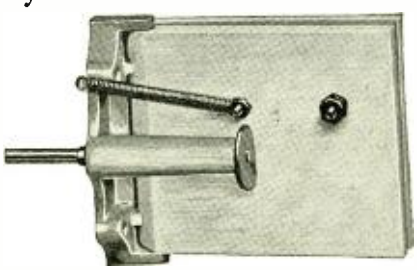
Harko Senior Radio Receiver

This instrument is a combination tuner and audion detector, and was developed to supply the demand for a low priced efficient receiving outfit with a range of 150 to over 600 meters. The hookup is special—of our own design and is non-regenerative. New Jersey, Pittsburgh, Detroit and other phones are regularly copied in Cincinnati and other points, with this receiver. The HARKO SENIOR is 11½ inches wide, 6 inches high, and 4⅞ inches deep. Price, complete without "B" Battery, "A" Battery or phones—$20.00.

Crosley Two-Step Amplifier

This instrument was designed to give the very maximum in value and to match up with the Harko Senior, using the same sized cabinet. Complete with amplifying transformers, sockets, rheostat, switch, binding posts, etc., mounted on formica panel in mahogany finished cabinet. This efficient instrument can also be used with any other apparatus requiring two step amplifier. Price, complete as shown in illustration—$25.00.

Crosley Variable Condensers



These condensers need no further introduction. They have been accepted by radio experts all over the country as being extremely efficient in all kinds of work. The Model "A" has a wood frame and the plates are high grade laminated wood. The Model "B" has die cast frame and best quality laminated wood plates. The Model "C" has die cast metal frame and porcelain plates and has a conservatively rated capacity of .001 MF. All CROSLEY CONDENSERS are tested under one thousand volts before shipment, and will not shower or break down in radio phone work.

	Price
Model "A" without knob and dial	$1.25
" "A" with knob and dial	1.75
" "A" with knob and dial mounted in mahogany finished cabinet complete with binding posts	2.50
" "B" without knob and dial	1.75
" "B" with knob and dial	2.25
" "B" with knob and dial mounted in mahogany finished cabinet with binding posts	3.00
" "C" without knob and dial	2.25
" "C" with knob and dial	2.75
" "C" with knob and dial mounted in mahogany finished cabinet with binding posts	3.50
Crosley knobs and dials complete, each	.50

Crosley V T Socket—60c

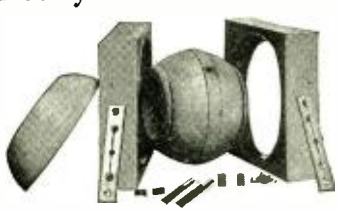
"Better—Costs Less"

The biggest selling socket on the market today. Practically unbreakable. For either base or panel mounting; made of one piece of porcelain. No metal shell and no ground hum. Better—and costs only 60c.

Harko Radio Receiver

The most compact, complete and efficient crystal receiving outfit on the market. Will tune from 200 to 600 meters, bringing in spark, voice and music with amateur antenna. A wonderful little instrument. Price, complete with battery, etc.—$9.00. One thousand ohm single head set, 125 feet of wire, insulators, etc., $6.00 extra. Complete outfit—$15.00.

Crosley Variometer Parts



Consist of two stators, one rotor and the necessary hardware as shown in the illustration for complete assembling. Shaft for knob and dial is 3/16" diameter. Wood parts are furnished either in mahogany or poplar.

Price, complete, made of poplar wood $1.50

Price, complete, made of mahogany wood $1.75

Crosley Variocoupler Parts

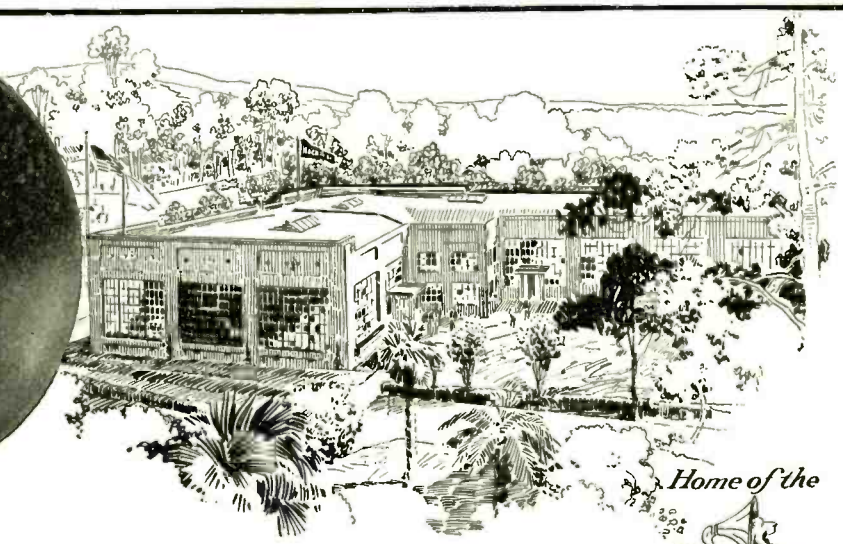
Consist of formica tube, rotor and brass hardware for complete assembling. Price, not wound or assembled, as shown in illustration, $1.50. Rotor only—40c.

Crosley Cabinets

We manufacture a full line of cabinets in gum, mahogany or quartered oak, and furnish them with genuine formica panels. Prices on cabinets range from $2.50 to $10.50.

Jobbers and Dealers: Order now if you expect early delivery.

CROSLEY MANUFACTURING COMPANY, Radio Dept. W-4, CINCINNATI, OHIO



The Plant of the Magnavox Co., Oakland, California—one of the show factories of the Pacific Coast.

Home of the MAGNAVOX *products*

Essential to the full enjoyment of your wireless receiving set is the MAGNAVOX RADIO

A FEW months ago the Magnavox Radio occupied a relatively unimportant position in the list of Magnavox products—today even our greatly increased production facilities are taxed to supply the demand for Magnavox Radio, the reproducer supreme.

It is the Magnavox Radio which gives every receiving set its greatest enjoyment and use—doing away with the restrictions and limitations of the *individual headset*. The receiving set only *brings* the message, while Magnavox Radio *tells* it clearly and in full volume to all within reach of its voice.

Unlike the *telephone receiver* used on headset and some forms of "loud speaker"—which are constructed on the electro-magnetic principle—the Magnavox Radio exclusively is constructed on the *electro-dynamic* principle and is thus a most efficient converter of electrical energy into sound waves.

The Magnavox Radio operates with any good type of receiving apparatus, and was not designed for any one particular make. Without the Magnavox Radio no receiving set is complete.

Any radio dealer will demonstrate; or write us for descriptive booklet and name of nearest dealer.

THE MAGNAVOX CO.

Home Office and Factory:
Oakland, California

New York Office: **370 Seventh Ave.**

Type R-2 Magnavox Radio
with 18-inch Horn

THIS instrument serves the requirements of professional use for large audiences, dance halls, etc. **Price, $85.00**

Type R-3 Magnavox Radio
with 14-inch Horn

THE same in principle and construction throughout as Type R-2, and is ideal for use in homes, offices, amateur stations, etc. **Price, $45.00**

3-Stage

Magnavox Power Amplifier Model C

INSURES getting the largest possible power input for the Magnavox Radio. Can be used with any "B" battery voltage which the power tube may require for best amplification.

AC-2-C, 2-Stage..... $80.00
AC-3-C, 3-Stage..... 110.00

MAGNAVOX Radio

Stop that Leakage!

The Willard All-Rubber Radio "A" Battery (shown at the right) is not an automobile battery adapted for Radio use, but is a special radio battery built for the reception of C W and spark messages. The reduction of the weight of connectors, the increase in thickness of plates, the special radio type of Threaded Rubber Insulation are all features that are necessary to an efficient, economical battery of this type.

You'll have to admit it's annoying to have a radio concert or a conversation interrupted by noises that sound as if all the animals in the zoo had cut loose at once.

Some of these noises can't be stopped by even the most careful tuning. They can be ended only by removing the leaky cell or the leaky battery that's responsible for them.

One of the most important features of the Willard All-Rubber Radio Battery is that it is absolutely leak-proof. Battery case and jars are cast in one solid piece of rubber, eliminating the possibility of leakage either from cell to cell, or to ground. Every case is tested at 24,000 volts.

The Willard All-Rubber Radio Battery has the same Threaded Rubber Insulation as the Willard Threaded Rubber Automobile Battery. The Willard Radio "B" Battery is a 24-volt rechargeable storage battery, with leak-proof glass jars and Threaded Rubber Insulation. Assures freedom from frying and hissing ground noises. Ask for particulars from your dealer, or at the nearest Willard Battery Station.

WILLARD STORAGE BATTERY COMPANY, Cleveland, O.

Made in Canada by the Willard Storage Battery Co. of Canada, Limited, Toronto, Ontario

Willard THREADED RUBBER BATTERY

"It's a Super-Rheostat for Your Radio Set"

No *Wire* Rheostat can produce the amazing results of the Bradleystat

If you want the finest results from your radio set, install a Bradleystat in each vacuum tube circuit. Our customers have found that by using Bradleystats, instead of wire rheostats, they get

1. *Clearest and Loudest Reproduction,* because the Bradleystat stepless control locates the precise filament current for greatest amplification or detection.
2. *Quickest and Easiest Tuning,* because one knob, without vernier, does the work. There are no interfering noises, no loss of time, and no worry as with complex wire rheostats.
3. *Greatest Receiving Range,* because noiseless control detects weak radiophone waves and by locating exact filament current, amplifies the waves to fullest extent.

That is why the Bradleystat is known among radio experts as the Super-rheostat. Don't hamper your vacuum tubes with inadequate wire rheostats. Use the Bradleystat.

Bradleystat
REGISTERED U. S. PAT. OFF.
PERFECT FILAMENT CONTROL

Two columns of graphite discs (not loose carbon grains) provide the delicate control so vital and essential for vacuum tubes in radio sets.

A single adjusting screw gradually applies or removes pressure from the discs, thereby changing the filament current in such a smooth and stepless manner that you quickly find the loudest and clearest reproducing point of your tube.

The Bradleystat is so simple and efficient that thousands of radio enthusiasts are using them to the exclusion of all wire rheostats. Twenty years of experience and research have made such perfection possible.

Allen-Bradley Co.
Electric Controlling Apparatus
283 Greenfield Avenue
Milwaukee, Wis.

INSIST ON THE CHECKERED BOX

Retail Price
$1.85
Postage 10c extra

MAIL Coupon for FREE BOOKLET on V. T. CONTROL

Allen-Bradley Co.
Electric Controlling Apparatus
283 Greenfield Av., Milwaukee, Wis.

Please send me latest bulletin on Bradleystat Perfect Filament Control, explaining how it will improve my radio set.

.....

.....

Put Prest-O-Lite Quality Into Your Radio Equipment

What the name, *Prest-O-Lite,* means to the automobile, it means to radio. Embodying the same battery principles and the same standards, the Prest-O-Lite designed especially for radio use delivers regular Prest-O-Lite satisfaction.

For summer months, it is without a rival. Its continuous, even rate of discharge eliminates necessity of continual adjustment.

A tasteful piece of cabinet making in mahogany finish, it harmonizes with any furnishings. Equipped with rubber feet, it does not deface furniture.

The Prest-O-Lite is beyond question the foremost battery for radio use. Ask for it at any Prest-O-Lite Service Station; or your electrical dealer will get it for you. Prices $15.75 to $37.50.

We advise the selection of the battery of ample capacity to avoid frequent recharging. When it needs recharging, remember there is a Prest-O-Lite Service Station in your vicinity.

THE PREST-O-LITE COMPANY, Inc.

Carbide and Carbon Building
30 East 42nd Street, New York

Eighth and Brannan Streets, San Francisco, Calif.
In Canada: Prest-O-Lite Company of Canada, Ltd., Toronto

ATTENTION DEALERS!

Prest-O-Lite Batteries for Radio Equipment make the quickest moving stock to-day. Write for our proposition.

Prest-O-Lite BATTERY For Radio Use

$37.50

$18.75

Make this a Radio Vacation

A Stramcy Coupler and Lily Horn, attached to one unit of your headphones, makes a complete Loud Speaker for $1.55.

A Duplex Adaptor provides an excellent means for connecting both units of your headphones to a Lily Horn or other loud speaking device. Price $2.50

ON your vacation, your automobile trip, at your summer camp, wherever you go—keep in touch with the latest news, the baseball scores, the events you and your friends will want to know about—by radio.

The NYRDO, PINK-A-TONE, and other "Radisco Recommended" receiving sets, displayed by all Radisco dealers, are purposely designed for summertime radio. You can set up one of these compact, portable outfits in a few minutes and listen to the charm of "music across the water"—by radio. Any Radisco dealer will gladly demonstrate an inexpensive outfit that you can carry with you. Insist on "Radisco Recommended" apparatus and enjoy the best vacation of your life. Radio Distributing Company, Newark, N. J.

RADISCO

"Your Assurance of Satisfactory Performance"

RADISCO · APPARATUS ·

In Our Opinion

WITH the advent of hot weather the people who want only a mysterious black box with a couple of knobs to turn are spending their time out of doors instead of listening to broadcasted programs. And many wise words are heard about the "end of the radiophone craze."

The Radiophone Craze

As a matter of fact, the passing of the faddish rush of the Winter and Spring is welcomed heartily. It gave publicity to the industry, but it also brought various evils in its train. Manufacturing equilibrium was upset and there sprang up a mushroom growth of inexperienced assemblers and retailers who thought they saw some cream to skim; a vicious circle of pyramided orders was built up that multiplied the actual consumer demand several times.

The Summer heat is boiling all these things down. The reliable manufacturers are getting a better scale of the market, they are catching up on back orders, and stocking their warehouses against the Fall business. The fly-by-night dealer is seeking cream in other pails. The industry as a whole is reaching a basis which, while much broader than it was a year ago, is firmer. The situation no longer is hectic, but healthy.

When the Fall arrives, and the radiophone once more becomes an indoor sport of the American public, the novices will find adequate stocks of dependable instruments awaiting them, improved broadcasting services at their command, and a capable dealer body anxious to aid them intelligently.

In the meantime, the amateurs, who for years have been the backbone of the industry and have contributed mightily to its progress, pursue their experimental way. While the industry enjoys a breathing spell they are discovering the great superiorities of C.W. transmission, and in receiving are developing radio-frequency hook-ups that keep out the static.

To the veterans, this is a great Summer!

* * *

JUDGING entirely by the results achieved by E. H. Armstrong in the recent demonstration of his new invention, the super-regenerative receiver, before the Institute of Radio Engineers this invention marks an important development of radio communication.

The Super-Regenerative Receiver

This new receiver—Armstrong's third important contribution to the art—is, in reality, a radio-frequency amplifier, its power of amplification increasing inversely as the square of the wavelength, or, in other words, the shorter the wavelength the greater the amplification it is possible to obtain. This one point in itself is specially interesting to amateurs, as heretofore devices for radio-frequency amplification have not worked with full efficiency on short wavelengths.

The really fascinating feature of the new invention, however, is its rejection of discontinuous waves, such as are emitted by a spark transmitter. The inherent characteristics of the new device are such that it automatically rejects all oscillations of "free" wavetrains, of the type set up with discontinuous radio-frequency by a closed oscillatory circuit acting on the open circuit of a transmitting station. Thus we approach close to the ideal in a receiver for radiophone reception; one that will cut out most of the interference from spark stations using code which has so often marred reception of broadcasted radiophone programs.

OUR present radio laws and regulations, made ten years ago, are so obsolete as to be practically useless in their application to the immense development, particularly in radio telephony, which has taken place within the last two years. The need for more satisfactory and up-to-date laws and regulations was recognized some time ago by Herbert Hoover, Secretary of Commerce, and a convention of radio engineers, experts, representatives of several departments of the Government, engineering and amateur organizations was called at Washington.

Red Tape and Taxes

The detailed report of this committee, earlier published in detail in THE WIRELESS AGE, assigned bands of wavelengths to various services, classified transmitting stations, and in general attempted to clear up what had been an unsatisfactory situation to all concerned. But revision of the existing radio law was found to be necessary before the new rules and regulations could be made effective.

To accomplish this a new bill to regulate radio communication, known as S-3694, has been introduced in the Senate by Senator F. B. Kellogg, of Minnesota. After two readings it was referred to the Senate Committee on Interstate Commerce.

The bill perhaps was well intentioned, but if enacted in its present form, promises a goodly addition to an already sufficient burden of red tape and taxes.

Just how the Secretary of Commerce is to carry out some of the provisions of this bill is not clear. How, for example, is he to determine whether anyone is "monopolizing, or seeking to monopolize" radio communication? He may revoke station licenses for this offense or intention, but many are likely to ask: What is a monopoly, anyway? The courts have frequently disagreed on the subject. Can a secret service organization, or other department of the Government, determine whether any individual or company is "seeking" a monopoly? Is protection of patent rights to be considered as constituting a monopoly, or fostering one?

Many will question the wisdom, too, of the provision by which autocratic power is vested in the Secretary to revoke any station license when he "shall deem such revocation to be in the public interest."

The bill also provides that the construction of a station can't be started until permission is given or a license is issued, and then if the station isn't ready for operation by a certain time the license is to be revoked. This is reminiscent of the trials of a public garage owner who was summoned to court by a fire inspector for having a wood floor on his garage, and who reported that the same wood floor had been installed by order of the Health Department to protect the workers from getting tiddle-de-winks from standing on cold concrete. Red tape!

And then we come to Section 9, and taxes.

Every type of transmitting station is to be assessed, from one engaged in trans-oceanic work to the attic type, consisting of a tin whistle and two dingbats. Now taxation may be necessary and advisable, but only if the revenue is to be applied to increased personnel for the inspection staff. The radio field would welcome such expansion, but if an already overworked radio staff is to be burdened with an excess of red tape, the good to be accomplished by an expanded staff would be negatived.

Drafted perhaps with the best intentions, the bill as it stands holds too much "Thou Shalt Not," instead of "Let's Go."

—THE EDITOR.

Mme. Petrova Delves Into Future of "Radio Brain"

WILL the human mind develop to the point where it will be in itself a "radio" transmitting and receiving station? Read Olga Petrova's interesting theory expressed in an interview on page 39

Personality Survives Radio Wave, Says Opera Singer

IN an interview on page 41, Yvonne de Treville, coloratura soprano who has sung in many countries, tells her radio audience that the individuality of the singer or speaker is retained in voice transmission over the radiophone

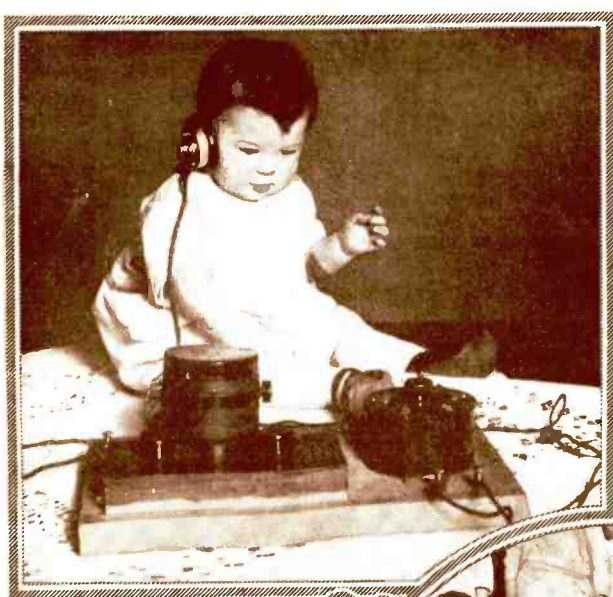
She Explains the Secret of Success in Broadcasting

OLGA COOK, star of "Blossom Time," the Broadway success, reveals the method radio singers employ to "feel" the pulse of their unseen audiences. Her interesting explanation appears on page 31 in an exclusive interview which is enlightening

Phonograph "Rube" Character Speaks to Radio Fans

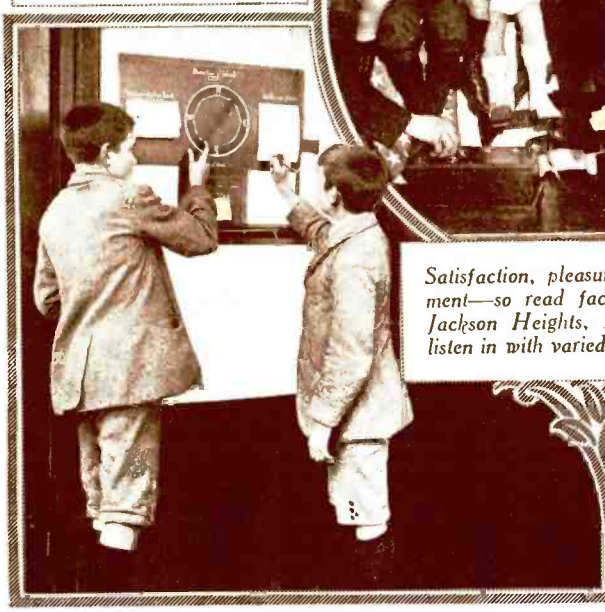
BYRON G. HARLAN, character singer, in a short time has become as popular with radio fans as he has been for twenty years with phonograph enthusiasts. On page 45 Mr. Harlan declares he believes radio is a force for good sent down from Heaven and is here to stay

Children's Hour These Days Is the Radio Hour

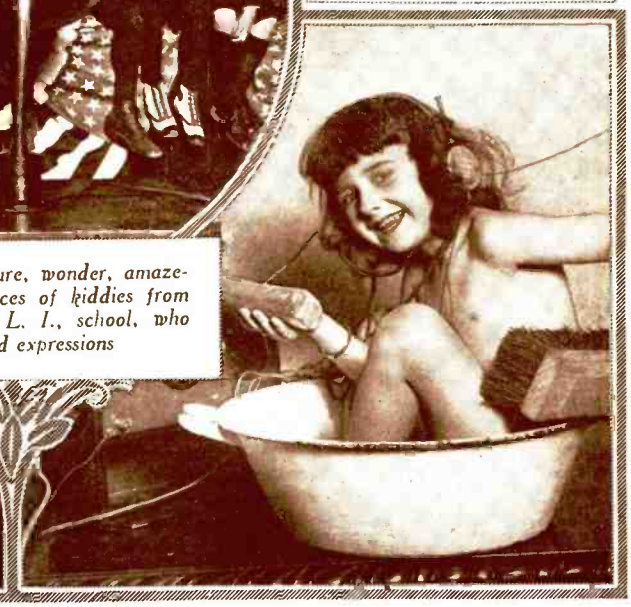


Georgia Moses, of Seattle, still speaks in terms of gurgles but she likes radio music

Little Jimmy Little is a modern baby. Jim can't talk but his eyes and mouth say a-plenty



Satisfaction, pleasure, wonder, amazement—so read faces of kiddies from Jackson Heights, L. I., school, who listen in with varied expressions



A scene common in schools throughout the country. These lads are visualizing weather reports received by wireless telephone. Educators predict radio will do important work in the development of children

Little Peggy Rice, four years old, listens in to a radio concert while taking her daily bath. And take it from Peggy, radio adds greatly to the enjoyment (?) of children's baths—as her happy face will testify

Nothing Would Seem to Be Impossible in Radio

Reta Pam might have difficulty, between holes on the links, in catching music with this set-up

June found Miss Mildred Fenn (top) and Mildred Redmond erecting an antenna on their motor boat

Here is Jack Hoxie and his wireless telephone for horseback riding. No startling results have been claimed, but it indicates the radio rage has reached the cattle ranges

Novelties Reveal Radio Monkeys and Radio Teas

At least Jimmy realizes the phones aren't attached to the feet—which is one comfort

Miss Janet Adamson likes this "radiolamp," exhibited at New York radio show. The base is a tone horn; shade covers receiving set and electric light

One of the novelties at the recent New York City radio show was a necklace containing a crystal receiving set. Miss Winifred Miller is shown wearing it

Radio helps digest the food, so they say. At least a set was recently erected in Tea Room of famous Waldorf-Astoria Hotel, New York. A midafternoon refreshment scene

More Notable Stage and Screen Radio Victims

Mme. Asta Souvorina, "The Bernhardt of Russia," listening in with "Buster" on receiver made by her two sons, Andrew and Nicholas

And Dick Bartelmess, movie star, decides at the studios he wants the correct time, so he tunes in for Arlington and sets his watch

Mary Pickford, "out on location" keeps in touch with the studio, and maybe with "Doug" Fairbanks, her jovial husband. The photo above shows Mary as the famous "Tess." Motion picture officials claim this communication from the studio to companies on location saves thousands of dollars worth of valuable time and eliminates many delays. Supplies are ordered in this way and instructions given. At the time this was taken "Doug" was filming "Robin Hood," miles away

Debate by Radio

"RADIO telephony is of more permanent value as a means of entertainment than for sending messages of general commercial use."

That was the decision of judges in the first debate conducted by radio in the Northwest. By a 2 to 1 vote the judges gave the verdict to the North High School debating team of Minneapolis, over the Johnson High School team of St. Paul.

On the Minneapolis team were Margaret McCaslin, William Boyer and Berryl Bearman, while Bernese Kern, Alvin Hilgedick and Elmer Noreen represented Johnson high school. Judges in the debate were Dr. Samuel F. Kerfoot, president of Hamline University; Mayor George E. Leach of Minneapolis, and W. I. Nonal, Speaker of the House of Representatives.

To Broadcast Movies?

PYRAMID PICTURES, INC., has contracted for the installation of a broadcasting station at its plant in Astoria, L. I., N. Y., and expects to have the station in operation in the near future. The exact manner in which it will be used has not been stated, but the close connection that the company has with the film distributors and the theatres has led to the supposition that loud speaker sets in the motion picture houses may be planned, to link the producer directly with the audiences in many houses. This would enable the stars in feature pictures to "appear" simultaneously in hundreds of theatres where their pictures were being shown.

Police Tests In Chicago

EXPERIMENTS in the use of radio in the transmission of police messages in Chicago have proved a complete success, George B. Carlson, Commissioner of Electricity, says in requesting an appropriation of $68,000 for radio equipment and personnel.

If granted the appropriation a new duplicate sending station will be installed on top of the City Hall. The eight high-powered bandit cars used by the Detective Bureau will be equipped with both sending and receiving sets.

"I think the equipment of the bureau cars with radio sets will prove an important factor in arresting criminals." Chief Fitzmorris said. "I doubt whether radio development is sufficient to warrant its use by ordinary patrolmen, however."

Aid To Builders

REAL estate subdividers find that the use of the radio promises to become an indispensable adjunct to their activities, according to a prominent subdivider and home builder of Los Angeles, who has just installed a radio system at his main office and is now in constant touch with the activities of his tracts.

Under the plan which he has adopted to use the radio, he receives every day at the close of business a comprehensive report from his managers.

He finds, moreover, that by receiving these radio reports after the hours of the business day and before the Los Angeles newspapers start their evening radio concerts, that the air is virtually free from conditions which interfere with the transmission of this business.

At both Walnut Park and West Adams Place, the Girard organization is engaged in extensive building operations which will keep a large force of men engaged throughout the summer.

"Stop, Look and Listen!"

IN connection with the national "careful crossing" campaign, conducted under the auspices of the American Railway Association, which started in June and will continue through September, a message, of which the following is an extract, was broadcast from KDKA, WJZ, WBY, and KYW:

"Under the direction of the American Railway Association, all railroads of the United States are taking part in a national careful crossing campaign.

"The object of the campaign is to bring to the attention of the American people, in an impressive manner, the necessity for exercising the greatest possible care to avoid being struck and killed or injured by trains while traveling over highway crossings.

"In the past five years 9,000 deaths and 24,000 injuries have occurred at highway crossings, while in 1921 alone thirty out of every 100 accidental deaths on railroads of the United States were classified as crossing accidents."

The message had a tremendously wide circulation, as many newspapers, catching the words from the air, reproduced them and no section of the country was left "uncovered."

Well, well, well! The Radio Shoeshine! Shoes are not shined by wireless but the patrons of this Oakland, Cal. bootblack hear radio music while he works

Radio Aids Surgical Patient

THE radio telephone and spinal anaesthesia together took a young girl through two dangerous operations recently at the Samaritan Hospital in Philadelphia. It was impossible to give the patient ether, so an injection into her spine was used to numb her body from the shoulders down. In order to distract her attention from the operation and give her mind a healthy tonic during the forty-five minutes she spent on the operating table, the head phones of a radio receiving set were placed over her ears, and she listened to the art of great musicians as transmitted by radio. While Dr. Frick excised her appendix and removed several large gall stones, the patient displayed great interest in the broadcast program, oblivious of the surgeon.

Only 15 Silent States

CALIFORNIA so far leads the country in the number of broadcasting stations. She now has 37 stations; Ohio comes next, and Pennsylvania and New York are close behind, according to a study made by the National Geographic Society. Only 15 states are without broadcasting stations, these being North and South Dakota, Arizona, Nevada, Utah, Wyoming, Idaho, Montana, Florida, Mississippi, South Carolina, Kentucky, Rhode Island, Vermont and New Hampshire. All these states, of course, listen to broadcast matter from many others, so that there is no part of the country in which it is not possible to listen in to radiophone concerts.

New City Stations

CHICAGO, not to be outdone by New York City, is to have a city broadcasting station, which will be erected on the Municipal Pier. Receiving equipment with powerful amplifiers also will be installed, so that the pier, which is used throughout the year for conventions, will be able to entertain those who are on it as well as those at a distance.

Richmond, Va., has started to experiment with receiving apparatus, in order to train its policemen and firemen in radio. As soon as the necessary experimental and educational work has been done, transmitting apparatus is to be installed, and portable receivers placed in the hands of the police.

Justice Taft Uses Radio

CHIEF JUSTICE TAFT delivered a speech on June 2nd by radio to the Associated Western Yale Clubs, on the occasion of their holding their seventeenth annual meeting in Detroit. The speech was broadcast from the Arlington station at 9 o'clock, Eastern standard time, on a wave length of 2,650 meters.

Robert Olyphant

Radio's Important Place In The Work Of

Americanization

General Robert Olyphant, President, Sons of Revolution, Explains Its Possibilities

"THE radio telephone will bring the English language and American ideals to those foreign-speaking sections of our large cities that now offer so great a problem in Americanization work."

Such is the opinion of Robert Olyphant, president of the Sons of the Revolution, which has been taking a large part in educating the foreign-born to become truly American in spirit.

"We have here many groups of foreign born citizens," said General Olyphant. "They come from almost every spot in the world. So that this country resembles a veritable Tower of Babel as far as language is concerned. These groups, when they come to this country generally settle down in a particular place.

"Those who follow, of the same group, invariably go to the same city and even to the same section of the city that has already been populated by people of the same race. New York holds a splendid example of this. We have entire sections peopled by those of different nationalities. Spaniards, French, Russians and many others live apart and when they speak to each other, they do so in their mother tongue. They read newspapers and books printed in the language of the country in which they were born.

Removal of Language Barrier

"At heart they are Americans and I do not mean to give the impression that I regard the settling together by these various peoples as at all undesirable. The point I do want to make is that the work of Americanization, and this includes the teaching of the American language to these people, is a task which becomes increasingly difficult in view of their keeping together and speaking and reading not in the English language.

"The radio telephone in my opinion," continued the General, "will penetrate this almost impossible barrier. The voice speaking the English language and the voice propagating the American ideals and literature will go into the homes of these foreign born citizens. They will be listening to the wireless voice and benefiting by it, whether they want to or not.

"Our organization was formed to promote and assist in the proper celebration of the anniversaries of Washington's Birthday, the Battles of Lexington and Bunker Hill, the Fourth of July, the Capitulations of and the Evacuation of New York by the British army and other prominent events relating to or connected with the war of the American Revolution.

Right Material Vital

"The radio telephone will do an important work in Americanization only if it carries the messages that assist in bringing home to the people the importance of this work. It all depends on what is transmitted.

"The objects for which our organization stand are sacred to this country, and if the radio telephone can help to impress upon the many millions the sacredness of them, then in my opinion the radio telephone will perform a service to America that will be invaluable.

"The radio telephone of course will play a very great part in patriotic demonstrations of the future. Consider, for instance, the celebration that we had recently in the City Hall Park, New York City, where we re-dedicated the statue of Nathan Hale which we gave to the city in 1897. I have no doubt but that in the future radio will be developed to such a point that a message given at that demonstration would be heard not only by those attending the affair but also the words will reach the ears of those hundreds of thousands scattered within a radius of several hundred miles.

"It is during the month of July especially that the work of patriotic societies comes to the attention of the public. The greatest American holiday, the Fourth of July, commemorating the birth of our free Republic, seems to give this nation a new lease on life and a new appreciation of the things for which America stands.

"This year also there is a new note added in the general scheme of things that goes to promote the well-being of America. The radiophone has been accepted by the public.

A National Blessing

"In every part of the country where patriotic gatherings had a place, the message of the speakers, pointing out the story of America, went out through the air and into hundreds of thousands of homes—homes of the American born as well as those to whom this land is an adopted choice. Therefore the lessons of patriotism that are sent out this year will have a far greater influence than any that were ever sent out before, in that they will reach farther and in that way come to the attention of more people. It is a national blessing that such an astounding feat is possible and it means a step forward in the progress of America and Americanization programs."

Such were the opinions of Robert Olyphant, President of the Sons of the Revolution.

Boys love radio and it is into boys' minds that the spirit of America is instilled. Photo shows "radio trio" in Jersey City Boys' Parade

Knights of Columbus Mission

MAKING missions by wireless is the latest radio achievement. Under the auspices of the Knights of Columbus, the second successful experiment in holding a large, general mission and broadcasting the lectures delivered at the mission has been concluded in Seattle. The first experiment was made in Pittsburgh.

From St. James Cathedral in Seattle, through a transmitting instrument placed in the pulpit, the missionaries were enabled to reach many hundreds of people in various parts of Washington and neighboring States who could not attend the mission.

The success of the mission has made it probable that K. of C. councils in all large cities will adopt the radio. Already many K. of C. councils have conducted full evening vocal and orchestral entertainments by radio.

It is probable, too, that the elements of radio telephony and telegraphy that can be taught by mail will be added to the curriculum of the K. of C. National Correspondence School in New Haven, Conn.

Radio for Health Service

WIRELESS telephony has been enlisted in the service of public health by Dr. Huntington Williams, who was a member of the first class formed at the Johns Hopkins School of Hygiene and Public Health. Dr. Williams is a sanitary supervisor in the New York State Department of Health.

When the wave of popular interest in radio swept the country a short time ago Dr. Williams recognized its possibilities as a medium for the dissemination of health instruction. He made arrangements by which his department broadcasts information of health topics every week in five-minute "talks."

Dr. Williams estimated that the talks are heard by at least 10,000 persons in cities and rural sections of New York State. They also have been received in California and Cuba, and have elicited replies from many points, including Baltimore.

The talks are prepared by officials of the department in popular form and on such subjects as keeping well, tuberculosis prevention and child hygiene. The General Electric broadcasting station sends out the talks as a public service, Dr. Williams said.

Arrangements have been made by which, in emergency, radio facilities will be thrown open to the department that will permit it to communicate with any part of the country. Dr. Williams believes this will be of great value in such a situation as that arising from the flood at Albany in 1913, when poliution of a huge water supply system caused an outbreak of typhoid.

To Help Pass Time

ANOTHER new use for radio has been discovered by an enterprising theatrical manager in Los Angeles.

The New Mission is the first Los Angeles theater to use the radio service, or any radio, as a means of entertaining patrons waiting in the lobbies for admission to theater auditoriums.

The patrons were delighted with the innovation, and they found waiting in the lobby such an entertaining part of the show that the management intends to give the radio concerts from the stage.

This photo shows players in a billiard hall getting hints on how to improve their game. A lecture on "How to play billiards correctly" is coming over

Pain, Get Thee Hence!

THE greatest substitute for laughing gas ever invented is the way dentists describe the very latest in radio devices.

The more disagreeable features of dentistry, the dizzy burr of the grinder, the sharp twinge of the probe, and other unpleasant things, are now relegated to the limbo of the past by means of a radio receiving set placed next to the dentist's chair.

Dentists claim that a little light music while teeth are being "fixed" helps greatly to relieve the pain and unpleasantness by taking the mind of the patient off his troubles. Anyway it serves to lessen greatly the monotony of long, tedious hours in the dentist's chair.

Yuletide Gifts Next Year

"THE Radio Corporation of America has established a great warehouse in Chicago and has allocated 40 per cent. of its entire output to the western territory," said J. C. Davidson of Hendrie & Bolthoff on the occasion of a reconnaisance of Eastern radio markets. Mr. Davidson is in charge of the electrical and radio departments of that big Denver jobbing house and visited Boston, New York, Philadelphia and Chicago.

"Future deliveries of parts and complete radio sets will be on a normal basis within sixty days," continued Mr. Davidson. "Many of the factories are working twenty-four hours and most of them have already enlarged their floor space to three and fourfold of former size.

"The Radio Corporation will be shipping its back orders within two months. Dealers thruout the East are preparing for an enormous fall trade. They are anticipating a most unusual Christmas business and believe that radio sets will constitute a very large proportion of the presents made by parents to boys and girls next yuletide."

Radio for River Boats

PASSENGERS traveling between Baltimore and Norfolk on the steamers of the Baltimore Steam Packet Company will soon be entertained by radiophone concerts. Preparations are being made to install wireless telephone outfits on the Old Bay Line boats.

To test the plan, a radio apparatus was placed on the Steamer *Florida*. As yet, however, it is impossible to hear any of the broadcasting stations distinctly. Programs broadcasted from Station KDKA, at East Pittsburgh, Pa., have been heard, but not distinctly. Joseph H. Delano, superintendent of the Old Bay Line, said that attempts were being made to remedy the defects so that the broadcasting stations could be heard clearly.

Radio Blesses the Lives of the Blind

Blind People in All Parts of the Country Are Benefited by the Wireless Telephone—Instruction and Entertainment Obtainable in No Other Way—Society's Greatest Gift to the Sightless

By Ward Seeley

THE lot of the blind in history has been ever sad. The most that they could expect was pity; neglect was usual up until very recent times; in the ancient world, cruelty toward them was not unusual, and it was not until the coming of Christianity that charity began to be shown to those bereft of sight, the first institutions for the blind having been erected in the Fourth Century A.D. by St. Basil at Caesarea in Cappadocia. Today, the coming of the latest marvel of science, the radiophone, promises to be the greatest blessing of the centuries since Christianity brought compassion into the heart of Rome.

By means of the radio telephone the world is brought to the blind as it never has been before. Radio receiving apparatus to a blind person is at once education and recreation; it is intellectual meat and drink; it brings to the blind the musician, the preacher, the lecturer, the news; it is to the sightless the newspaper, the book, the theater, the opera and concert, the church, and the lecture platform. Not one per cent. of the blind have ever enjoyed save spasmodically and occasionally the benefits of these things that sighted people take as a matter of course. A blind person must be unusually gifted, insensitive to either public pity or annoyance, and amply financed if he or she is to take advantage of the resources of modern society. Only the newest of those resources, radio, brings easily within the ken of the blind all that can be represented by the spoken word or musical sound.

There are now 52,617 blind persons in the United States, according to the U. S. Census of 1920. This figure shows a ratio of 49.8 per 100,000 of population. The census tabulation shows 30,199 male blind, 22,418 female; 45,783 white, 6,306 negro, and 488 Indian.

These figures are considered by authorities on the blind to be greatly in error. Large inaccuracies have crept into the census in regard to the blind, due to the reluctance of many families to report to the census takers, and to the carelessness of these latter, few of whom made the specific inquiry, "Are there any blind persons in the family?" A measure of the error is afforded by the New York State Commission for the Blind, which found, through painstaking survey, 10,982 blind persons in New York State, while the Census total for that state is only 4,205. If that proportion holds in the other states, and there appears no reason why it should not, the number of sightless persons in the United States must be in the neighborhood of 104,000, or about 100 per 100,000 population.

OF the blind much has been written. Their misfortunes and their sorrows, their struggles and their attainments, their fortitude and their heroism have all received commentary. At the story of those who sit in darkness, of the lot which they endure, and of the things which they have overcome, a sigh of compassion has arisen to many a lip, a tear of sympathy to many an eye, a glow of admiring pride to many a cheek. It is perhaps well that this should be. The deprivation of sight is verily a grievous one—one to which mayhap none other befalling the sons of men is to be likened. That commiseration for the state of the blind should so widely be evolved in the breasts of their fellow creatures is a tribute for the great heart of humanity.—from "The Blind," by Harry Best, Ph. D.

Society's attitude toward these people is one of compassion. Society's action toward these people is to provide education for them, more or less haphazardly, and to give them alms indiscriminately. The blind traditionally have been beggars through the centuries, and today many of them, if not most, still stand with outstretched hands for the coins that mean so little compared to the great wealth of the world now passing through their very bodies in radio waves.

Those who are born blind, it is true, now have great care taken of them in many of the states, being placed in institutions where they are taught minor trades, and instructed in such elementary school subjects as the schools may decide it is feasible to teach. One or more of the embossed type reading systems of course is essential.

It is after the children are old enough to leave their school and return to their homes that the great time of testing and trial of the blind comes. In many cases the want of sight creates a situation beyond the power of the blind to meet. The family, often ashamed of its afflicted member, is inclined to neglect to give more than the barely essential care. Such things as reading aloud of books or newspapers seem too great a burden to the sighted. Leading the blind abroad for walks or to attend the theater, concerts or lectures, is distasteful.

Only those blind who can afford to employ a nurse can be assured of a limited freedom of movement and a flow of intellectual stimulus. The majority are condemned to dependency, distress and want. In the instances where they have been taught a trade,

Charles Burrows, blind Civil War veteran, listens happily at his receiving set. He posed for this picture especially for THE WIRELESS AGE, in token of his gratitude to radio

usually their earnings are so small as to be barely sufficient for food and clothing. Probably the blind who tramp the streets, begging with little trays of chewing gum and shoestrings, are financially better off than most, but they are far in the minority. Most blind people are either in institutions, or in homes from which they seldom step.

The greater part of the blind population is old. Most blindness is an affliction of old age, and 65 per cent. of the sightless are too old to learn a trade or even a useful occupation. Thousands of old blind men and women sit rocking from morning to night with nothing to do, waiting for time to pass, patient sufferers from a fate earned solely by living to an advanced age.

The problem afforded by this large body of the blind of all ages attracted attention early. In nearly every case the efforts made were aimed at making the sightless more self-supporting and less dependent, more contented and less pitiable, more intelligent and less ignorant.

Obviously the first manner of instructing the blind is by personal instruction, including reading aloud. This, however, can be had only by those able to employ readers and instructors specially trained in working with the blind. The great necessity for the blind was a means of reading, of doing without personal service. Raised or embossed type for this purpose was first invented in Spain in 1517 and went through many modifications until the present several blind alphabets in raised type were evolved, known as American Braille, English Braille, New York Point, Line letters, and Moon system. When alphabets of this kind became practical and instruction was given in them to blind persons, their greatest handicap became apparent, namely, their expense. A book printed in type for the blind will cost from five to ten times as much as the same book in ink type, and it will be three or four times as bulky. Therefore, but few blind persons can own libraries, and must depend on the circulating libraries of the institutions and the large public libraries.

In addition, there are several magazines printed for the blind, the leading one being the "Matilda Ziegler Magazine for the Blind," printed monthly in New York City on an endowed press and distributed free of charge. The edition is 9,000 copies, or approximately one-tenth of the number of blind persons, but as many copies go to institutions and libraries, probably the "Ziegler Magazine" reaches the majority of the American blind.

These books and magazines are considered so important by the authorities that they are carried through the mails free of postage.

In speaking of the "Ziegler Magazine," the American Encyclopedia of Ophthalmology says: "During this century no single effort in behalf of the blind has brought so much happiness to those who spend their lives in darkness."

Probably that verdict will have to be revised as radio spreads its benefits among the blind. Walter G. Holmes, editor of the Ziegler Magazine, said in a recent issue: "I believe that the time is coming, and not in the far distant future, when by the use of radio the blind will sit in their homes in any part of the country and hear news of the day at a certain hour, music at a certain hour, and a book read at a certain hour. A number of these radiophones are in constant use in various parts of the country." After explaining briefly the installation of a set and the difficulties due to interference, static, and —to the average sightless person—the high price, these cheering words are added: "We suggest that our readers just be patient, and as developments occur we will keep them informed and let them know just as soon as the instruments are in practical use and within the reach of all. I believe that in time each community will feel that it should take an interest in helping the blind residents to secure one of these instruments."

The major difficulty of furnishing radio for the blind is the cost. The majority of the blind are impecunious, and the institutions in which some of them work or live likewise are struggling. Nevertheless, many sightless men and women today are living as they never lived before the radio telephone became a reality.

Charles Burrows, a Civil War veteran and a leader in the fast-disappearing G.A.R., has a receiving set, and recently, when William Wade Henshaw sang at WJZ wrote the following letter:

"As one of the vast audience which listened to the 'Impresario' last evening I gladly accept your invitation to let you know something of my impressions.

"I could hear everything distinctly and with so great a pleasure that I was frequently tempted to join the applause, forgetting for the moment that I was more than eight miles distant. It needed only the sight of the artists to complete one's enjoyment. That enjoyment I cannot have by reason of blindness, but thanks to the radio apparatus I have had the pleasure of hearing many things, and none more delightful than your rendering of the 'Impresario' for which I thank you and ask you to convey my thanks to each member of your company."

Another blind person, Miss Leila Holterhoff, of New York City, who has pursued her education to the point of taking a medical degree and who is prominent in welfare work, stated to THE WIRELESS AGE: "I believe that the radiophone will be the greatest single force in history in ameliorating the condition of the blind."

Not only are individuals profiting from radio through the ownership of sets, but institutions likewise are making use of broadcasting. So far, comparatively few have been able to secure receiving sets, as $250, the cost of an average set complete with a loud speaker, is a great deal of money to an organization that is continually begging in order to pay its running expenses.

Probably the first organization for the blind, at least in New York City, to make systematic use of radio was the N. Y. Guild for the Jewish Blind, which in September secured a modest

(*Continued on page* 40)

Pioneer work in wireless for the blind was done in this class in September, 1921, when blind boys were taught the code and received broadcast press messages

Olga Cook Says:

"Studio Attendants Are 'Models;' Their Expressions Give You a Key to the Radio Audience"

Tells How She Solved Problem of Gauging Her Efforts

Musical Comedy Star Explains Her Success to Interviewer

Olga Cook

HOW does a singer over the radio telephone know whether she is or is not making a favorable impression upon those who listen in? Is it possible to know?—Since her audience is "invisible," how then can she guide herself as she does when she is face to face with a public over the footlights?

These are questions I asked the smiling blonde star of the musical comedy success, "Blossom Time," and although Olga Cook has only had but one experience in broadcasting and has never passed through the somewhat similar experience of recording music records, she answered without hesitation.

She told how she had gone into the broadcasting studio of WJZ to sing the "Song of Love," which is the hit of her show, and even in the short time that it takes to repeat the lines, she had grasped the fundamental rule of successful radio telephone singing. The attendants became, to her, a sort of specimen public.

"A singer wants to see her audience," she told me. "It is almost a necessity. Success depends largely upon the artist's ability in catching the sympathy of those who hear her. When you are facing the audience in the theatre you know how you are 'going over.' If the audience is noisy, talkative or restless, you may be sure that their minds are on anything but your singing. But if, on the other hand, the big auditorium is quiet and the expressions on the faces before you are tuned to the words you are singing, then you know you have scored.

"This holds true equally well for singing over the radio telephone, despite the fact that it is a physical impossibility to see the great mass of your listeners.

Singer's Last Hope

"There remains one opportunity, however, for the singer and this opportunity she must grip with all the fervor and tenacity at her command.

"That last hope is the few who happen to be with you in the broadcasting studio. It is all-important to watch their expressions, because after all they are representative of the other hundreds of thousands who are hearing you. It is as if they were the 'models' of this vast audience much as a gigantic ocean vessel has in its model an exact replica.

"It is doubly important to catch the interest of these 'studio companions.' They hear so many sing, that you may be sure if you hold their attention, you are 'going over.'

"Another thing that impressed me in my broadcasting," she added, reflectively, "was the ghastly silence around me. It was rather uncanny and utterly unlike anything that I had ever been through before."

Radio No Competitor

Then, thoughtfully: "I believe the possibilities of radio are tremendous, but do not believe that it will ever seriously compete with the stage, where sight is an all-important factor."

Olga Cook is well known to theatre goers. Before joining the Blossom Time Company she was a star on the vaudeville stage playing in B. F. Keith houses. Her voice is unusually rich in tone and her stage presence remarkable. She is of the striking blonde type, about five and one-half feet tall, and she radiates the out-of-doors atmosphere. Her success on Broadway was assured following her rather unusual debut in "Blossom Time" and listeners-in on the radio telephone are eagerly looking forward to the time when they may have the privilege of hearing her once more.

She told me of a conversation she had some years ago with a lighthouse keeper up along the rocky coast of Maine. It was during a week she was playing in a small vaudeville theatre and some members of the show conceived the idea of brightening the day somewhat by taking a trip out to the lighthouse that reared so majestically far out in the ocean.

They chartered a stout motor boat in the morning, and in about a half hour reached the sentinel of the sea.

The lighthouse keeper proved to be one of those grizzled natives, with facial features as weatherbeaten as the very lighthouse. He welcomed the visitors, as only one can who is continually shut off from the world.

Lonely Lighthouse Life

"He showed us about," Miss Cook said, "and then offered a cup of tea. And we sat about the rough, wooden table, listening to the stories he had to tell of the lonely nights spent out there, of the shipwrecks, the rescues, and all of the other sordid glamour of the sea.

"'Folks up there on the mainland really do not appreciate what a luxury you entertainers are,' he told us. 'I was reading in the papers how they came to hear and see you last Monday. Nothing like that for us, ever. But I wonder.' And he assumed a quizzical expression, little knowing, though, how truly he was reading the future.

"'I wonder when the time will come when we out here will be able to hear you all sing at the same time those in the theatres are hearing you. I believe that time will come. Your voice will be made to travel through the air and into this lonely house. Man will invent such an instrument.'

"And I hope," she concluded, "that that old sentinel will be the first of all the lighthouse keepers to get a radio receiver. What a blessing it will be for him!"

Powerful Church Station

IT is not uncommon to hear of churches installing radio broadcasting stations, but the First Baptist church of Shreveport, La., is using a radio on a scale hitherto unapproached. The new church edifice, erected at a cost of $500,000 has installed in a ten-story tower a powerful radio broadcasting station. The auditorium of the church seats seven thousand persons and is located in the heart of the business district of the city.

It is stated that many small churches in the southwest have installed receiving outfits to take advantage of the offers of the Shreveport church. A good many of these churches are without pastors and are able to have sermons only at irregular intervals, but with the radio this inconvenience will be eliminated.

First Radio Evangelist

PAUL RADER, evangelist, conducted the first radio revival ever given, pleading with sinners to repent and calling for converts to Christianity. In the broadcasting station atop city hall, Chicago, coat off, fists waving, biceps knotting, the revivalist who launched his Chicago campaign in his new gospel tabernacle went at his myriad listeners as though they were at the foot of his pulpit. A brass quartet, two cornets and two trombones played hymns into the receiving apparatus and to complete the program Rader sang. He had previously opened his fifteen-minute revival with prayer.

"One hundred thousand sinners within sound of my voice today must be saved," he thundered into the broadcaster. "The world is drifting. Crime rules and the temporal officials are blamed when religion and religion only, nonsectarian, unquibbling, undogmatic religion will bring the peace you pray for. All who hear me and wish to accept Christianity come to the tabernacle and I will pray with each individually."

Mr. Rader, who keeps fit by maintaining his old skill as a boxer, having been a sparring partner for Jeffries and Fitzsimmons in other years, put in as strenuous a fifteen minutes as he has ever done in the pulpit, he said at the conclusion of his meeting.

Radio for Apartments

THE increasing popularity of the radio telephone is plainly evidenced by the volume of requests being received by several of the large real estate companies from tenants who desire to erect aerials, with the result that it is planned to wire a number of the larger apartment houses along Park and Fifth Avenues, New York City, and equip them with radio telephone service.

Principal Broadcasting Stations

KYW—360 Meters. Daily, 8 P.M. Central time, 9 P.M. eastern time. Westinghouse Station located at Chicago, Ill.
KDKA—360 meters. Daily, 8 to 10 P.M. Westinghouse Station located at East Pittsburgh.
WBZ—360 meters. Sundays, Mondays, Wednesdays and Fridays, 8 P. M. Westinghouse Station located at Springfield, Mass.
WGI—360 meters. Evenings. American Radio and Research Corporation station located at Medford Hillside, Mass.
WGY—360 meters. Tuesdays, Thursdays and Fridays, 7 P. M. General Electric Co. Station located at Schenectady, N. Y.
WJZ—360 meters. Daily, 11 A.M. to 10 P.M. Radio Corporation-Westinghouse Station located at Newark, N. J.
WVP—1450 meters. Evenings, 9 to 9:55 o'clock, except Sundays and Holidays. Signal Corps, Bedloe's Island New York Harbor.
WWJ—360 meters. Daily. The Detroit News, Detroit, Mich.
KYJ—Leo J. Meyberg Co., Los Angeles, Cal.
KDN—Leo J. Meyberg Co., San Francisco, Cal.
WGR—Federal Telephone & Telegraph Co., Buffalo, N. Y.
WOK—Arkansas Light & Power Co., Pine Bluff, Ark.
WLB—Crosley Mfg. Co., Cincinnati, Ohio.
WOC—Palmer School of Chiropractic, Davenport, Ia.
WLB—University of Minnesota, Minneapolis, Minn.

Stations Broadcasting Music and Speech on 360 Meters

Additional List to Those Previously Published

WGF	The Register & Tribune.....Des Moines, Iowa
WGM	Georgia Railway & Power Co. (Atlanta Construction) Atlanta, Ga.
WGU	The Fair .....Chicago, Ill.
WGV	Interstate Electric Co.....New Orleans, La.
WHD	West Virginia University..Morgantown, W. Va.
WHN	Ridgewood Times Printing & Pub. Co. Ridgewood, N. Y.
WHX	Iowa Radio Corporation.....Des Moines, Iowa
WIK	K. & L. Electric Co.....McKeesport, Pa.
WIL	Continental Electrical Supply Co....Wash., D. C.
WIP	Gimbel Brothers .....Philadelphia, Pa.
WIZ	Cino Radio Mfg. Co.....Cincinnati, Ohio
WJD	Richard H. Howe.....Granville, Ohio
WJT	Electric Equipment Co.....Erie, Pa.
WKC	Joseph M. Zamoiski Co.....Baltimore, Md.
WKN	Riechman-Crosby Co.....Memphis, Tenn.
WKY	Oklahoma Radio Shop.....Oklahoma City, Okla.
WMA	Arrow Radio Laboratories....Anderson, Ind.
WMB	Auburn Electrical Co. .....Auburn, Me.
WMC	Columbia Radio Co.....Youngstown, Ohio
WMU	Doubleday-Hill Electric Co.....Pittsburgh, Pa.
WNJ	Shotton Radio Mfg. Co.....Albany, N. Y.
WNO	Wireless Telephone Co. of Hudson County, N. J., Jersey City, N. J.
WOE	Buckeye Radio Service Co.....Akron, Ohio
WOI	Iowa State College.....Ames, Iowa
WOO	John Wanamaker .....Philadelphia, Pa.
WPA	Fort Worth Record.....Fort Worth, Texas
WPE	Central Radio Co. .....Kansas City, Mo.
WPG	Nushaw Poultry Farm.....New Lebanon, Ohio
WPI	Electric Supply Co.....Clearfield, Pa.
WPJ	St. Joseph's College .....Philadelphia, Pa.
WPL	Fergus Electric Co. .....Zanesville, Ohio
WPM	Thomas J. Williams.....Washington, D. C.
WPO	United Equipment Co.....Memphis, Tenn.
WRM	University of Illinois.....Urbana, Ill.
WRP	Federal Institute of Radio Telegraphy, Camden, N. J.
WRR	City of Dallas (Police and Fire Signal Department) Dallas, Tex.
WRW	Tarrytown Radio Research Laboratory, Tarrytown, N. Y.
WSB	Atlanta Journal .....Atlanta, Ga.
WSL	J. & M. Electric Co. .....Utica, N. Y.
WSN	Ship Owners Radio Service .....Norfolk, Va.
WSV	L. M. Hunter and G. L. Carrington, Little Rock, Ark.
WSX	Erie Radio Co. .....Erie, Pa.
WSY	Alabama Power Co. .....Birmingham, Ala.
WTG	Kansas State Agricultural College, Manhattan, Kans.
WTK	Paris Radio Electric Co. .....Paris, Tex.
WTP	George M. McBride.....Bay City, Mich.
WWB	Daily News Printing Co. .....Canton, Ohio
WWI	Ford Motor Co. .....Dearborn, Mich.
WWL	Loyola University .....New Orleans, La.
WWT	McCarthy Bros. & Ford.....Buffalo, N. Y.
WWZ	John Wanamaker.....New York, N. Y.
KDYL	Telegram Publishing Co..Salt Lake City, Utah
KDYM	Savoy Theatre.....San Diego, Calif.
KDYN	Great Western Radio Corp..Redwood City, Calif.
KDYO	Carlson & Simpson.....San Diego, Calif.
KDYQ	Oregon Institute of Technology..Portland, Oreg.
KDYR	Pasadena Star-News Publishing Co., Pasadena, Calif.
KLX	Tribune Publishing Co.....Oakland, Calif.
KNX	Electric Lighting Supply Co. Los Angeles, Calif.
KQI	University of California.....Berkeley, Calif.
KYI	Alfred Harrell .....Bakersfield, Calif.
KZV	Wenatchee Battery & Motor Co., Wenatchee, Wash.
WAAD	Ohio Mechanics Institute.....Cincinnati, Ohio
WCAB	Newburgh News Printing & Publishing Co., Newburgh, N. Y.
WCAC	John Fink Jewelry Co.....Fort Smith, Ark.
WCAD	St. Lawrence University.....Canton, Ohio
WCAE	Kaufman & Baer Co.....Pittsburgh, Pa.
WCAG	Daily States Publishing Co....New Orleans, La.
WCAJ	Nebraska Wesleyan University, University Place, Nebr.
WCAK	Alfred P. Daniel.....Houston, Tex.
WCAL	St. Olaf College.....Northfield, Minn.
WCAM	Villanova College .....Villanova, Pa.
WCAN	Southeastern Radio Telephone Co., Jacksonville, Fla.
WCAO	Sanders & Stayman Co.....Baltimore, Md.
WCAP	Central Radio Service.....Decatur, Ill.
WCAQ	Tri-State Radio Mfg. & Supply Co., Defiance, Ohio
WCAR	Alamo Radio Electric Co.....San Antonio, Tex.
WCAS	William Hood Dunwoody Industrial Institute Minneapolis, Minn.
WCAT	South Dakota State School of Mines, Rapid City, S. Dak.
WCAU	Philadelphia Radiophone Co...Philadelphia, Pa.
WCX	Detroit Free Press.....Detroit, Mich.
WHB	Sweeney School Co.....Kansas City, Mo.

Genuine Radio Sleuth

WILLIAM J. BURNS, Chief of the Department of Justice, Bureau of Investigation, told a story recently in which radio took the part of Sherlock Holmes. A dapper young man appeared one day before the sales manager of a large radio manufacturing plant, and explained that he wanted to purchase a very fine receiving set for a local high school. He was greeted cordially and the best of the house's sets were demonstrated. Ordering an expensive set, he managed somehow to secure delivery without payment, and then disappeared. The set also vanished from the place it had been shipped to originally much to the chagrin of the manufacturers who decided to advertise their loss through radio itself, being able to give a very accurate description of the young man, who had a noticeable scar on his cheek.

Chapter two opens in an apartment where a genial and fine appearing young man, with a scar on his cheek, is entertaining his friends with a new receiving set. Suddenly the instrument begins to tell of the manufacturer's loss and give a detailed description of the thief—unmistakably the host! The consternation of the guests may be imagined. The next morning a very worried mother paid for the instrument which her son had wanted so badly, he had evolved the above scheme for getting it, whereupon the manufacturer dropped the matter.

"Not Only for Children"

"RADIO telephony is not for men, moys and girls only," said Edward D. O'Dea, of a Buffalo firm, speaking before the Buffalo Women's City Club in the Iroquois hotel. "Radio is as much a thing for the women as it is for anyone."

Mr. O'Dea explained the workings of a radio set and with a working model demonstrated how messages were received.

The wireless telephone, Mr. O'Dea pointed out, is one of the greatest influences on home life today. It is a means of keeping the young people at home evenings instead of seeking pleasure in other places.

"In a New Era!"

FOR the second time a judge has ruled that radio transmitting is not a "nuisance."

Chancellor J. E. Martineau, of Pulaski Chancery Court, Arkansas, ruled in this way when he refused to issue an order restraining enthusiasts from transmitting between 9 p.m. and 7 a.m. The complainants objected to "buzzing noises." The chancellor said that "we are in a new era. We must become accustomed to the buzz."

Radio in the Great Outdoors

Vacation Time Throngs the Woods and Waters with Wireless Enthusiasts Who Carry Their Hobby with Them

By Sam Loomis

THIS year as never before the great American vacation grounds are linked to the centers of population from which their visitors come. The radiophone is bringing to seashore, lake and mountain, to yacht, motorboat and automobile, the news, music, speeches and lectures of the national network of broadcasting stations.

No longer does a vacation in the country mean putting up with cracked phonograph records, pianos that date back to the flood, and newspapers one or two days old. No longer does a camping or canoe trip in the forests mean a complete separation from the rest of the world.

Amateurs skilled in code communication for years have been taking their receiving sets along on vacations, and a few even have carted their transmitting apparatus about. This year, however, more radio apparatus has gone on tour than ever before in the history of the world, for the vast general public, listeners-in since the Winter, doesn't want to lose its contact with the broadcasting stations.

Hence almost any outdoor center this Summer is likely, in fact, more than likely, to have one or more radio receiving sets. Camps for boys and girls, study camps, fishing clubs, engineering school camps, bungalow colonies, yacht clubs, lake colonies, mountain top resorts, wayside automobile camps, mining and lumber camps, and just plain camps—today all use radio to tap the currents of the world.

The amateurs years ago were the first to demonstrate the possibilities of Summer-resort radio, long before the radio telephone was more than a hope in the minds of those who were experimenting with arc transmission.

Every locality has its own radio characteristics, just as it has its climatic and topographical individuality. You have to visit a place in order to enjoy the climate and admire the views, and likewise you have to listen in when you get there to discover just what traffic can be heard in the air.

This is the great fascination of vacationing with a radio set. The amateur who has worked his neighborhood and maybe the nearby districts as well during the Winter, wonders what conditions he will find in the new location. Putting up a make-shift aerial, making

Woof Woof listens in and says "It's a bear!"

as good a ground as he can, he hastens to hook on his set and listen.

DIT DIT DAH DAH DAH DIT DAH DIT DIT DIT

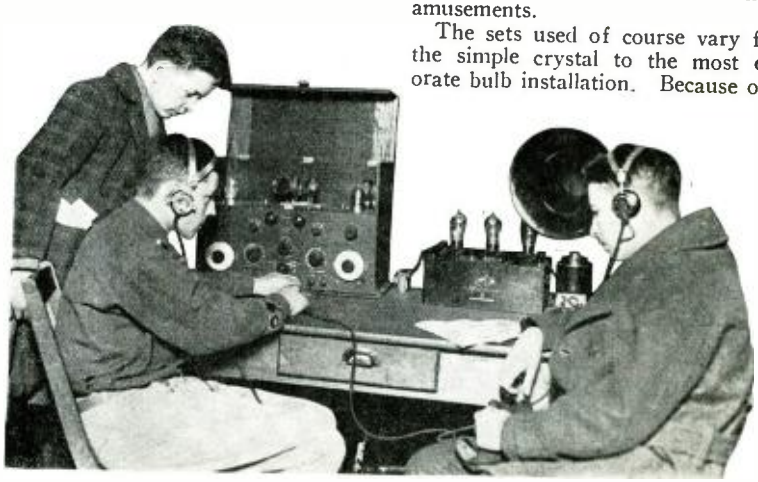
And down goes a note: "2AS." That is a new station. Who is 2AS? The message is copied, and then a reply from 2XY. The air is full of new stations that the listener had never heard before.

Trying a longer wave length, he breaks in on a strange commercial station. Another change, and a ship is heard. Still another turn of the knobs, and a new district comes swinging in. Fading has a new periodicity; at home, signals from certain points of the compass always faded in a certain manner, and a different degree at other points. At the Summer camp, all these conditions are changed, and points that previously were inaudible may come in with great strength, while some that were the most easily heard at home may be beyond audition at the new location.

The amateur, fascinated, sits for hours with the headphones clamped to his ears, copying station after station. The great outdoors calls at the door of his shack or tent—but the only calls the amateur listens to are the numerals and letters that flash through the ether. He is too busy exploring the local radio country to ramble through the woods and fields about him, or to pay attention to the lake or river or bay or sea beside which he sits.

When the "radio country" has been charted, so to speak, then he will perhaps allow the rest of the party, impatiently waiting a chance at the set, to listen in while he goes out into the open—to gaze at hill and dale and wonder why it is that signals seem to come in with great strength over or through the mountains to the north west, while hardly any seem to be able to pass through the broad flat valley to the east. "Radio exploring" is the most fascinating of the amateur's Summer amusements.

The sets used of course vary from the simple crystal to the most elaborate bulb installation. Because of its



Radio receiving sets now are part of the equipment of many Boy Scout camps, affording entertainment and instruction at the same time

extreme portability and lack of batteries, probably the crystal set is the most popular for vacation trips, and hence it may be estimated that about 70 per cent. of the receiving sets in vacation use have crystal detectors. These of course are entirely satisfactory for limited distances, and are being used in all the resorts near the big cities. The Adirondacks, for instance, this Summer are literally full of them, profiting by the powerful broadcasting station of the General Electric Company at Schenectady, N. Y., and the shores of the Great Lakes likewise are dotted with enthusiasts who listen to the code traffic of the steamers and to the broadcasting stations at Buffalo, Cleveland, Chicago, Detroit, Dayton and Toledo.

The main difficulty in the use of the bulb set for temporary installations is the weight of the storage battery. In the case of the motorist, however, this is easily overcome, for the car can carry the wireless equipment, and it even is possible to use the starting and lighting battery of the automobile for lighting the bulb filaments. Many motorists are doing this very thing.

In fact, so general has become the custom among owners of bulb receiving sets that one automobile manufacturer, the Chevrolet Motor Co., this Spring began to offer a sedan model fully equipped with a Westinghouse RC set, including a loop aerial, with connection to the car's regular battery for the necessary current. This has proved a successful installation, though of course the engine of the car must not be running when it is desired to receive, on account of interference from the ignition system.

By far the greater portion of the radio receiving sets used by motorists, however, instead of being installed more or less permanently on their cars, are merely transported in them, being put in operation at the end of each day when camp is made for the night, and a semi-permanent installation made when the destination is reached.

There are two items that sometimes give trouble in vacation installations—the aerial and the ground. Trees of course are easy to fasten aerials to, especially if there is a rising young man in the party. The ground connection is a bit more difficult unless some partly-buried pipes are handy. Dropping a bare wire in a lake or bed of a stream often is the easiest plan to follow.

KITE EXPERIMENTS

From these simple practices the stunts tried by wireless fans run all the way to the use of kites and even balloons. One internationally-known amateur some years ago experimented with kite aerials, flying the kites from the deck of his motorboat. By sending the kite up to an altitude of about 1,000 feet he discovered that he could overcome many of the limitations of his locality, copying stations not previously heard, whether because of peculiar local conditions, or because of distance.

The drag of the kite, however, made the length of the aerial wire so great that some difficulty was experienced in tuning the shorter wave lengths, and in order to secure a more vertical wire it was decided to try a balloon. A small one accordingly was secured, inflated, and sent aloft, with remarkable results until suddenly it was noticed that the signals were becoming weaker and weaker. On going on deck, the aerial was found trailing in the water, and the tatters of the balloon floating on the surface. The heat had expanded the gas in the balloon and burst it. That was the last experiment with a balloon—the operation was successful, but the balloon died!

Even when far from camp, the wireless fan on horseback can stop for a moment and listen for news of the great cities miles away

The ground used on this motor boat consisted of a series of copper plates fastened along the keel of the boat. As the boat was used in salt water in and around Long Island, the ground was a perfect one.

In other installations on motor boats, trailing wires have been used, but these sometimes have a way of getting tangled up in the propeller, for when the boat anchors for the night it is sure to be swung about by wind and tide. In cases where the boat is tied up to a steel buoy, anchored to the bottom by a cable leading to a cement block imbedded in the mud, the ground wire frequently is attached to the buoy.

Other grounds on a motor boat consist of the frame of the engine, the metal piping of the cooling system or of the toilet, while a counterpoise can be arranged by running a wire completely around the boat, inside or outside. All these have been used by various experimenters, though the use of copper plates on the bottom of the boat probably has proved the most successful.

On dry land, grounding problems depend on the degree of dryness—the dryer the land, the poorer the ground. Where plenty of wire is available, a counterpoise often is the best thing to use. However, except in the case of parties exploring the Great American Desert, where the land is loose sand and no trees are to be seen, most Summer visitors select places provided with plenty of water. The visitors to the desert, of course, now take radio sending sets along for the sake of safety, so that they can communicate with the nearest station and secure help should some mishap befall the expedition, just as Amundsen and other explorers now carry radio equipment.

WATER MEANS GOOD GROUND

For the average person, however, a Summer trip means a visit to the seashore, to a lake or river. What is a camp without a swim? Even for those who neither hang their clothes on a hickory limb nor go near the water, adjacent bodies of water are considered indispensable to Summer resorts—they cool the air and attract the young folks.

Where there is water there is good ground for the radio set. Often a hole dug down a few feet will reveal a suitably moist layer of earth, in which can be buried an ancient metal bucket, some old pipe, a mess of wire, or some similar scrap metal to form a ground. If the camp has an artesian well, as many have, connection can be made to the pump, as the casing of iron pipe leading from the pump down to bedrock, all moist inside and outside, forms a perfect ground.

Other grounds are lightning conduc-

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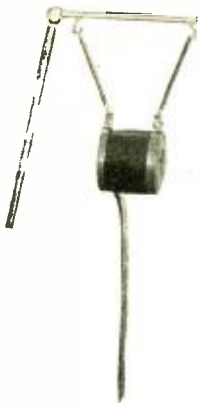
"A BROADCAST review of a theatrical production will prepare those in rural communities when they come to the City to see the current shows"

Maurice Henle Interviews Bertha Brainard the Girl Who Originated the Idea of

Broadcasting Broadway



Miss Brainard is a Greenwich Village Girl

A DRAMATIC department or the "radiophone review," as it might be called, was inevitable. It was as sure as radio itself, and when it came there was not even a suggestion of a raised eyebrow, a look of astonishment.

The dramatic department of the ordinary newspaper is a most important part of the daily print. People come to regard it as the expression of a competent critic, who tells them whether a play is good, bad or indifferent. Many thousands of readers are guided by the message of the dramatic critic, so that the service which the theatrical column in the newspaper renders is invaluable to the theatre.

When radio came along, among the first words to be heard were expressions of amused wonder as to when someone would start a dramatic review department over the ether wave. Things went along for several months without anything happening along these lines, but finally there began to appear in the weekly programs of WJZ one short line reading "Broadcasting Broadway, by Bertha Brainard." When the reader of the programs finally penetrated the meaning of the avalanche of alliterative B's, he realized that the thing had at last been accomplished, and that those who listened in were going to be benefited by an additional service.

Bertha Brainard lives in Greenwich Village, New York City, which may or may not be the reason why she is an energetic young woman with ideas. She was the one who suggested to officials at WJZ the possibilities and value of broadcasting dramatic reviews. They accepted the suggestion readily.

Reviews Musical Play

On one occasion she broadcast a review of the musical play "Blossom Time." It was immediately after this that I sought Miss Brainard with a view of asking her to speak through the columns of The Wireless Age to her radio audience. I thought as I talked to her that the reader would get but a faint idea of how Miss Brainard looks, because unfortunately her brilliant red hair registers only as black in the photograph reproduced on this page.

She listened quietly while I was asking her what in her opinion was the most important result accomplished by her talks.

"The greatest value of this work," she said, "lies in the service that it gives those who live out of the city. I might add that I have substantial proof to back this up.

Helps Rural Communities

"There are many thousands of persons scattered about New York within a radius of one hundred miles. Many of them do not receive New York newspapers. Many of them consider coming into the city an event, and if a trip is made more often than once every two or three months it is most unusual. We believe that they, when they do come to the city, act much after the fashion of our visitors from more distant points.

"When the man from Ohio, Indiana or Illinois comes to New York with his family, the first thing the family thinks about is to see the Woolworth Building, Grant's Tomb, and Central Park. The second thing the family thinks about is to see the shows on Broadway. If the family goes back without being able to tell the home folks that they 'took in' some Broadway show, the fascination of the trip loses considerable color in the eyes of the home folks. And so the New York theatres are always filled with visitors from out of town.

"This holds true equally as well for those who live within a hundred miles of New York and only come to the city three times a year as for those who live a thousand miles away and make a trip once in two years. These people do not know, cannot know, which plays are the better ones and they are very grateful for the opportunity to find out if a play is worth while before spending their money to buy tickets for it. Sending out a broadcast review goes far to eliminate the possibility of these out of town people going to New York unprepared as far as knowledge of the current plays is concerned.

Explains The Story

"I commence by telling the radio audience immediately the type of show I am going to review—that is, whether it is musical, dramatic, straight comedy, comedy drama, or what. If the play is founded on a dramatic episode, as in the case of the play you just heard me review, 'Blossom Time,' which is written around an incident in the life of Franz Shubert, I tell that, and mention the names of the people who wrote the music, the lyrics and the book. I explain on what the action of the played is based.

"Then I describe the scenery and the costumes and go on to tell the story of the play in chronological order, act

(*Continued on page* 40)

Broadcasting In London

GREAT BRITAIN has been suddenly awakened to the possibilities of the radiophone. While America was developing radiophone broadcasting, Great Britain sat by and watched and its newspapers made comments on "America's radiophone."

Now Great Britain is in the radiophone game to the hilt.

Postmaster-General Kellaway has announced that a broadcasting service is to be instituted by the Post Office Department. There will be a limited number of broadcasting stations, probably in London, Cardiff, Plymouth, Birmingham, Manchester, Newcastle, Glasgow and Aberdeen.

Licenses will be necessary for those who wish to install receiving sets and a fee of $2 will be charged for each license.

"We do not want wireless free to all, as is the case in America, with regrettable consequences," said Godfrey Isaacs, head of the Marconi Wireless Company. Sooner or later in America they will have to institute some measure of control, such as that with which we are beginning.

"We are only on the threshold of it all. Nobody has any possible conception of what it all may develop."

The Postmaster-General proposes that all broadcasting shall be done by the Post Office Department and that those who wish to broadcast concerts and speeches must arrange for their programmes with the postal officials.

The new wireless possibility is looked upon with enthusiasm by members of the House of Commons, and with a forthcoming general election in view it has been seriously suggested by some members that a broadcasting station should be installed in the chambers of Parliament in order that all of the proceedings might be open to any who cared to listen.

The sale of radiophone receiving sets in London has been great since the announcement of the Postmaster-General.

"The Wireless Voice"

"IN commenting the other day on the prospect of wireless telephony for all we said that it opened an amazing vista, reads an editorial in the *London Times*.

"We instanced many of the surprising opportunities which it will bring to the domesticated and stay-at-home, but for the moment we did not refer to the astonishing opening which it offers to those in search of a profession. We mean the operators of the new wireless, the new heralds, whose voices will simultaneously address millions and overcome for a wide radius in every direction all the material obstacles which have hitherto defied the most stentorian town crier. Before long we shall know what are the various points of the ideal 'wireless voice'; its merits will be discussed as we now discuss those of a bass or a tenor; and appointments to the post of wireless herald will clearly depend on the tone and accent of the applicant."

New Canadian Station

LA PRESSE, of Montreal, Canada, has signed a contract with the Canadian Marconi Company for the immediate installation of a radio broadcasting station. At stated hours each day, starting early in June, it will broadcast in French and English condensed bulletins of the most interesting news of the day, as well as attractive excerpts from the feature pages of the paper.

"Esperanto Logical Outcome"

BELIEF that a universal language, possibly Esperanto, will be the logical outcome of radio telephony was expressed recently by Prof. A. Christian of the department of languages of the University of Glasgow. Professor Christian came to the United States to deliver a series of lectures at Columbia University, before the National Geographic Society in Washington, at the Universities of Pittsburg and Pennsylvania, and before the Washington high schools.

"The radio telephone," said Professor Christian, "played an important part at the conference at Genoa. It enabled diplomats to ascertain the views of their home governments when time limitations precluded the use of other media of communication.

"Radio is doing more in Europe to dissipate mistrust and ill feeling and to break down the traditional barriers of secret diplomacy than any other single agency. It is hoped by advocates of one universal language that radio will eliminate the dialect distrust among all nations."

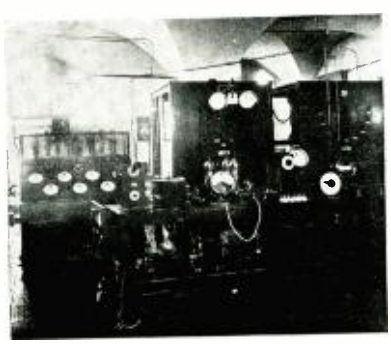


Photo shows first broadcasting station to open in Germany. It is located in Berlin

Latin America a Radio Field

"RADIO broadcasting has assumed such tremendous proportions throughout the United States that it is entirely reasonable to expect that this newest of popular arts will soon find its way to neighboring countries and particularly Latin America," says Col. C. H. Nance, of the Radio Corporation of America.

"The field for radio broadcasting in Central South America is of exceptional importance, for its introduction will bring great educational and entertainment advantages more cheaply and far more effectively than any other medium.

"In the southern continent communications are not so well developed as those of North America, owing to geographical and other natural barriers which make impracticable the installation of telephone and telegraph lines and the dissemination of news by means of the newspaper and other carriers.

"Radio obviates all such conditions because no land lines are necessary, and its influence has a broad and far-reaching scope which comes at once within the reach of every home located within receiving range of the broadcasting station. There are certain agents in the foreign field who have foreseen the possibilities of radio broadcasting and who are today planning large and effective radio broadcasting services which will reach even to the most isolated hacienda."

Taxes Puzzle the French

THE radiotelephone has begun to attract popular attention in France, as concerts and weather reports are broadcasted from the Eiffel Tower (FL) in Paris. The situation in France is somewhat complicated, however, as FL's schedule is irregular, and the Postal, Telephone and Telegraph Bureau is endeavoring to tax all receiving sets as well as transmitters. At first the tax was 5 francs for each receiving set, now it is 10 francs, and it is proposed to raise it to 20, which latter sum would be more than the cost of a simple crystal set. A tax of 250 francs is to be imposed on transmitting sets. However, the entire situation is clouded by doubts as to the legality of the tax, and hence French amateurs are inclined to await the decision of the courts.

Tax On Canadian Sets

CANADIAN radio fans do not enjoy the privileges in radio of their American neighbors. In Canada it is necessary to secure a Government license to operate a radiophone receiver and the tax is $1 per installation. Applicants are required to secure a license within 10 days after a receiving set is installed.

RADIO makes it possible for homes to have an "audible background" just as they now have a visual background. Inasmuch as music has a great subconscious influence, the importance of radio can not be over-estimated. It will mold the character of our children, influence adults, and bring new happiness to our lives.

Major General George O. Squier

What the Manufacturers of America's Musical Instruments Heard When Addressed

By Maj. Gen. George O. Squier

I AM a radio fan and a radio bug. I am very much interested in it. This art that is now so prominently before the people is just about of age, twenty-one years old, and it is probable that it has progressed more than any other movement since the world began. We have all seen certain movements and fads come along, such as the cheap motor car, the Kodak, roller skates, etc.; but the question now is, "Has radio come to stay?" My belief is that it has, that this is not a temporary fad, but is here as a great agency which is destined to change very profoundly our modes of life.

It is a very wonderful thing to be able to broadcast a beautiful song by a prima donna, making it audible not only over this earth of ours, but as far as we know to the most distant planets.

Music is, of course, of special interest to the musical world. I am not a musician, I do not play any particular instrument, but I enjoy music of all kinds. It influences me very much. I do not have a cultivated taste, but I enjoy everything from jazz through to grand opera. I think that radio someway or another will develop music, both in its production and in its methods perhaps more than any other single movement.

This is just a guess of mine. I could not tell you how it is going to be done, but there is a demand for more music of various kinds, and radio is a great agency that will help fill that need.

Music is an understandable, international sort of language; in fact it is a super-language that begins where speech quits. Two people can enjoy classical music even though they can't say an understandable word to each other and I have had this happen to me frequently in Europe. Music has an international appeal that no language has. It has an influence that we are just beginning to realize; it appeals to the ear instead of the eye. While great attention has been paid to the uses of the eye, I think we have hardly begun to develop the possibilities of the ear.

Broadcast music to the nursery. Bring children up so they will know the best music, because they have played to it

The ear is universal. It hears everything within audible range, while the eye can see only that at which it is directed. A person has to look in order to see, but he has to listen, willy-nilly, to what is in the air around him, and he understands it subconsciously, without mental effort. You are taught the ear at your mother's knee. In some sort of language we can reach the aliens coming into this country from the first day by the ear.

Furthermore, the psychological influences of certain organized harmonies is very great. We realize the importance of visual harmonies in decorating our homes with beautiful lights and colors. We employ interior decorators who furnish our rooms with all sorts of beautiful things to please our eye, and I am wondering why we cannot furnish them to please the ear also.

If we can do it in a cheap way on a regular basis, and supercede the other noises that we find in the ordinary cities and towns, which are not altogether agreeable, we must add to the pleasures of life. We could furnish our houses with noises—music—dimmed as we please, nurseries having one kind of "audible background," bedrooms another and salons another. We could furnish this atmosphere methodically, instead of topsy-turvy. Manifestly in developing this new idea, engineering would reach a new stage where we could furnish culture to people as an engineer would, on a watt basis.

These are possibilities. I admit they are a bit speculative but some of us must be visionary as well as practical. It behooves us to look ahead if we can. I think that radio offers a tremendous cultural opportunity of putting the spoken word any distance, or the beautiful combinations of sound which we recognize as music. This is the best

opportunity music has had for centuries—giving it to the masses of the country in their very rooms and doing it on a practical basis. It opens new methods of advertising, new methods of culture, new conditions of labor.

Is there any reason why we should not have restful, beautiful music played in the sweatshops where men and women work making garments? If we can do it by plugging into the light socket a very simple apparatus that delivers that music as cheaply as an electric fan delivers air, it would be entirely feasible.

If we take all noise and light away we will very soon lose our sense of proportion. Let's select the kind of noises that we want and organize them and deliver them into our homes. I should say there might be a professional interior decorator for sounds, just as we have for visible things.

Music has a great power over people; it has a great uplifting power that none of us can explain. You don't have to be at all educated to understand it. You may not know any music technique at all and yet be absolutely thrilled by music. We scarcely realize as yet what the great power of music is or may yet be.

Let us take hold of this new agency which projects music to the stars and go into it and cooperate and investigate and experiment in every possible way. Let us develop to the utmost this new radio broadcasting which has burst upon us so suddenly.

At the same time let us develop music. Broadcast it to the nursery. Bring children up so they will know the best music, because they have played to it. If we can reduce it to an engineering basis and sell it cheaply, which I believe we can, we can broadcast culture; you can have the child, and the adult, the rich and the poor, hear any kind of good music.

Radio in the Great Outdoors

(*Continued from page* 34)

tors, water pipes such as frequently are found in camps to lead water from springs, and even a wire fence, if one should happen to run near the aerial. In fact, wire fences have been used for both aerial and ground, or rather, aerial and counterpoise.

The opportunities offered by a new location out of doors are endless, and that is why the Summer, despite its static problems, is so fascinating to the amateur. At home he may be more or less limited. Having found what seems to be the best installation for his home location, the operator touches it very little. The aerial and ground stay put. The operator spends most of his time listening in. But when he is experimenting with a temporary installation he can yield to the temptation to try "stunts" that he would never think of anywhere else, and whose results will give him some wild tales that his neighbors will never believe.

There was the man, for instance, who reached up and drove a nail in a tree, and another in the ground, and received on a six-foot aerial. And the man who put his set on the ground and discovered that he could receive as long as he kept one finger on the antenna binding post. Also the boy who used his bicycle for an antenna when it was standing insulated on its rubber tires, and for a ground when it was lying on the ground. Again, there was the man who was troubled with thunder storms until he discovered that if he took one end of the aerial down and wrapped it around a tree as soon as a thunder storm approached, the aerial became vertically directional, most of the static disappeared, and he could continue to copy code. True, that ingenious fellow got a severe shock one day when a flash of lightning happened to pass directly overhead, right in the direction in which the aerial was pointing, but he considered that part of the game. Most people, of course, ground the antenna and stay away from the set during thunder storms. When the wire is thus grounded it forms an excellent lightning protector, and if attached to a house or extending over a row of tents or bungalows, it may save them from being struck.

Incidentally, new interest is lent to static this Summer by the emphasis that is being placed on radio frequency amplification. It has been found that static currents are at audio frequency, and therefore, if two steps of radio frequency amplification are placed ahead of the detector, most of the static is strained out, so to speak. After the detector come two steps of audio frequency amplification, and the volume of sound that is produced is not only large, but comparatively free from the crackles of static.

Radio Frequency

A great portion of the experimentation being done this Summer is on circuits of this type. They require five or six bulbs, and draw quite a little current from the battery, necessitating frequent charging. Many camps and Summer hotels, however, if they do not have electric current from a high tension line, have individual electric light plants, run by gasoline engines, of the type made by Delco-Light, Willys-Light, and the other manufacturers of such apparatus. Places where there is either a high voltage line or a private plant are of course especially suited for wireless experimentation, as they offer an easy source of current.

In some cases the presence of a high tension line will be found to cause interference with radio reception. Usually this occurs when the antenna is placed parallel with the power line, and can be remedied by turning the aerial wire at right angles to the line.

Directional Experiments

Directional work always forms an interesting part of outdoor activities, for changing the direction of the antenna usually is more or less easily accomplished. It is easy to discover which points of the compass are the best for receiving certain stations. Where the set is mounted on a boat, direction work is perhaps easiest, unless a revolving loop is used.

Canoe installations will be popular this Summer, particularly in the public parks, such as Belle Isle, at Detroit, where for years the evenings have been rich in the melodies from talking machines. This year the radio set has taken its place beside the talking machine for canoe use. At Detroit especially is this true, for there the talking machine has been for years almost as essential in a canoe as a paddle. Now the presence of a broadcasting station right in the city makes it easy to receive in Belle Isle Park, in the river nearby, with crystal detectors, while those who have more elaborate sets, including a loud speaker, rival the phonograph.

Wireless Chess

A CHESS game by radio, from mid-Atlantic to Chicago, was played recently between Edward Lasker, American amateur chess champion and E. T. Grumbach of Chicago and New York.

The two had planned a game when Grumbach was suddenly called to Europe. He sailed on the *President Taft* of the United States Lines, after making arrangements to fight out the game through the ether.

Grumbach's moves were wirelessed to the steamship company's offices in New York and then wired Lasker in Chicago. His return moves were transmitted the same way.

Radio In Texas Movie

CONCERTS, lectures, addresses from all parts of the country in moving picture houses by radio is the latest—and the Iris theater of Houston, Texas, not only has the distinction of introducing the latest in Houston but in the entire South.

Patrons of the Iris theater recently were given a surprise when Manager Will Horwitz, Jr., reproduced for them a radio concert.

"PERHAPS, in the early development of the human mind, mental telepathy was universally a fact. We may regain the lost gift. Would it be progress for us? That I do not know"

An Interview With

Olga Petrova

By H. N. Lee

Olga Petrova

WILL the time ever come when the human mind will be tuned to such a fine point that it will catch signals which now cannot be heard without translation through the medium of a mechanical instrument such as the radio telephone?

Let us suppose—

You are talking to someone who stands one hundred feet away and that person continues to move backward until he reaches the point where the sound of your voice is no longer audible. Behind him, however, at some distance a dog could stand and could pick up the sounds which the human mind misses. And back of this point is a zone where the dog no longer will be able to hear the sounds, but in which the horse could hear.

This has been proved.

Will the time ever come when the average human mind will be so delicately attuned that it will catch the vibrations which certain brains, far inferior, now can pick up?

Madam Olga Petrova, international star, believes it will.

Not very many weeks ago the vast radio audience was told that a new studio was being dedicated at WJZ. They listened in a little more eagerly that night because on the program was the name of Olga Petrova.

Many Original Ideas

Officials of the Radio Corporation-Westinghouse Station of Newark, New Jersey, wanted to make this night one long to be remembered and that they succeeded is attested to by the thousands of letters which Madam Petrova received. The radio audience wants to hear Madam Petrova, not once more, but many times, again in the future, and it is believed that their wishes will come true.

I was sure that a woman who could so interest her radio audience the way Madam Petrova did, would have some very interesting comments to make about the radiophone.

The star and her husband, Dr. John D. Stewart, live at Great Neck, Long Island, but it was at lunch at the Hotel Plaza in New York City that the interview for the readers of THE WIRELESS AGE took place. Madam Petrova launched the conversation with the thought that appears at the beginning of this article.

"But," I asked her, "will this be progress for the human race or will it mean a reversion to an ancient type?"

"That cannot be said," she replied. "It is entirely possible that it will be a retrogression."

She made an interesting observation at this point. She said she believed that sound goes on infinitely—it has no stopping place.

"I think that everything is up there!"—and she raised her shoulders slightly in a charming little shrug that expressed volubly her awe at the magnitude of the infinite. "It is there—only we cannot hear it. The sound goes on for millions and millions of miles.

"And then," she added, "consider thought. I know that my dog can tell when I even am feeling sad. Doesn't that indicate something to you? The dog's mentality is able to 'pull' something from humans, as it were.

"Have you ever noticed that the so-called mediums and clairvoyants are persons of inferior mentality? They are crude. Many times they are stupid and most of them are ignorant. That these people are able to pick up things which are in the air about us and which we do not know even exist—and there is no question but that they can—would indicate that such an ability does not reveal a higher intelligence. Obviously it is just the opposite."

Madam Petrova interjected here the thought that she is not by any means a spiritualist, in the commonly accepted sense of that word. She does not believe, she emphasized, that, should the time ever come when the human mind will pick up signals and sounds which it cannot pick up now, that such ability will be brought about through the aid of those mentalities which have passed from our material world, but she is firmly of the opinion that it will be entirely physical in the sense that we will only discover a hidden mechanism in the brain or possibly, as she puts it, "re-discover it."

Won Fame in Movies

Madam Petrova probably won her most lasting fame as a motion picture star. Born in Poland, she came to London while still very young. In fact she is half English. While still in her 'teens she decided she wanted to be a newspaper reporter; and so she took a job on one of London's dailies at the tremendous salary of one pound sterling a week. She not only did reportorial work, but creative work as well, such as dramatic reviews, special articles, and so forth, but she found, much to her dismay, that she could not have freedom of expression and that many times the policy of her paper demanded that she leave out a significant word here and there in her dramatic review.

She was the same impulsive, determined Madam Petrova then that her audience later grew to admire, and it was not long before she left the newspaper in order to turn her efforts in a channel which would permit the utmost freedom of expression. Her new medium of expression was the drama, and her initial efforts were confined to Shakespearian parts on the London stage. Several years later found her a star in the motion picture world.

(Continued on next page)

Broadcasting Broadway

(*Continued from page* 35)

by act, until the final curtain. I do not give full details, of course, nor do I attempt to give any of the dialogue. And then I wind up by telling about the producer of the show and whether or not he has succeeded in his efforts to make it all that it should be."

"And what," I asked her, "is the next important thing that you believe your broadcast of these reviews does?"

"Well," she replied, "it certainly brings home to the theatrical producer the idea that radio can only be another means to help him and that, contrary to the gross misimpression, radio will not hurt, but will help, the box office of the theatre."

Miss Brainard has some very interesting letters written by those who listen in; they constitute the "proof" of which she spoke above. Typical is the following:

Pine Brook, N. J.

My dear Miss Brainard:

Your talk on the play "The Goldfish," on Friday, May 5th, at WJZ, was very interesting, and your "New Idea" of discussing current plays appeals to me very much.

There is no doubt in my mind that your talk was enjoyed by all who heard it, but I assure you that it was most appreciated by those of us who reside in the country, and haven't much chance to come in contact with, and be advised as to what plays to see by people who frequent the theatres as often as city people do.

I assure you that the next play I see is going to be "The Goldfish," for your detailed account of Jennie and her troubles has aroused my interest to such an extent that I cannot wait until the time comes.

I heard your talk in the Pine Brook Post Office where there is a loud speaker which enabled quite a number of people to enjoy the discussion. When I suggested writing a letter to you immediately they all wished to sign their names to show you that their sentiments are the same as mine.

I am, sincerely yours,
(signed) EVELYN WEIDBERG and six friends

Here's another:

New York City

Dear Miss Brainard:

I had the pleasure, last evening, of hearing you speak over the radio on your new idea of reviewing the New York plays.

It seems such a splendid way of telling people about the good plays, and letting them know just enough about each one to pique their curiosity into wanting to see every one you talk of.

I had little interest in "The Goldfish" until Friday evening when you told the plot of it.

Cordially yours,
(signed) RUTH D. CHAMPENOIS,
Ass't Editor Good Housekeeping

So much for the initial attempt of "Broadcasting Broadway." The newspaper, telegraph, cable—all have played their parts in the past to herald the fame of the theatres of Manhattan, and now comes the radio telephone standing at attention, as it were, and saying "present!" when the roll call of those forces which bow to the fame of New York's Gay White Way is made.

Radio Blesses Blind

(*Continued from page* 30)

crystal set and a single tube set, and conducted code classes for blind boys, who learned to copy commercial messages, including the various wireless press services. This was the most popular course of the institution, and is to be much expanded, using the Newark, Schenectady and New York broadcasting services as a basis, as soon as a donor can be found to contribute a loud speaker.

The other homes and workshops for the blind in New York City likewise intend to install apparatus. Most of them have secured promises of sets from various sources. In the meantime several blind boys have built their own crystal sets, which are operating entirely satisfactorily.

The same situation exists in the other large cities. The Maryland Institute for the Blind, in Baltimore, already has a set, and daily concerts from it are part of the curriculum. The paid readers in the Industrial Home in Chicago and at Jacksonville, Ill., are to be replaced by receiving equipment. From all parts of the country the sightless eyes of the blind are being turned hopefully to radio.

"Undoubtedly the greatest blessing to humanity occurring in this era is the use of radio equipment by blind persons," says Charles E. Comstock, of the Illinois State Department of Public Welfare.

Radio has become the all-seeing omnipresent eye of the blind.

Olga Petrova

(*Continued from previous page*)

It was to learn whether she believed that the radiophone will play an important part in the motion pictures of the future that I asked her in what way, if any, could the two assist each other.

"I do not believe that the radiophone will ever be used in connection with talking motion pictures," said the fascinating Petrova. "Such a thing is highly impractical, and too impossible to even mention.

"I do believe, however," she continued, "that radio will be an important factor in the development of interest in motion pictures. Nothing new was ever created that could drive out any other thing which had merit. If the radio drives out the motion picture, then it means that the motion picture has no fundamental merit, and it should go anyway.

"A thousand and one new inventions could come into the field and none of them could drive out any existing invention if it had merit.

"While the radiophone is still a fad, it is possible that the box office may be temporarily hurt, but this cannot last long, and the ultimate result will be that the motion pictures of the ones who come before the broadcasting audience will have greater pulling power."

Radiophones for Alaska

WITH the co-operation of the navy, radio telephones have recently been installed at several of the remote lighthouses in Alaska.

Some of the lightships are also equipped as radio fog-signal stations, with the new department of commerce system, used continuously during foggy weather to furnish accurate bearings to ships possessing the radio compass.

According to George R. Putnam, commissioner of lighthouses, radio should be a great boon in relieving the lonely and monotonous life of the faithful keepers at isolated stations both on lightships and at lighthouses. The keepers of the Alaska lighthouses at the entrance to Bering Sea remain at their posts for three years on a stretch; they have been without mail for ten months. At Tillamook Rock Light, off the Pacific coast, bad weather has prevented direct communication with the shore for periods of seven weeks at a time. On the offshore lightships supplies are received usually only once a month, and the tenders often work in remote localities.

Radio Popular in Paris

WIRELESS telephone concerts are gaining popularity in Paris, and the big department stores are offering this entertainment daily to their clientele. From the toy department of the Louvre or the furniture section of the Printemps, the visitors can hear, about six o'clock, concerts given at the central wireless telephone station of the Eiffel Tower.

One of the popular priced stores, the Palais de la Nouveauté, uses it as an advertising means, and has installed in the main hall of the store a huge horn with a very powerful receiving station, so that all the visitors in the hall can hear the concert and other communications as well.

Yvonne de Treville as Jenny Lind

"MUSICIANS and professional folk generally accept radio's contribution to their art because their personalities are transmitted to listeners. As they become convinced that each individual's interpretation is faithfully reproduced, they admit the new industry to art circles"

Is the Opinion of

Yvonne de Treville

as Expressed to St. John Martens

WHEN personality survives in the transmission of the voice by radio telephone then indeed does radio become a valuable asset to a music loving world; then can radio and the higher forms of musical expression such as the concert and the opera work together for mutual benefit.

That was the qualifying statement made by Yvonne de Treville, the grand opera prima donna who has sung in such opera houses as the Opera Comique of Paris, the Theatre Royale de la Monnaie, Brussels, and the Imperial Opera of Vienna.

She believes that, generally speaking, the personality is carried with the voice over the radio telephone—in a few instances she is sure that it is carried in that way—but whether that will be the case one hundred per cent of the time depends on the outcome of the present continual experimentation. She is certain that development over the radiophone will reach the point where transmission of the personality of the one who broadcasts is assured; then will the radiophone receive most serious consideration from the artists and in the eyes of those who appreciate really good music.

When I asked her about her experiences in singing at WJZ, she exclaimed:

"My broadcasting on that night reminded me very strongly of the period when I lived in Budapest before the war. I was to appear in the Royal Opera House at that time.

"My mother was with me in the city, but due to an illness she was confined to her bed in the local hotel where we were stopping. It seems that someone had conceived the idea of broadcasting the opera throughout the city for those who were unable to attend.

"I recall distinctly asking someone in the opera house what those funny little megaphone things were, stretched along the footlights on either side of the prompter's cage. In those days, you know, we had prompters, who stood on a level below the stage facing the actors but hidden by a canopy from the audience. These prompters followed the lines of the opera, and when the occasion arose, prompted some forgetful artists.

"This custom still survives in a few cases but, generally speaking, it exists no more. I do not recall exactly what answer I received, but I am under the impression that someone told me that they were transmitters into which the voices of the performers were carried, to be broadcasted throughout the city. I do know, however, that my mother, lying in bed at the hotel, clamped a pair of phones over her ears and was able to follow the opera from beginning to end. Each day that I appeared my mother heard me through this means. I do not know whether it was by wireless or by wires."

I explained to her that I was familiar with the experiment made in Budapest at the time and that it was entirely through the medium of wires. It was commercially an impractical method, so it did not last long.

It was probably the diva's fondness for travel which carried her into so many countries and taught her to sing in so many languages. She is one of a few prima donnas who can successfully cope with an opera in eighteen different tongues. Her home is in America, but during the past nine years she has been heard in Belgium, China, Austria-Hungary, Denmark, Finland, Russia, Spain, Sweden.

Then, not satisfied, her wanderlust took her to Egypt and Algeria, where she was induced to give some special performances.

On her arrival in Europe it proved no easy task to obtain a hearing, for she was considered a foreigner, despite the fact that her father was a Frenchman. She did succeed finally, however, in appearing in concert in Paris and from that time on her progress has been a steady and healthy one. Such famous virtuosi as Ysaye, Cesar Thompson, Kubelik, Gerardy and many others have given concerts with her.

It was in Stockholm that the prima donna first sang before what a generous republic still calls "royalty," the late king of Sweden having commanded her to appear at the palace. The young singer repeated over and over again the various formulae of address she was told she should use. All went well until the singer suddenly realized that it was getting late. Then, springing impetuously from the seat on which she had not dared to sit until invited to do so by His Highness, she exclaimed, as she would in any other drawing room:

"Eh bien, au revoir, Monsieur."

This, it is hardly necessary to tell my readers, is far from being the correct way to address a king; anyway it was a very bad break. But this king, it seems, was different. He laughed heartily, as not many kings in Europe are able to laugh today, and patted her on the cheek as he wished her goodbye.

The demon wanderlust still pursued the subject of our sketch and she flitted to Smyrna, Athens and Constantinople. Eventually she made her way back to her home land, and at the present time she is in New York City.

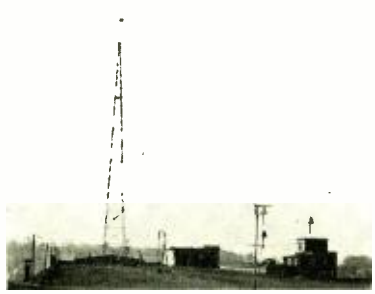
One of Yvonne de Treville's most popular songs is a laughing song which compels her audience to laugh with her. It was this song that she sang over the radio telephone. Friends of hers who listened in from various points within the range of WJZ, told her afterward that in the transmission of that laughing song the personality of the singer did not die. That those who listened as her voice came out of the loud speakers were compelled to laugh with her. And, in her opinion, that is proof of her theory that the apparatus does not kill the personality of the artist.

W G Y

The General Electric Broadcasting Station at Schenectady, N.Y., Described for the Many Fans Who Admire Its Radio Programs

A RADIO broadcasting station, in order to transmit music and other forms of entertainment faithfully, must be equipped with specialized apparatus of very high quality. In the WGY station of the General Electric Co. at Schenectady, N. Y., particular reference has been paid to this point with the result that the radio equipment contains numerous important refinements. When radiophone apparatus first came into more or less general use several attempts were made at broadcasting music and while many of these tests were quite successful it was found that equipment that would give satisfactory speech quality was not always particularly suitable for music transmission. Consequently a large amount of experimental work was done to improve the quality of transmission with the result that both music and voice are now faithfully reproduced.

Contrary to the general opinion of the public, the radio transmitting apparatus and the studio where the artists perform are not located in the same building but are about three-fifths of a mile from each other. Such an arrangement allows considerable flexibility as it is possible to broadcast programs not only from the studio but also from any point that can be connected to the studio by a telephone line.



What WGY station looks like on the roof, showing one of the high towers and two-wire aerial

The transmitting apparatus proper at WGY is located on the top floor of one of the factory buildings. A multiple-tuned antenna has been erected on the roof of this building. The antenna is 350 feet long and is supported at each end by a steel tower 180 feet high. A counterpoise system has also been installed a few feet above the roof. This consists of a network of wires that act as a ground and results in a considerable decrease in the effective resistance of the whole antenna system.

Two fundamental conditions must ordinarily be fulfilled in order to operate a radio telephone transmitter. First it is necessary to supply the antenna system with high frequency energy. Secondly means must be provided to control or modulate this high frequency energy in accordance with the speech or other audible vibrations that are to be transmitted. The wave length used at WGY is 360 meters. This corresponds to a frequency of approximately 833,000 cycles. The manner in which alternating current of this frequency is produced by the transmitting apparatus may be described as follows:

The power supply for the transmitter is alternating current, three-phase, 60 cycles, at a potential of 110 volts. This source furnishes practically all the power for the entire equipment. Two types of vacuum tubes are used, namely, Kenotrons or two-element tubes and Radiotrons or three-element tubes. The filament of the Kenotron is heated from the secondary of a step-down transformer. A direct current motor-generator set is used to supply the Radiotron filaments.

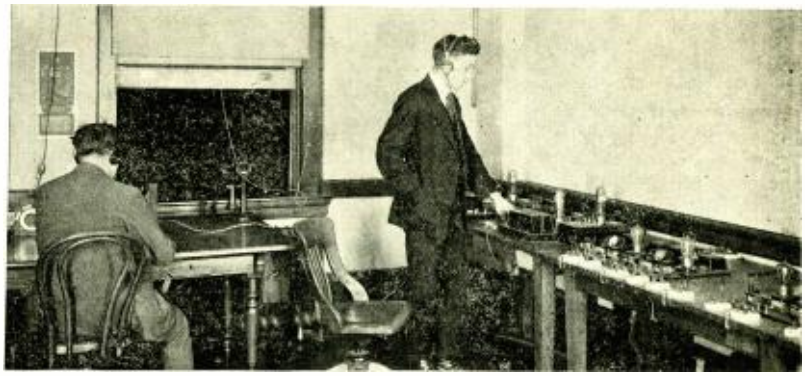
The plate circuit of the Radiotron power tube requires high voltage direct current at a potential of about 12,000 volts. This is obtained from the Kenotrons which are connected through a suitable rectifying circuit to the secondary of the high voltage plate transformer. A filter system is connected in the rectifying circuit in order to remove the alternating current hum that would otherwise be present. The high voltage output of the Kenotron rectifier then passes into the Radiotron tubes, where by means of the proper oscillating circuits it is converted into radio frequency energy. The oscillating circuits are coupled to the antenna system by means of an air core transformer, commonly known as an oscillation transformer. Therefore, by means of the vacuum tubes and their associated circuits the station is able to take alternating current at 110 volts and 60 cycles and convert it into radio frequency power at several thousand volts and practically any desired frequency.

In order to understand how the modulation or audio frequency control

Mlle. Besnier and Max Merson of the Ladony Opera Concert Co., giving a recital at WGY. In the background is Robert Weidaw, an announcer, at the switch controlling the microphone circuit

of the antenna current takes place we must begin at the studio where the artists perform. Three rooms are utilized at the studio, one being used as a reception room, one containing pianos, organs and other musical instruments and the third containing the controlling and amplifying apparatus. The only radio apparatus located in the room where the artists perform are small microphones, which are mounted on stands so that they may be placed in the best position for the particular selection to be broadcast. These microphones have been very carefully designed so that the true tone qualities of music and voice will be clearly reproduced. The minute electric currents set up in the microphones are then transferred to the apparatus room where they pass into amplifiers. Various controls are provided on these amplifiers so that the intensity of the transmitted selection may be varied at will. There is then available at the output terminals of the last amplifier a fairly strong electric current that varies in exact accordance with the sound waves impressed on the microphone in the studio. This current is next transmitted over a pair of wires to the modulator tubes located in the transmitting station proper. These modulator tubes are so connected that they may control the antenna current by varying the plate potential impressed on the oscillator tubes. Consequently we have a system of modulation that enables comparatively feeble sound vibrations to control or mould large amounts of radio frequency energy.

The censorship and supervision that is exercised by the men in charge of the broadcasting equipment is of some interest. The studio director has at his disposal a control switch that cuts the microphones in or out of the circuit. As soon as this switch is closed a red lamp is illuminated which warns those in the room that everything spoken will be transmitted to the invisible audience. The "censor" or man in charge of the amplifiers in the apparatus room listens continually to the concert or selection being broadcast so that he may make any adjustments necessary to improve the tone quality of the transmission. The censor is also in telephone communication with the operator of the transmitting equipment. The latter keeps a constant watch on his apparatus and by means of an oscillograph can determine the amount of modulation that is taking place in the antenna circuit. All circuit adjustments are, however, under the complete control of the censor and no changes are made without his consent.



Control room adjoining the studio of WGY, the General Electric broadcasting station. It is here that the censor works and all electrical details are under constant supervision

All broadcasting of the General Electric Company at WGY is under the direct management of Martin P. Rice, who is manager of the publication bureau of the company. It has been Mr. Rice's theory that the privilege of furnishing entertainment to thousands carries with it the responsibility of affording the radio public good music and of providing addresses of an informative and interesting nature.

Kolin D. Hager is studio manager of WGY and also the chief announcer, for which work he is peculiarly fitted. Trained for the operatic stage, he speaks French, Italian and German; his speaking voice is pleasing and the radio fan, in commenting on the programs, frequently refers to his voice.

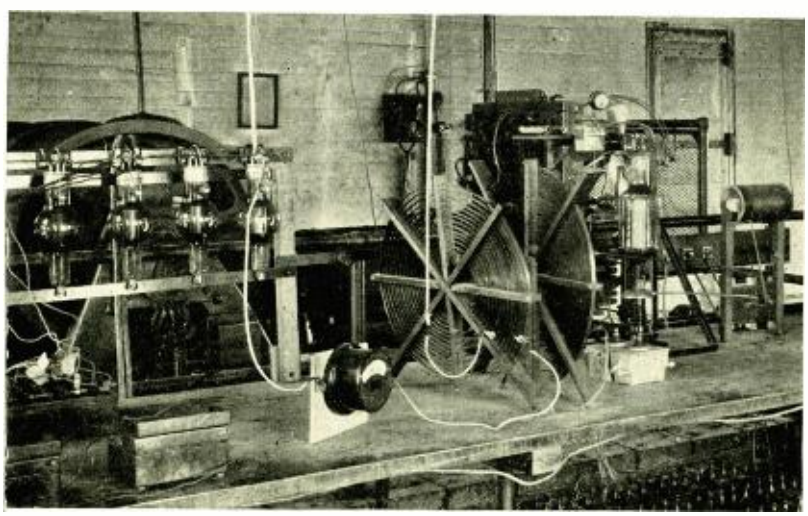
WGY is offering concerts three nights a week, Tuesday, Thursday and Friday and nightly, except Saturday and Sunday, furnishes produce and stock market reports, baseball results and news bulletins. Every Friday night a special late program is given at 10:30 o'clock Eastern time.

The General Electric Co. broadcasting station at Schenectady provides radio entertainment for the New England states, south-eastern Canada and west through Wisconsin and Illinois, south to South Carolina and Tennessee. This territory may be conservatively stated as the nightly range of the station, excepting for those sections which are close to other powerful transmitting stations. The station is often heard at much greater distances, however, and WGY's mail contains many letters from Florida, Texas, the middle Western and Rocky Mountain states.

Among the distance achievements reported was the receipt of WGY entertainments by the S.S. *Harry Luckenbach*, on March 30 of this year, when the ship was 7 degrees north of the equator and directly south of Panama in the Pacific Ocean. The log of the ship's operator checked with that of WGY and was verified by the master of the ship.

The Rockridge station at Oakland, Cal., reported perfect reception of voice and music on the night of March 24.

Among the interesting distance reports was that received May 5 from Elmer F. Barber, an amateur, who reported getting WGY at St. John, Washington, on a home made receiver, using only one bulb.



Transmitting equipment of WGY station. The large oscillator tube is shown at the right and the modulator tubes at the left, with meters, coupling inductances and filter condensers

"I Take My Pen in Hand to Tell You—"

Correspondents Report Their Pleasure and Profit in Broadcast Programs. Each Home Finds New Reasons for Listening In. Gratitude Moves Many to Express Their Appreciation in Written Words of Thanks

Camp Bragg, N. C.

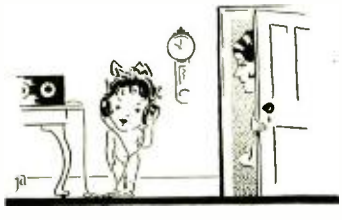
For some time past I have followed with great interest the developments in radiotelephony and have recently acquired a receiving set. Myself as well as all of my friends stationed here at this camp are greatly benefited by it and it has become a regular hobby of all personnel at this place. Married men are bringing their families for entertainment during the evenings and young and old are enjoying it immensely.

Camp Bragg, N. C., our station, is approximately eleven miles from the nearest town, Fayetteville, N. C. Fayetteville has a population of about 8,000 and is not offering much to our men in the line of amusement and diversion —consequently we are always on the lookout for any new form of entertainment. Radio telephony has solved the problem. There are about 3,000 officers and enlisted men and about 300 families here. My set is the only one in the hands of and for the amusement of enlisted men. ALFRED HAHN.

Bridgeport, Conn.

I "listen in" on your concerts at my home in Stratford, Connecticut, and, while I can't answer back, I assure you of my appreciation.

An ex-service man (a Captain in the 42nd Division) was visiting me Sunday night and was much interested in Major Charles R. Morris' lecture.



Last night my wife found our ten-year old daughter oblivious to everything except the concert. The child was supposed to be getting ready for bed so mother was censorious. They compromised upon daughter both listening and getting ready for bed. Again mother hunted up daughter, found her still oblivious to earthly affairs but clothed only with a pair of ear 'phones. H. L. LEWIS.

Send your impressions in the form of a letter to The Wireless Age. Be sure to tell about your more interesting and unusual experiences. Write on one side of the paper, not over 300 words. Address them to Letter Editor, Wireless Age, 326 Broadway, New York City.

Garfield, N. J.

On Sunday and Monday nights we heard your request to have all people who have radios to write you.

As ex-chief of the Fire Dept. I was at the headquarters of Co. No. 2 where a radio is in working order.

I must say all of the firemen including myself heard the band concert and I thought the way the men acted someone might take the radio home with them.

The invention is wonderful and I must give you all the credit my power can give you for your speaking and programs you send out.

On Sunday evening, our entire department will be on hand to hear you.

CHAS. H. LOHSEN,
Ex-Chief, Fire Dept.

Morris Plains, N. J.

We listen most every night to your wonderful entertainments and I am sending you these few lines to thank you for the pleasure you give our family.

We heard the Ed. Wynn show and it came in very clear. We get all of your stuff quite clear—in fact we can hear the needle go down on the records whenever you play one and my wife said she heard the organ stool being moved yesterday when the organist finished playing.

Had my father down yesterday. He is 75 years of age and he thinks it is a wonderful thing. I don't know how I can repay you for your entertainment as our machine is as large and good as we want, but I am a booster for WJZ and whenever I can interest a customer of mine in radio I shoot him full of the great possibilities for making money by installing your instruments.

WM. M. SUMMER.

Springfield, N. J.

Extract of letter to Miss May Peterson

We have just heard you finish your program and tell your unseen hearers that you have enjoyed yourself "immensely." We—my husband and I—would like you to know what delight we had in your singing tonight. The "Echo" song and the "Cuckoo Clock" song were novel and realistic and we enjoyed them very much; but your "Carry Me Back to Old Virginny" and "Last Rose of Summer" were sung with such expression, sentiment, and sweetness, that we derived the greatest pleasure from them.

It may interest you to know that for years I have been hard of hearing and have been deprived of the enjoyment of all soft or faint melody. Yet, tonight, over the wireless I "got" every note you sang, even to the faint dying away of the last note of the "Last Rose of Summer."

We also enjoyed the piano solos very much, especially the Chopin number. It is a pity that the artists rendering programs over the wireless cannot hear the "silence" applaud. We always clap our hands.

MATHILDE M. HORSTER.

Jersey Shore, Pa.

I write you to express my appreciation of your excellent service that I have had the pleasure of listening in on for the past week. Your programs, the last three nights, have been exceptionally good and have been enjoyed by perhaps twenty people besides myself at my home. The misfortune of having to take you on at six instead of seven o'clock, on account of the failure of our legislature to help make daylight saving uniform, is a bit of a handicap to us, but will be in on it just the same.

L. M. GOODMAN.

Byron G. Harlan

"I WOULD like to shake hands with every one of my radio audience. As that's impossible, I am more than pleased to greet them through THE WIRELESS AGE." *So said the man who has made millions laugh*

Edwin Hall Interviews

Byron G. Harlan

Whose Humorous Songs and Stories Have Won Fame on the Stage, on Talking Machine Records and Now by Radio

TWENTY years ago Byron G. Harlan, making his bow to the public as a singer, thought he could best achieve lasting fame by making people cry. So he sang baby songs and other sentimental pieces. And now the twenty years have flitted into the never-returning past and Byron G. Harlan still is singing to the public through thousands of talking machine records. His fame has spread into all countries during this time, but it is not the fame of which the singer once dreamed.

He does not make them cry. Any desire to do that fled years ago. All his efforts now are directed toward making people laugh, and many hundreds of thousands of radio telephone users will readily testify to his success.

Although Mr. Harlan has broadcast several times and "knows" his audience as well as any entertainer, he welcomed the interviewer, who wished to present him to the radio audience in printed word and picture.

"I'd like to shake hands with every one of them," he said. "I'm also glad of the chance to let them see what I look like, for many of them have written me asking for photographs.

"I am quite certain," and here he grew serious, "that the radiophone will be taken up by such agencies as the church for the teaching of the gospel. Who knows but that it is the force sent down to man by God for the spread of the message of the Bible!

"At heart, people are good. But they do many things that are thoughtless, and cause pain to others. Simply because they forget. That is why we need the voice of the church—to remind. But unfortunately many do not go to church. What must we do then? Why, it is simple—we must bring the church to them.

"That is where radio will play its part. It will bring the church into the home. It will be a remarkable power for good.

"I could sense its power by my experiences in broadcasting. The rebounds of my laughs across the air were tremendous. I have heard from nearly every state in the union east of the Mississippi."

Radio listeners as well as phonograph users have come to know Mr. Harlan as an extremely versatile artist. He sings "rube" songs; "Cousin Caruso," Italian comics; and negro dialect songs with equally good effect.

Since the death of Cal Stewart, the original "Uncle Josh," Mr. Harlan has been assuming this character role, and in another column the reader will find extracts from the latest "Uncle Josh" Okeh records made by him—"Uncle Josh and the Wireless." These Uncle Josh monologues. which radio audiences have come to like. are spoken and not sung.

Uncle Josh and the Wireless

As Spoken by Byron G. Harlan

ABOUT two weeks ago my brother-in-law, Squire Abner Witfield, bought one of those new fangled radio sets, from a mail order house in Chicago.

A few days later he strung wires from the two poles, upon the roof of the old homestead.

Well, Sir, last Wednesday night he invited all Punkin Center to a radio party, and you never saw such a conglamaration of small town skeptics in all your life.

Well, Sir, after he had us all seated he pulled a lever, and the darn thing started to sputter and spark, and everybody started to giggle; and Lem Johnson wanted to know if we were going to have fire works or movies, ha, ha, ha!

Finally, after the darn thing got tamed down, all the wiseacres that claim Missouri as their native state, got the surprise of their life.

The room was filled with the sweetest music I ever heard, and a girl called Jean Neilson, known as the radio girl, sang a song called "Kiss Me by Wireless," ha, ha! It was the cutest thing I've heard in many a day. Everytime she would come to the chorus that silly old fool Chett Green would deliberately walk up to the horn, and smack his lips, Hank Walton, the village wit, said if Jean Neilson's lips are half as sweet as her voice, she wouldn't have to plead long to be kissed in Punkin Center, ha, ha!

Abe Martin said he never saw a clothes line in such a ridiculous place before in all his life. Aunt Polly said maybe Abner was going to be one of their circus fellers, and do a little wire walking as a side line. Obidian Green, the town evangelist, said it was some new invention of the devil, and Abner looked as if he was on the way to perdition, whatever that is, ha, ha, ha!

LIFE ON THE FARM

Mr. Harlan's singing partner, during his entire career has been, and still is, Arthur Collins, and the team of Collins and Harlan is very famous.

Physically, as well as in his own world of song, Mr. Harlan is a big man. This he credits to early life in South Dakota, where he was born and raised on a farm. It was while at the plow that he first aspired to become a singer. Up and down the field he would trudge, slowly behind the oxen, singing all the time.

People stopped along the roadside to hear him; and it was their interest that encouraged him to go on to greater triumphs.

Finally the old homestead was sold and his father bought and operated a hotel in Canton, in the same state.

His first public appearance was with his present partner, Arthur Collins, who hailed from a small town called Hempstead. From the successes of those early days the team of Collins and Harlan progressed by leaps and bounds, winning collective and individual honors everywhere, first by the phonograph, and recently via radio.

What Newspaper Editors Say

Writers Comment on the Danger of Political Campaigning by Radio Spoiling the Public Taste for Broadcasting

THE Summer months are here and soon it will be Fall. Then politics—campaign—elections. From one figurative end of this country to the other whispers are being heard as to how extensively the radio telephone will play its part in the elections, local, state or national, of the future. Probably this Fall will indicate which way the wind will blow; that is, how eagerly the politician will seize upon the radiophone as a means of acquiring votes.

Thus runs the trend of thought in the columns of the nation's daily newspapers—columns devoted both to radio and to politics.

Many of the newspapers treat the subject humorously. Others are quite serious.

Under the heading, "The Radio in Politics," the *Milwaukee* (Wis.) *Journal* says editorially:

We might have known there was a catch somewhere in this radio business. Getting music out of the air and market reports from an ethereal ticker was too good to be true. Senator New has gone and crabbed the whole thing. He sat in his office in Washington and stump-speeched, smearing prideful points all over the map of Indiana.

When a candidate hires a hall there's no law to make you go hear him. If a paper prints his speech, you can skip it and read something interesting in the next column. Usually you can dodge him on the street. But when he takes to the radio, he's got you. With the radio in the office, the club, the home and the bathtub, on boats, trains and automobiles, there's no escape from the spellbinder.

Along the same line of thought appears the editorial in the *Toledo* (O.) *News-Bee,* commenting in light vein on a bill introduced in Congress:

Some Congressman has introduced a bill for having all the proceedings of Congress sent out by wireless.

We vote no!

One can let the *Congressional Record* lie in its wrapper. Or one can find out when something worth while has been said, and read that. For there is lots of good stuff in the *Record.*

But in the place of the music, the lectures, market reports, weather reports and things of this sort, the congressional proceedings as a whole are not worth the time.

Nobody but the man who is paid for it should have to stand the racket of Congress.

A second time we vote no! When congressmen want to do their electioneering, let 'em hire a hall.

The *New York Times* doubts whether a political speech could be transmitted with satisfactory effect upon the listeners—satisfactory at least on the part of the politicians. It thinks that the success of a political speech is dependent largely "on the addressing of it to auditors, most of whom already are convinced."

Continuing, it says:

It is not at all obvious why protest should be made by candidates for office because it has been decided not to "broadcast" their appeals for votes from the Government radio stations. On the other hand, however, it is not obvious why business of this sort, if offered on a business basis, should not be accepted.

What is obvious is that the rendering of such service at a Government station might be influenced by partisan considerations, and fairness in the granting of facilities might not always be maintained. If it were not, there would be both moans and growls.

Perhaps the public would like to get political speeches this way and perhaps not. People would not ever become wildly excited over appeals coming from an unseen orator, and most of the effects produced on assembled crowds would be unattainable, for there would be none of the enthusiasm due to contagion, and there might be a dangerous pondering over the arguments offered—dangerous to the candidates, that is.

The success of a political speech is largely dependent on the addressing of it to auditors most of whom already are convinced. That can be done at a "rally," but there would be no selection by radio.

Calling Senator New's experience of broadcasting his speech by radio interesting as an experiment, but horrible as an example, the *New York Tribune* contends solemnly that the pleasure of the evening group around the fireside would swiftly turn to consternation were music and lectures and market reports interspersed with pleas of politicians seeking re-election.

Then it goes on to say editorially:

Furthermore, were the practice to become general, it would be impossible for even the most modern apparatus to strain out of the New York radio canvass the speeches broadcast to Iowa, Oregon, Michigan and Louisiana. And good Republicans, interested only in addresses calculated to supply them with campaign arguments, would be forced against their wills to hear dozens of reasons why Democrats should be supported. And they could not even "boo" their disapproval.

The radio is rapidly adding entertainment and instruction to the household, and that is about enough for the present. When it begins to supply political opinion as well, many of the partisan listeners will open the lightning switches and cut off the unwelcome voices.

Entirely aside from politics there is another point that is of interest to newspapers throughout the country in connection with radio during the Summer months, and that is reflected in the press of the land.

We refer to the Summer camps, and the new note that has been added this year—radio. Thousands of these Summer camps dot the coasts, the lake fronts, the rivers in the northern wilds. And this year, the editors point out, few of them will be without their radio sets, to brighten the life of the camp, to keep the folks in touch with the sweltering world outside from which they sought to escape.

Heat drives people to cooler climes, but it only has the effect of making radio all the more popular in Summer camps. For where present day civilized man is, there will one find the radio telephone.

That is the gist of editorial comment of the press of the country now. The *Providence* (R. I.) *Journal* suggests that, if the demands made upon it are not too great, the battery in a vacationist's automobile may be made to serve admirable duty with the radiophone.

Heading the passage "Vacation Radio," the newspaper says editorially:

One noticeable change in the landscape at Summer resorts is the presence of aerial wires. Several have already been seen, and many people are considering the installation of receiving outfits in their houses down the bay and on the seashore.

The conditions for reception at shore resorts are excellent, oscillations from transmitting stations having greater range over the water than over the land. There are no extensive power lines to increase outside interference to the reception of signals.

The difficulty is in the transportation of the apparatus, particularly of the filament battery. The same problems present themselves in this case, as they do in vacuum tube sets at home. Crystal detector sets can be used, but their limited range works against them.

It is possible to use the automobile starting battery for filament lighting purposes. In summer an automobile battery generally gets overcharged because the demands for starting are less than in winter, and there is less driving at night. Excessive overcharging is harmful to a battery, and the use of the battery for radio purposes will keep it in good condition if the demands on it are not too great.

The *Louisville* (Ky.) *Herald* points out that Summer months are not ideal for radio reception, but it predicts that when the Fall rolls around again the interest in radio will be much greater than ever before. It says:

Look for a drop in radio enthusiasm during Summer.

Then for a recurrence of interest in fall, even greater than ever.

That's the prediction of radio engineers and officials.

In The War Zone

Adventures of George N. Soupos, Wireless Operator, During the Graeco-Turkish War

"His Knowledge of the Greek Language Obtained for Him a Job on the Themistocles"

IF you had been a wireless operator aboard a Greek troop transport and your ship had taken an active part in a successful battle against the enemy and you, especially, had distinguished yourself by some particular feat so that Queen Olga of Greece would personally ask you if there was anything in the world you would like to have—what would you say?

That is what actually happened to Operator George N. Soupos of New York City, an adventurous lad, who, a victim of circumstances, found himself one day in the storm center of the war between Greece and Turkey some few years ago.

And George N. Soupos said that the only thing he wanted was some potatoes mashed with plenty of cream.

This was a favorite dish of the young operator before he heard the call of adventure—*potatoes a la Soupos*—as he styled the dish which was his favorite delicacy.

The story of young Soupos is another tale of adventure plucked from the life of that fearless group of American youths—the wireless operators. The youngsters just starting into the wireless operating business like to speak of his adventures, but it is a safe guess to say that there is no operator of experience today who cannot duplicate—as far as excitement and thrills go—the story related on this page.

Used Spare Time

When he was eighteen years old Soupos was an aspiring wireless amateur and devoted as many minutes as he could spare to acquiring knowledge about wireless by experimenting in his little station in his home. Within one brief year he was returning home, a war veteran, for in a few months of fighting in the Aegean Sea for the liberty of Greece, he had taken part in minor battles and one big naval engagement; he had saved his vessel from destruction on several occasions, and once he had been in irons awaiting execution.

It was because of his knowledge of the Greek language that he obtained a job as wireless operator on the *Themistocles*. It was a ship carrying Americanized Greeks back to their native land. They were going back to fight and every one of them continually sought young Soupos on the trip over when knowledge was wanted of what was going on in the war-ridden land they were approaching.

Remained With Crew

After the vessel had deposited the passengers at Piraeus, Greek naval officers told the captain of the *Themistocles* that arrangements had been made by the owners of the boat to convert it into a transport for Greek naval service.

The captain, his officers, and the young wireless operator remained with the ship. Steel plates were bent about the bridge of the vessel and four-inch guns were mounted on her decks.

On one occasion Soupos was startled by hearing a spark station in operation. It sounded like a Turkish station, and seemed very close. So he reported it to the captain, who discovered he was out of his course and ordered all lights extinguished. The vessel steamed ahead under forced blast away from the danger zone. Searchlights from a nearby Turkish fortress played upon the water and the twelve-inch guns of the Turks would have made short work of the vessel had they discovered its presence. For this service, Soupos was rewarded with a lieutenancy.

The following days were marked by skirmishes with the Turks and during one of the lulls between battles, an attempt was made by the enemy to bribe the young operator into betraying secrets of the Greeks. Young Soupos, of course, refused, but he was ordered to "string along" the one who had made the offer, and it was not long before the officers knew that another operator had accepted what young Soupos refused. That operator did not operate long.

Soupos likes to tell about the chase in which his vessel was the one pursued. One day he caught a Turkish spark and again the captain, on searching the horizon with his glasses, discovered he was too close to an enemy ship for comfort. The Turkish armor-clad vessel took up the chase, and it was not until the *Psara* of the Greek Navy hove in sight that the Turkish boat abandoned the chase.

The captain of the rescuing vessel was under the impression that young Soupos should have detected the presence of the Turkish boat before he did and he calmly told the lad that he would be executed.

The captain of his vessel proved a friend and persuaded the irate officer that Soupos, being an officer, could not be executed without a court martial and should the execution take place, he would request an investigation. After a night in the brig, Soupos was released.

Longs For Home

Eight months of battle smoke and very many narrow escapes found Soupos longing for his home in New York City. A conversation by wireless with the operator on board the U. S. S. *Virginia,* opened up anew the floodgates of his homesickness. He asked for a discharge and received it. A wireless message to his mother told her that he was on his way back home, and there was a proud mother waiting for her returning hero when his vessel docked under the shadows of the metropolitan sky scrapers.

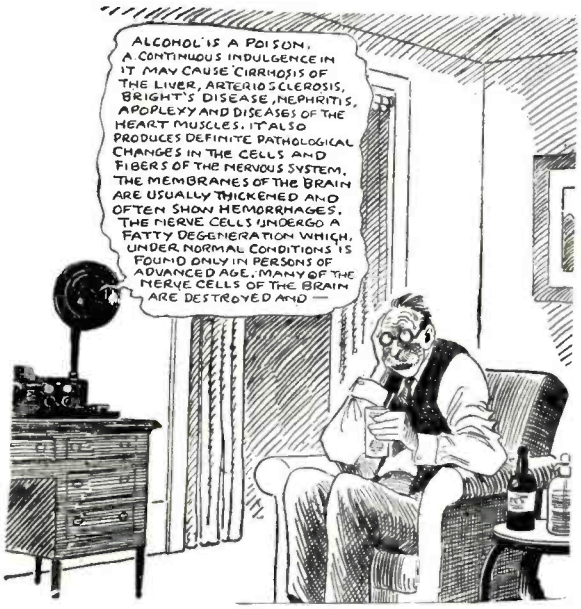
The shadows of night were falling as Soupos mounted the steps of his home. Supper was on the table and the sight of the familiar faces and a certain bowl of food on the table made the lad realize that once more he was safe.

What do you think it was that his mother had prepared for him?

It was a bowl of potatoes mashed with cream!

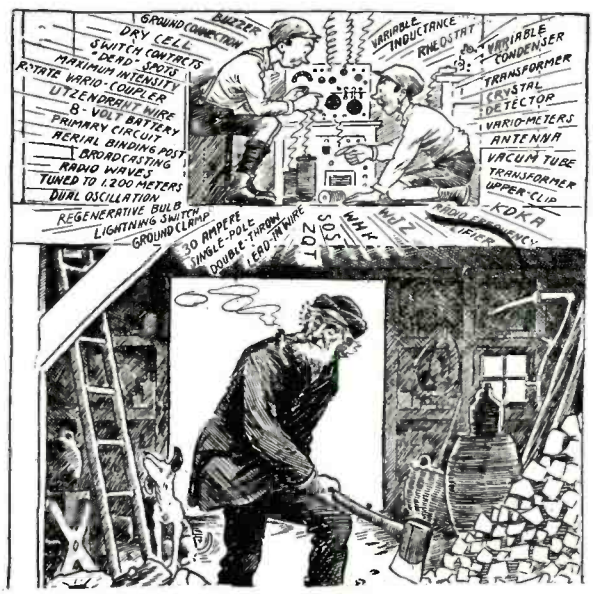
When The Radio Bug Clashes With The

THE RADIO TEMPERANCE LECTURE



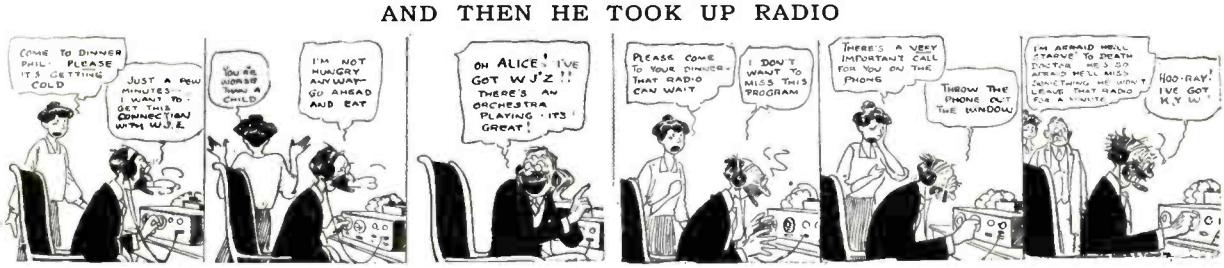
Richmond (Va.) Evening Dispatch

GRANDPA HEARS A STRANGE LANGUAGE



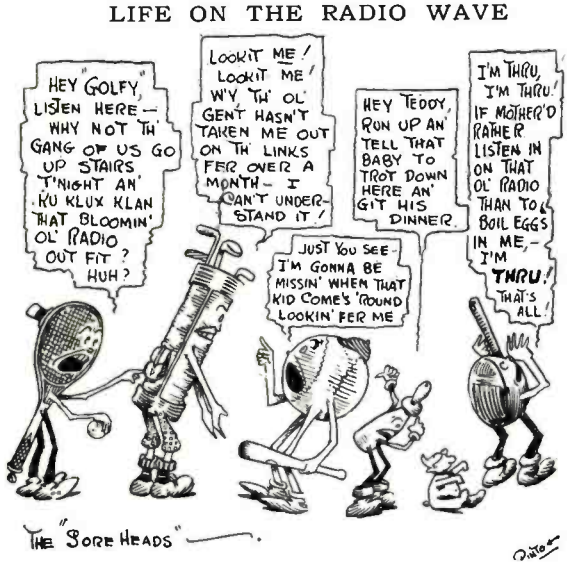
—By Cartoonist Bushnell

AND THEN HE TOOK UP RADIO



—N. Y. Tribune

LIFE ON THE RADIO WAVE



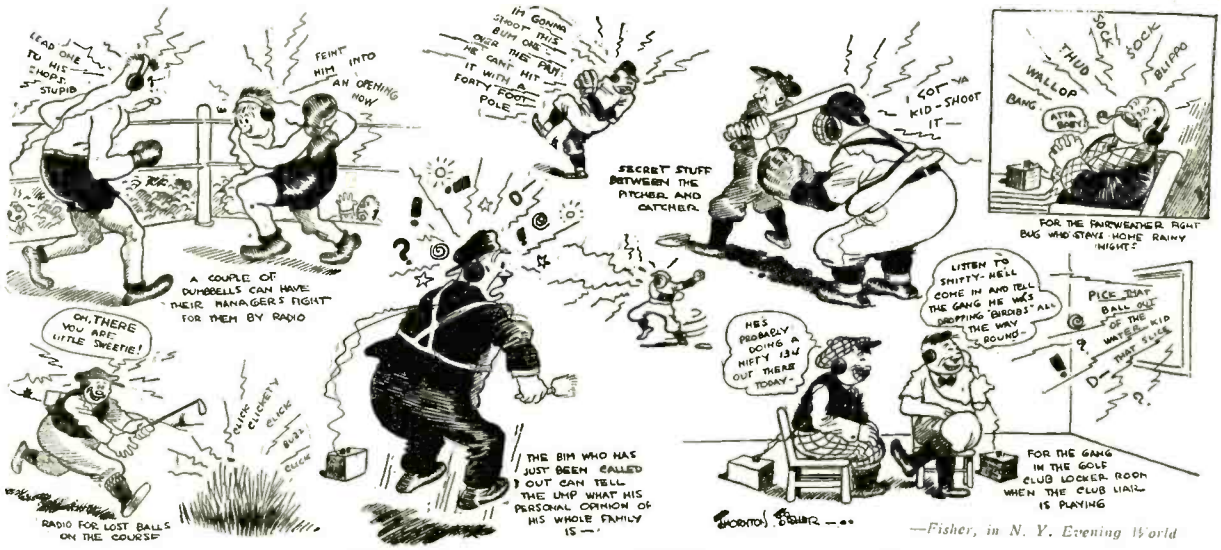
—San Francisco Chronicle

MERRILL SHUDDERS AT THOUGHT OF IT

—Atlantic City Gazette

Cartoonist's Wit Sparks Are Bound To Fly

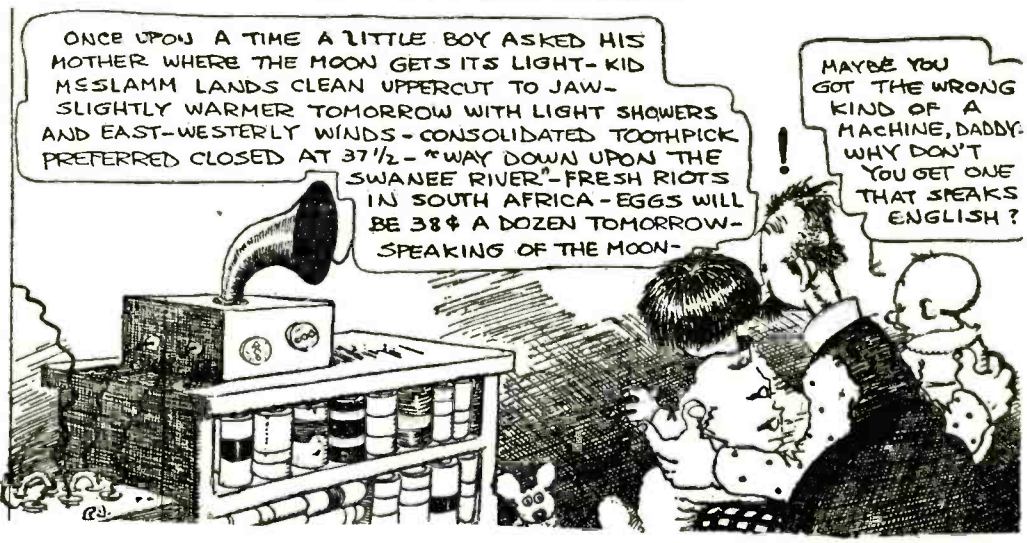
PLAY IT WITH RADIO



—Fisher, in N. Y. Evening World

OUR OWN WEEKLY RADIO RAVINGS

THE RADIO APPARATUS IS ALL SET FOR THE DAILY BED-TIME STORY, BY PHILANDER M. DROWSY, BUT THE AIR 'NAVES GET SCRAMBLED AND THE CHILDREN THINK THE MACHINE IS CONNECTED WITH THE ASYLUM.



—Los Angeles Examiner

TOOTS AND CASPER

RADIO BILL

—Covington (Va.) Virginian

Witching Wireless Waves Whirl Wittily

An Exceedingly Remarkable Interview

By R. E. Porter

THE fame of the Hon. T. Dingbatus Montgomery Nutmeg is a household byword on a couple of continents. He is especially liked by the housewives, being what might be called a ladies' man.

And he has strong opinions of his own.

When along came radio he was among the first to be asked to broadcast. His address was a powerful plea for the greater use of condiment. Thus it was that the Editor considered him a peppery subject for an interview.

"Get a good spicy interview with Hon. T. D. M. Nutmeg," read the assignment.

So I went to his club on Fifth Avenue, following which I scrivened as below:

The Interview

HAVING just returned from an interview with the Hon. T. D. M. Nutmeg, let me observe that he knows so little of radio that he thinks a loose coupler is an unscrupulous "marrying parson." So I am going to give you a verbatim report of our conversation, uncolored and without leaving out a comma.

"Now, Mr. Nutmeg," I began, "we are very anxious to get a good interview on what you think of radio—opinions gathered, of course, from your broadcasting experience."

He looked at me with a perfectly blank expression.

"Huh?" he asked.

I repeated my statement.

"Radio?"

"Uh-huh!"—he had me doing it, too.

"I don't know anything about it," said the noted statesman.

"But surely you have impressions. It would be difficult (even for you) to prevent getting one after broadcasting."

"No impressions," he grunted.

(Remember, I'm giving you the straight interview.)

"What do you think about sending your voice through the air? Doesn't that inspire you?"

"Never thought about it before. But I guess it is wonderful."

"We think, Mr. Nutmeg, that radio will be a powerful force for good. What are your views along those lines?"

"Never thought about it."

I tried again: "Radio will break down boundaries between countries. It will make people more friendly. It may eliminate wars altogether. Don't you think so?"

"Huh?"

I repeated.

"Possibly . . . but I don't know a thing about this radio."

Here his expression mutely pleaded, "Hey you, quit pickin' on me."

But I persisted. "Radio undoubtedly will be a potent factor in bringing amusement into the homes. It will keep the boys off the streets. Don't you think so?"

"Um . . . it might, I never gave it much thought, though."

"And then," I continued, "think how radio can be used in sending out descriptions of football games, baseball games, and so forth. It will be a power in athletics—building up the youth of America, and all that—don't you think so?"

"I guess it will—but I don't know much about it."

Once more I tried. "Well, how about the possibilities of the radiophone for use in politics? Should political speeches, in your opinion, be permitted on the air?"

"Politics? I don't know."

"Think of the influence of a speech on the air, addressed to a hundred thousand people!"

"I'm tryin' to."

"Have you any more suggestions?" I asked, in conclusion.

The mighty statesman looked thoughtful. "Yes," he said, impressively, "you write a profound interview, and say I said it."

LIFE ON THE RADIO WAVE

—*San Francisco Chronicle*

"A man's voice can now be heard all over the country," says President Lowell, "and soon will be audible all over the world." And even then there will be a lot of discontented people who will spend a lot of time hollering "Louder!"—*N. Y. World.*

Our Own Broadcasting Program

This program can be heard by anyone who succeeds in remaining awake. Merely connect up your sewing machine, using a borrowed umbrella as an antenna. The service is free, positively. Tune your instruments as much as you care to.

DAYLIGHT THRIFT TIME

SUNDAY

7 P. M.—Big Bill Haywood will deliver a sermon on "Feet; Why Your Left Should Synchronize With Your Right When The Police Are After You."

8 P. M.—Dr. Thomas J. Nickelsnatcher, of the firm of Jump Brothers, will deliver a lecture on "What Comes After The Purchase Price," describing in verse and prose the appearance and wherefores of bill collectors and sheriffs.

9 P. M.—Remarkable demonstration of reproduction of a spirit photograph by radio. Subject: Ex-Soldier Receiving the Bonus.

10 P. M.—The brothers Trade and Mark Smith will demonstrate new styles in coughing.

MONDAY

7 P. M.—Bedtime story by Humpty

When Whimsical Wisdom Winks

Dumpty, Never Sit On A Wall; or, Don't Be An Egg.

8 P. M.—Professor Hoof will teach the latest dance, the "Salary Slide," originated on Saturday and now a weekly favorite.

9 P. M.—Lesson in concentration. Over a period of sixty minutes Hiram Gooseberry, the famous mathematician, will count the revolutions of an electric fan.

10 P. M.—Swimming lesson on the wireless waves, by Annette Kellerman.

TUESDAY

7 P. M.—This entire evening will be devoted to an illuminating lecture by Mr. Hi Frequency, on radio elementals, including valuable technical data on "How to Insulate the Ground." Miss Lotta Gas demonstrates the ease with which persons are put to sleep by ether waves.

Squire Owens will lecture on how to yank grand opera out of an electric light socket.

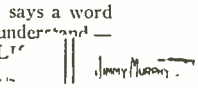
(For Wednesday, Thursday, Friday and Saturday, roll your own)

"Listen!"

BY ESSIE PHELPS DUFFY

Our boy has built a station
For receiving wireless,
There's an aerial, vacuum tube,
O, a hundred things I guess
That we do not know the names of;
But he sits down there at night
So deaf to anything we say,
We're out of patience, quite.
If we venture just a question
Of his school work for the day,
He will motion us to silence,
And we only hear him say—
"LISTEN!"

His sending and receiving set
Are really very neat;
He built a cabinet and desk
To hold them, all complete;
There're little knobs and things to turn,
And switches by the score;
And batteries in rows and rows
Are lined up on the floor.
He puts a "rigging" on his head
And takes his pen in hand,
And then he scarcely says a word
That we can understand—
But—"LI[illegible]



—N. Y. Ameri...

He talks of coil, condenser,
Spark-gap, motor; helix, too;
Well it really is a marvel, what
These things combined, can do.
For they seem to form a prison
That can chain the waves of sound,
And every eve at nine o'clock,
We wait and wait around,
And when, o'er seven hundred miles
From Washington, D. C.,
The Time comes singing in through space,
We're quite convinced, and we—
LISTEN.

He gets reports on weather,
And he gets the Springfield "Press,"
And the way the news comes flying
Is astounding, I'll confess.
Why, it seems almost uncanny,
Just as if the sound was hurled
To this little wayside corner
From an unknown Spirit world;
And last night I nearly fainted,
When he jumped and hollered, *"Wow!"*
"It's an SOS I'm hearing,
There's a steam-ship calling now!"—
LISTEN!!!

He's installed an amplifier,
We can hear the people talk
By telephone to Frisco,
All the distance from New York;
And from Pittsburgh too, and Cleveland,
And 'twas but the other day
That we heard a brass band playing
Near a thousand miles away;
So, although we sometimes tire,
Why we wait and wait around,

EDDIES' FRIENDS

—N. Y. American

And we dare not fix the fire,
O, we dare not make a sound—
We just LISTEN.

But it's worth it—all the trouble—
Just to see the lad succeed,
When he gets "high power" stations
We are gratified indeed;
We are learning calls, and wave-lengths,
And we know that POZ,
One, two, six, and then two ciphers,
Stands for Nauen, Germany.
Wireless—morn,—and noon,—and evening—
We absorb it—wouldn't you?
There! He says that Boston's talking,
I must go and hear him too—
"LISTEN!"

Wise Crack-les

Readers are urged to send in their Wise Crack-les on Radio. Let 'em come, all you humorists.

A. CONAN DOYLE DOES SAY THERE'S A LOST WORLD

"Nelson White is erecting a wireless station in White & Son's hall and we hope soon to be connected with the outside world by this method."

Harrison briefs in Three Forks, Mont., *Herald.*

* * *

In the same column, though hardly connected with wireless, appears this hot news item:

"Walter Pease met with a severe accident Thursday while out on the Montana Power line repairing the wires by falling about 15 feet from a telephone pole, breaking his leg and lacerating it with his climbers."

An unusual way of repairing a power line. * * *

OSCULATORY OSCILLATION

"Kiss me by radio,"
Gosh! That is tough.
Lady, O, Lady, O,
'Tain't close enough.
—*Washington Times.*

"Kiss you by radio?"
I'll say it's tough;
Kiss you any way-io
Would be enough.

WORLD WIDE WIRELESS

Radio Jams United States Patent Office

WHILE the radio telephone has literally added to the joys of nations, it has burdened the United States Patent Office with a flood of applications for new patents. The Patent Office for years has been swamped, and has been falling further and further behind every day. With the development of the radio industry an added strain was thrust upon it, and as it had been unable to keep up to date before the "radio flood," wireless has jammed the Patent Office even more than it has jammed the air at certain spots. Already more than a thousand radio patents have been issued, and between 2,000 and 3,000 are pending. Many of these latter, however, never will be issued, for they cover ideas that are not new. The great popular interest in wireless has served to start thousands of experimenters working, many of whom rush into the Patent office with their discoveries instead of employing an experienced patent attorney to make a search and tell them whether or not their invention is patentable.

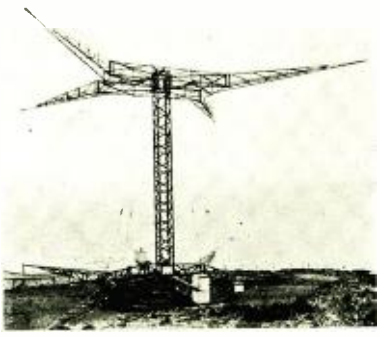
French Fishermen Use Radio

MORE than 200 French fishing schooners are to be equipped with radio transmitting equipment using from 250 to 1,000 watts. In 1918 only thirty fishing boats were so equipped, and the installations proved so valuable in reporting catches and in saving life that it is expected that soon every French fisherman of any size will use radio.

Cures Pneumonia by Radio

DR. W. S. IRWIN, surgeon of the *President Adams*, of the United States Lines, who was probably the first ship's surgeon to treat a patient by wireless, recently added another cure to his list of long-distance treatments by radio. The most recent case was that of a seaman on a freighter, dying of pneumonia. By means of radio messages between the two ships, far separated in the sea, Dr. Irwin diagnosed the case, secured a list of the remedies carried by the freighter, prescribed the treatment, and at length was rewarded by a flash from the lumbering tramp steamer that the seaman was recovering. Dr. Irwin first earned fame about ten years ago as "the man who cut off a leg by wireless," having directed the amputation on a distant ship when his own was in the Caribbean.

As more and more ships install wireless telephone transmitting apparatus, the radio telephone is adding new laurels to its humanitarian crown. The S. S. *America*, of the United States Lines, had a telephone set installed some time ago, and demonstrated on its first trip thereafter the value of the installation, the surgeon giving directions



This is a "radio beacon" just erected at Inchkeith, an island in the Firth of Forth. It sends forth automatic directional compass bearings for the guidance of ships

by voice to the captain of a freighter 300 miles away, who was ill with ptomaine poisoning. The man's life was saved. Since then every voyage demonstrates anew the great value of the radio telephone.

Irish Destroy a Station

THE British Admiralty Station at Bunbeg, Donegal, Ireland, was destroyed by Irish Republicans on May 10, causing damage estimated at 20,000 pounds sterling or about $97,200 at the normal rate of exchange. The wireless equipment and buildings were burnt only after the furniture of the station and the personal effects of its personnel had been sold at auction to the neighbors.

March Radio Exports

EXPORTS of radio apparatus from the United States during March totaled $21,180, according to the figures of the Bureau of Foreign and Domestic Commerce, which always are about three months behind due to the necessity of collating reports from all ports. Japan took nearly half the March shipments, and Canada came next with $6.761 worth.

France Marvels at American Progress

SOMEWHAT enviously, France, which for years has used the radio telegraph intensively for Government purposes, has cast eyes upon American broadcasting. Here is what "Radio-électricité," a French radio paper, says in a recent issue. in an article entitled "Mister Broadcasting, Friend of Radio:"

"You have guessed it, the name is American, which does not necessarily mean that the person is of that nationality. However, it is certain that Mr. Broadcasting has made a fortune in America, which, over there, gives him the freedom of the city. All the great daily papers of New York, Chicago, Philadelphia, etc., speak of broadcasting. Each week, one or two pages of these powerful organs are consecrated to broadcasting, whose magic name spreads itself over their columns in enormous letters. All American children dream of this personage who has become equal to a god over there; each American family dedicates itself to the new cult. . . .Each wishes to possess a radiophone or aeriola; the journals publish the daily programs, and Mr. Broadcasting has done so much for wireless telegraphy that you cannot find today a single one of the marvelous instruments in any dealer's shop." The article concludes by pointing out that France is far behind even Germany in broadcasting services, and demands that the Government take steps to develop "this art that keeps the family within the home, which develops the taste for science and art, which permits hundreds of thousands of listeners to hear the greatest artists, follow the lessons of the most learned professors, and hear the most eloquent of orators."

New Equipment for Mail Airplanes

AIRPLANES used in the U. S. Mail Service are being equipped with radiophone transmitting and receiving apparatus, in order to enable the pilots to keep in close touch with the flying fields, aiding them in reaching their destinations. The first of these machines so equipped was recently flown from Chicago to Washington in just two minutes over six hours, at the rate of 119 miles an hour, and the pilot reported that his new wireless telephone set was of great assistance.

Protest Closing of Naval Station

PROPOSED dismantling of the Navy wireless station on Grand Isle, La., has brought forth a flood of protests from the residents, who are either fishermen or truck gardeners. They have been profiting greatly by using the market information collected by wireless, in the case of the truckmen, while the fishermen have been able to save themselves from storms as a result of the station's weather reports of Gulf storms. Closing of the wireless station would cut the island off from quick communication with the mainland, and handicap the residents in comparison with other districts along the Gulf. The Navy states that it intends to close the station as a matter of economy, as its commercial business has not been sufficient to warrant its continued operation.

The Radio Corporation of America recently installed a 200-watt radiophone set on the S.S. CARL D. BRADLEY, a Great Lakes cargo boat, which thus had the honor of being the first vessel on the Great Lakes to be so equipped. The set is of the type described in the June issue of THE WIRELESS AGE, and proved its value the day it was put in commission

Show Apparatus at Paris Fair

THIS year for the first time wireless telegraph and telephone apparatus was shown in large numbers in the annual Paris Fair, held in May. Numerous exhibits of commercial and amateur instruments attracted large crowds of French amateurs and the general public. The two "Halls de l'Electricité were thronged with visitors. Special interest was shown in a receiving set making use of a loop antenna in hexagonal form, with the tuner and radio and audio-frequency amplifiers mounted within the base upon which the antenna is fastened.

Radio Serves Holland

WIRELESS weather reports now are transmitted daily by the Netherlands Government, which has found it so successful in code that it is planning to send out the reports by radio telephone, in order to make them available to farmers who do not know the code. Already much radiophone broadcasting is being done in Holland, the Amsterdam Stock Exchange sending out a bulletin every fifteen minutes giving current quotations, and when the exchange closes, a press bureau uses the station for domestic and foreign news bulletins. On Sundays from 2 to 5 music and speeches are sent out by the Netherlands Radio Industry at the Hague.

R. C. A. Opens Chicago Office

IN order to secure a more central point for distribution of its apparatus in the states of the Middle West and the Pacific Coast, the Radio Corporation of America has opened a district office of its sales department in Chicago, and also has secured warehouse space. The new sales office is at 10 South La Salle Street, and the warehouse is in Unit B of the Central Manufacturing building. With these new facilities the Radio Corporation's distributors will be better served in the states of Missouri, Kansas, Nebraska, Illinois, Indiana, Michigan, Iowa, Minnesota, Oregon, Wisconsin, Oklahoma, Texas, Louisiana, Ohio, California, Kentucky, Tennessee, Montana, Alabama, Colorado, Utah, and Washington.

Dr. Michael A. Rebert, surgeon of the S.S. PRESIDENT TAFT, has several "radio cures" to his credit, having frequently treated sick persons by wireless. Here he is seen in the wireless cabin, giving instructions for the treatment of a sick man on a ship far distant over the sea

Requires Use of Radio Compass

THE captains of the Standard Oil fleet of tankers have been ordered to "make full and frequent use of the Naval Radio Compass stations in determining their correct positions." In the event that a Standard Oil vessel runs aground, the company will make an investigation in order to ascertain whether or not the vessel was near any of the 44 compass stations, and whether or not the captain made use of the facilities, in order to determine his responsibility for the accident.

NPO Changes Wavelength

THE U. S. Navy station at Cavite, NPO, in the Philippines, now operates on 13,700 meters when sending East-bound messages. The new length was selected after tests with 14,200 and 13,900 meters, each of which lengths were found to interfere with the Japanese and British stations in the Pacific.

Norway Builds a Station

ADDITIONAL commercial radio telegraph facilities between Norway and the United States are to be secured by the installation of a powerful station on Rundemanden, a mountain 2,500 feet high near Bergen, Norway. The station will work with England and the Continent as well as North America.

Belgians Building Big Station

THE Belgian Government has just started construction of a new wireless station at Ruysselede, near Bruges, in the center of Flanders. The station will provide communication with the Belgian Congo, in Central Africa, as well as with most of the other continents when necessary. The aerial is to be of the radial type, with eight towers each 275 meters high. The power plant will consist of a 1,000-kilowatt generator with two high-frequency transformers of equal power, one of the arc type and the other an alternator of the Bethenod-Latour system. On a wave length of 25,000 meters it is expected to put 850 amperes in the antenna. High-speed transmission is to be used. Other stations are being erected in the Congo to work with it.

A Six Million Market

A MARKET for 6,000,000 radio receiving sets in five years is seen by the Copper and Brass Research Association, which set this modest figure after a short investigation. The Association is composed of manufacturers of copper and brass, who realize that radio apparatus consumes annually many tons of their metals. In reaching the figure of six million sets, the Association took as a basis the fact that there are approximately that number of phonographs now in use, and that the cost of the average receiving set is about equal to that of the average phonograph. Radio experts, however, point out that the six million phonographs were sold over a period of some fifteen years, while at present there are about 1,500,000 radio receiving sets in use, 85 per cent. of which were purchased within the past year. This seems to indicate that radio is destined to far surpass the phonograph, until there is one in every home.

Will Listen for Spirit Waves

SIR ARTHUR CONAN DOYLE, who recently came to America to lecture on his psychic investigations, has become a radio fan, and will take back with him to England a complete wireless outfit of American make. He states that though so far he knows nothing of radio, he feels sure that it will give him a deeper insight into the psychic world.

Navy Sells Surplus Tubes

THE surplus radio transmitting tubes that the U. S. Navy advertised recently for sale to the highest bidder have been sold to Bachrack Brothers of New York. The Bachrack bid was $2.51 each for the 30,000 tubes, which was not the highest bid, but it was accepted as technicalities caused elimination of the other bidders. Many bids were received, ranging all the way from 10 cents each to $4.0069.

The tubes, while designed for transmission, may also be used for detection and amplification by re-slotting the receiving tube socket 45 degrees away from the slot required by the usual detector and amplifier tube. This is rendered necessary by the fact that the Navy tubes have their retaining pins in this position. The tubes when sold by retailers must be in their original cartons, which must show their origin and the fact that they are for amateur or experimental use only.

Signals Circle the Globe

THE time signals sent out by wireless from Annapolis have been heard in the antipodes, half-way around

Sir Arthur Conan Doyle, the famous British novelist and spiritualist, became a radio fan on his recent visit to the United States, and plans to use American wireless apparatus in his work

the earth, at exactly the opposite point from Annapolis. C. E. Adams, astronomer and seismologist at Hector University, Wellington, New Zealand, reported recently that he had heard distinctly the Annapolis signals. The signals were heard only a fraction of a second after transmission, and apparently came both ways around the world.

Michigan Buys Transmitters

THE state of Michigan has purchased from the U. S. Shipping Board 13 transmitting sets, for use throughout the state, particularly at the various ports and mining and agricultural centers. The sets, which were originally purchased for the Shipping Board's wooden vessels, are 1 kilowatt spark transmitters. They will be used for transmitting weather reports, crop and market reports, and official state messages, to local authorities such as forest rangers, police, shipping and coast guards. Other states have made inquiries of the Shipping Board as to its equipment with the evident purpose of acquiring some of its sets.

Navy Studies Static

THE U. S. Navy this Summer is making a special study of static in order to determine more facts as to its cause and methods of overcoming it. All the Navy Radio Compass stations are co-operating with the Weather Bureau in making observations as to the locations of static disturbances, in order to discover whether there is any connection between storm centers and static centers. Three static compass bearing observations are taken daily during the progress of the work.

Coming Radio Shows

ALL Kansas always goes to the State Fair, held every year at Hutchinson. This year Kansas and other visitors will see not only the State Fair, but also the Kansas Radio Exposition, which is to be a feature of the event, to be held September 16 to 22 inclusive. An entire building is to be given over to the radio exhibits. The State Fair is a semi-official event, being conducted under the auspices of the State Board of Agriculture.

Toronto, Canada, will have a radio conference and show on September 8 and 9. The leading Canadian figures in the radio industry will attend, as well as several experts from the United States. Important matters in relation to the use of wireless in the Dominion will be discussed, and many manufacturers and dealers will display their apparatus.

The second annual Pageant of Progress, which will be held on the $5,000,000 Municipal Pier, at Chicago, Ill., July 29 to August 14, inclusive, will have many radio features of unusual interest. A large radiophone broadcasting station will be located on the pier during the exposition and will be in charge of a committee of well-known radio men, including George E. Carlson, Commissioner of Gas and Electricity; L. R. Schmitt, Chief Radio Inspector, Ninth District: Dr. W. A. Evans, of the Chicago Tribune; John T. Tansey, Secretary of the Illinois Radio Club; Geo. B. Foster, of the Commonwealth Edison Co., and Barratt O'Hara, Chairman of the Board of Directors of the Illinois Radio Club, and Wm. J. Herrmann, manager of the Cort Theater. A large block of space has been reserved for radio manufacturers, dealers and others connected with the radio industry. It is predicted by the management that the total attendance of the exposition will be in the neighborhood of 2,000,000.

Newark, N. J., will have a radio show October 4 to 7, inclusive. It will be held in the Robert Treat Hotel, and will be under the management of Edward Siegelson, who managed the show last Spring in Newark.

Marconi Demonstrates Directional Radio

Gives Practical Demonstration of the "Wireless Lighthouse" and Information on World-Wide Investigations of Static and Long-Wave Reception at the Antipodes

SENATORE Guglielmo Marconi, who is now the guest of the Radio Corporation of America in this country, lectured on June 20, before an audience that packed the large auditorium of the United Engineering Societies Building at 29 West 39th Street, New York City. The occasion was a joint meeting of the Institute of Radio Engineers and the American Institute of Electrical Engineers.

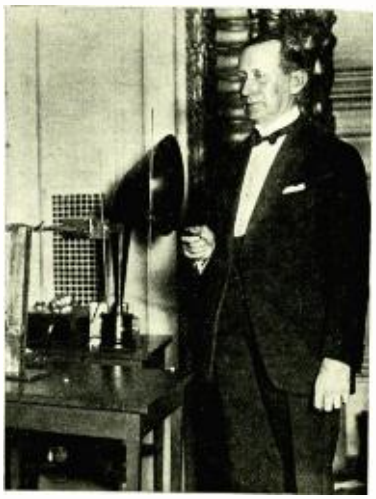
The audience of 1160, which was crowded into a hall built to hold 1000, was the largest which has ever attended either separate or previous joint meetings of these organizations. A conservative estimate is that an additional 500 persons could not be accommodated in the hall and were turned away.

In addition to its unprecedented size, the audience was extremely warm and enthusiastic and Mr. Marconi on his introduction was given a great demonstration of appreciative applause. In spite of its enthusiasm and interest, the great audience was a very quiet one and Mr. Marconi's pleasing voice could be easily understood at the far corners of the main floor and gallery.

Mr. Marconi in his lecture first dealt briefly with the early history of long-distance communication. He said that the work carried out by the engineers and experts of the Marconi Company in England with electron tubes or triode valves shows that, according to their experience, greater efficiency can be obtained at present by a number of bulbs used in parallel than by the employment of large single unit tubes.

Information was given in a general way in regard to recent practice in the design and construction of receivers with the object especially of improving selectivity, reducing interference, and concerning the possible speed of working.

The lecture also dealt briefly with results obtained at receiving observation stations situated in various far distant parts of the world, where it has been ascertained that radio signals arriving from high power stations situated at or near the antipodes of the observation stations, reach the receivers by various ways around the earth, not always following the shortest great circle route, and also that at such places the electric waves coming round by different ways do in certain cases increase this effect on the receivers whilst in others interfere with each other.

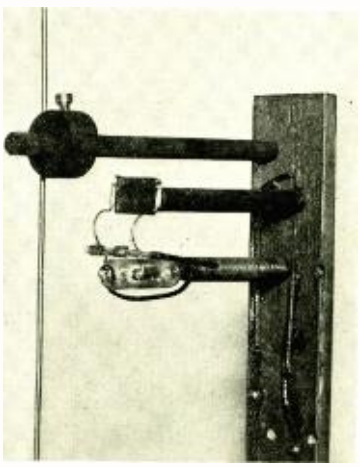


Mr. Marconi and the receiving equipment used at the directional wireless demonstration. The rod held by the famous inventor is the receiving antenna for the 1-meter waves used in the demonstration

Mr. Marconi also said that it has been noticed that apparently transmission is easier from west to east than from east to west, and that it may be necessary to modify somewhat the transmission formula for long distances.

It has also been ascertained that the most troublesome atmospheric disturbances or static usually come from the continents and not from the oceans.

The lecture further dealt with a study of short electrical waves and the results which have been obtained with waves of a length from 1 meter to 20 meters, and describes tests which show for the first time that electric waves of under 20 meters in length, used in connection with suitable reflectors, are quite capable of providing a good and reliable point-to-point, unidirectional system of radio over quite considerable distances.



1-Meter transmitter used in the demonstration of directional radio. Transmitters of several hundred watts have been successfully used in tests of directional radio by reflectors on wavelengths between 1 and 15 meters

The application of this system as a direction finder in aid of navigation, and as a method for preventing collisions at sea, was also dealt with, and Mr. Marconi spoke briefly on the great development of broadcasting in America.

Mr. Marconi's lecture in part follows:

"The results recently obtained and which go to show the relative facility with which radio signals can now be sent from England to Australia seem to indicate that there is something in the idea of the wireless waves traveling round the earth by various ways and reuniting at places near the Antipodes.

"Two expeditions, one to Brazil, and the other to New Zealand have carried out a number of most interesting and instuctive observations, and although complete reports have not yet been received, I think it will nevertheless be of interest if I give you the results of some of their important tests.

"The expedition to Brazil has just completed a series of observations at various points on the Atlantic Coast of South America, where the intensity of the signals from European and other stations has been observed and measured at all times of the day and night.

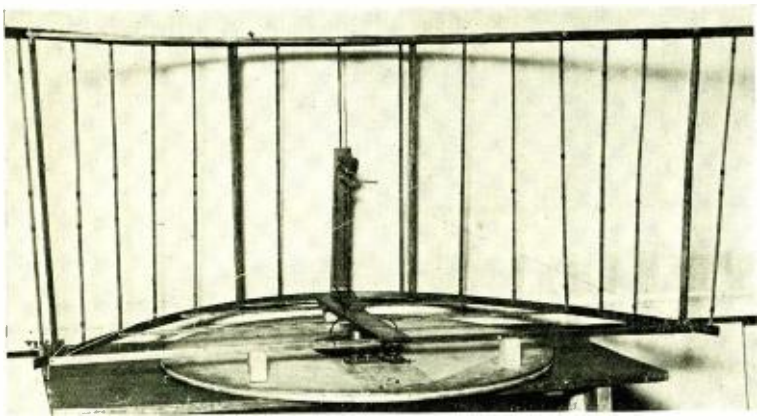
"Another expedition under the direction of the English Marconi Company, has just completed its work in measuring signals from all European and American high power stations, on a journey between England and New Zealand via the Panama Canal, and from the mass of information obtained on both day and night signals it should be possible, among other things, to reconstruct the attenuation formula. Incidentally, I may say that the signals exeed greatly in strength what should be expected according to the Austin-Cohen formula, otherwise super-long distance working would not be a practical proposition.

"Complete measurements from England to the Antipodes have been made on the Carnarvon, Nauen, Bordeaux, and Hanover signals; and also in Brazil on the American high power sta-

tions and on the U. S. Naval station, NPO at Cavite (Philippine Islands).

"The observers noted American signals form Radio Central and from Tuckerton coming from a direction which indicated that they preferred to travel a distance of three quarters of the way around the earth, rather than come by the shortest way around. Always according to the reports received from the observers on other occasions at or near the Antipodes of the English or German stations, the direction finder often indicated the signals as coming from directions all round.

"Another interesting and rather extraordinary result was noted on several occasions, according to the report of Mr. Tremellen from Rocky Point, New Zealand, where during last March the signals from Nauen appeared to travel to him via the South Pole, whilst those from Hanover, also situated in Germany, and not very far from Nauen, appeared to prefer to travel via the North Pole."



The semi-circular or "reflector" antenna used in the demonstration by Mr. Marconi. The signals at the receiver varied in intensity as the waves were directed at, or away from the receiver

Mr. Marconi pointed out that all his early experiments had been conducted with short wave lengths. In the development of radio communication the longer wave lengths have so much absorbed the attention of inventors and engineers that in his opinion the time has come to conduct research in short wave length radio.

"Some years ago, during the war, I could not help feeling that we had perhaps got rather into a rut by confining practically all our researches and tests to what I may term long waves, or waves of some thousands of feet in length, especially as I rememberd that during my very early experiments, as far back as 1895 and 1896, I had obtained some promising results with waves not more than a few inches long.

"The study of short waves dates from the time of the discovery of electric waves themselves, that is, from the time of the classical experiments of Hertz and his contemporaries, for Hertz used short electric waves in all his experiments, and also made use of reflectors to prove their characteristics and to show among many other things that the waves, which he had discovered, obeyed the ordinary optical laws of reflection.

"Research along these lines did not appear easy or promising; the use of reflectors of reasonable dimensions implied the use of waves of only a few meters in length, which were difficult to produce, and, up to a comparatively recent date, the power that could be utilized by them was small. This and the fact of the very high attenuation of such waves over any distance of land or sea, gave results which appeared to be very disappointing.

"The investigation of the subject was again taken up by me in Italy early in 1916 with the idea of utilizing very short waves combined with reflectors for certain war purposes.

"The waves used had a length of 2 meters and 3 meters. With these waves, disturbances caused by static can be said to be almost non-existent, and the only interference experienced came from the ignition apparatus of automobiles and motor boats. These machines apparently emit electric waves from near 0 to about 40 meters in length, and the day may come when they will perhaps have to have their ignition systems screened, or carry a Government license for transmitting.

"Incidentally I might mention that one of these short wave receivers will act as an excellent device for testing, even from a distance, whether or not one's ignition is working all right. Some motorists would have a shock if they realized how often their magnetos and sparking plugs are working in a deplorably irregular manner.

"In 1919 further experiments were commenced at Carnarvon for which electron tubes or valves were used to generate these very short waves, the object being to evolve a directional radiotelephonic system. As a result of the success of these experiments it was decided to carry out further tests over land across a distance of 97 miles between Hendon (London) and Birmingham. It was proved at once that, with reflectors at both ends, good and clear speech could be exchanged at all times between the two places. The power supplied to the tubes employed is usually 700 watts. The aerial is rather longer than half a wave length and has a radiation resistance which is exceedingly high. The efficiency input to the tubes to aerial power is between 50 and 60 per cent and about 300 watts are actually radiated into space.

"With the reflectors in use at both ends speech is strong and of very good quality. It is usually strong enough to be just audible with a ¼ to ½ ohm shunt across a 60-ohm telephone. The result obtained by reflectors appeared to be so good that I was tempted to try out my old idea of 26 years ago, and test the system as a position finder for ships near dangerous points. This is now being done in Scotland. Trials are being carried out with a revolving reflector erected at Inchkeith Island in the Firth of Forth near Edinborough. The transmitter and reflector revolving, act as a kind of wireless lighthouse or beacon, and, by means of the revolving beam of electrical radiation, it is possible for ships, when within a certain distance to ascertain, in thick weather, the bearing and position of the lighthouse.

"The reflector was caused to make a complete revolution every two minutes, and a distinctive signal was sent every half point of the compass. It was ascertained on the steamer that this enabled the bearing of the transmitter to be accurately determined within ¼ point of the compass, or within 2.8 degrees. At a later date a new reflector was designed and erected and is now being tested.

"With the revolving beam the exact times of maximum signals are not easy to judge, by ear, but the times of starting and vanishing are easy to determine, as the rate of rise and fall of the signals is extremely rapid. The time half way between these two times gives, with great exactness, the moment when the beam is pointing to the ship.

"By means of a clockwork arrangement a distinctive letter is sent out every two points, and short signs mark intermediate points and half points; and this is done in practice by contact segments arranged on the base of the revolving reflector, so that a definite and distinctive signal is transmitted at every half or quarter point of the compass.

"I will now try to show you the working of a roughly constructed 1-meter wave transmitter and reflector."

Mr. Marconi then demonstrated the directional properties of a reflector antenna by means of a model which had been erected on the platform. As the reflector was slowly revolved, the signal response obtained in the receiving set and thrown out into the hall by means of a loud speaker horn, increased and decreased in intensity as the beam of radiated energy was directed at or away from it by means of the revolving antenna reflector.

Mr. Marconi then said it seemed that it should be possible to design apparatus by means of which a ship could radiate or project a divergent beam of these rays in any desired direction, which rays, if coming across a metallic object, such as another steamer or ship, would be reflected back to a receiver screened from the local transmitter on the sending ship, and thereby immediately reveal the presence and bearing of the other ship in fog or thick weather. One further great advantage of such an arrangement would be that it would be able to give warning of the presence and bearing of ships, even should these ships be unprovided with any kind of radio.

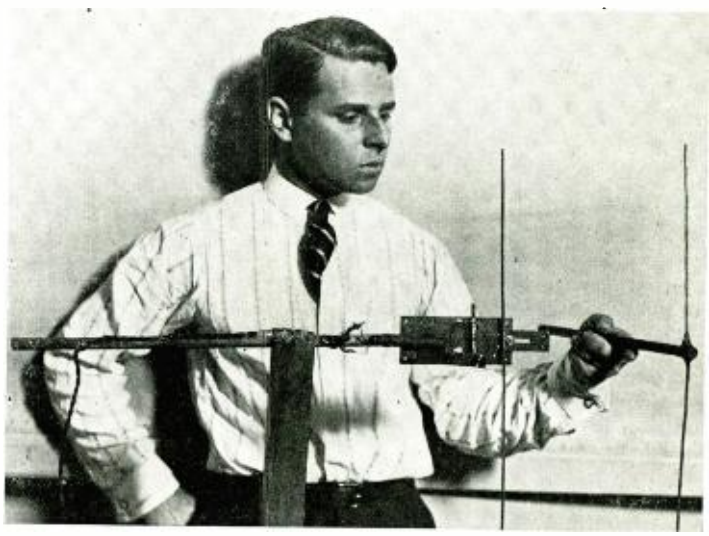
Mr. Marconi, in referring to static, made known the following results of his investigations:

"It seems to have been definitely ascertained in a general way that the sources of bad atmospheric disturbances, or static, are situated chiefly over land, but observations in Brazil indicate that a type of static known as 'grinder' is a disturbance originating a long way off and coming from a direction which indicates the African Coast and at a time of the day when static there would be at a maximum, whereas a very violent 'click' type of static came from a direction indicating its source as being nearby in South America.

"During my present journey across the Atlantic, on board the Yacht *Elettra*, we noticed that up to about half way across (apart from the effects of local storms) static interference appeared to be coming mainly from the European and African continents, while at more than half way across they were coming from Westerly directions, that is, from the American continent. The changing over of the direction of origin of these disturbances has also been noted under similar circumstances in the Pacific."

"In thousands of homes in this country there are radiotelephonic receivers, and intelligent people, young and old, well able to use them—often able to make them—and in many instances contributing valuable information to the general body of knowledge concerning the problems great and small of radiotelegraphy and radiotelephony.

"But I think I am safe in saying that if radio has already done so much for the safety of life at sea, for commerce, and for commercial and military communications, it is also destined to bring new and, until recently, unforseen opportunities for healthy recreation and instruction into the lives of millions of human beings."



When another "antenna" or coil of wire, the period of which was the same as that of the transmitter, was placed in front of the receiving antenna, the signals entirely disappeared, illustrating very clearly the principle of absorption

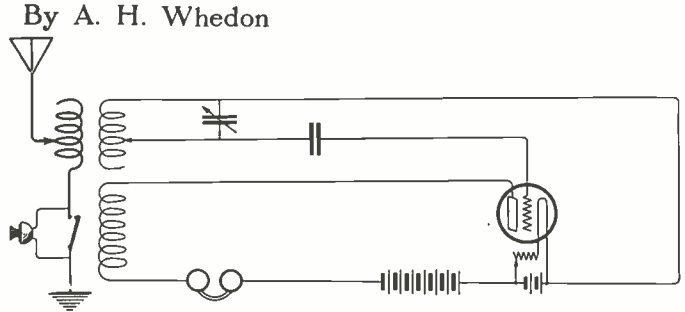
Referring to the great development of radio in this country, Mr. Marconi said it was a revelation to him, when, 300 miles off the coast he began to pick up speech and music from the various broadcasting stations of this country. In commenting on the great development of this branch of radio Mr. Marconi said:

At the conclusion of his address Senatore Marconi was presented with the gold medal of honor by the Institute of Radio Engineers.

How to Convert a Regenerative Receiver Into a Simple Radiophone

By A. H. Whedon

DISCONNECT ground lead of receiver and insert a transmitter in series with the ground wire. Shunt a single pole single throw knife switch around the transmitter so as to be able to short circuit in order to receive when not transmitting. Adjust set so that detector is in oscillation as if to receive C.W. Talk or blow into transmitter and adjust tickler coil until voice is plainly heard in receiver.



The simple radiophone hook-up

This arrangement will be found to work very satisfactorily for short distances, and will afford the experimenting amateur who is not able to purchase a more expensive phone some experience in transmitting.

Armstrong Super-Regenerative Receiver

This New Circuit Makes Possible Amazing Amplification by Stopping Oscillations of the Regenerating Tube and Then Carrying Regeneration to the Absolute Limit

By Abraham Ringel

ON June 7, last, Edwin H. Armstrong demonstrated his new invention, the super-regenerative receiver, before the Institute of Radio Engineers, and described the new principle by means of which it is possible to carry amplification to what has been heretofore considered as impossible limits.

The apparatus described and demonstrated was not unduly elaborate nor were the circuits employed at all complicated. The amount of amplification obtained, however, when compared with that of an ordinary regenerative set, was amazing.

In the course of his lecture, Mr. Armstrong gave an actual demonstration of his latest discovery, contrasting a number of arrangements of regenerative and super-regenerative circuits on the concert transmitted from WJZ, at Newark, twelve miles away. The Engineering Societies Building, at 39th Street and Fifth Avenue, New York, where the demonstration was made, is built entirely of steel and stone; the steel framework being well grounded. The hall itself is on the fifth floor, and its dimensions are, about 75 feet wide, by 150 feet long.

Demonstrating Armstrong's remarkable super-regenerative receiver before the Institute of Radio Engineers

With a two foot loop as an antenna, and a loud-speaker horn, the speech and music obtained with a two-tube super-regenerative set was so great as to flood the entire lecture hall. The quality also was surprisingly good. With an ordinary regenerative receiver, followed by two stages of audio-frequency amplification, the same loop and loud-speaker, the concert was just barely audible to listeners seated only ten feet away.

This is even more remarkable, when it is considered that in the super-regenerative arrangement, only two tubes were used, neither of which was employed for audio-frequency amplification; whereas in the ordinary regenerative circuit, three tubes were necessary, including two stages of audio-frequency amplification.

Mr. Armstrong estimates that the amount of amplification of the super-regenerative system is approximately 100,000 times as great as is possible with the regular regenerative circuit; and in some cases, this ratio could be increased to 1,000,000 to 1.

The new system is unique in one respect, in that it does not amplify damped wave signals to anywhere near the same extent as continuous or modulated continuous waves. This makes it especially desirable, therefore, in broadcast reception or in C. W. telegraphy. This discrimination against spark signals is of great value also in such congested radio districts as New York City, where spark stations often seriously interfere with a radio concert.

Theory of Regeneration

Before describing the principle involved in this new extension of regeneration, we will consider the behavior of an ordinary regenerative receiver. Incoming signals are applied between the grid and filament of the tube. These oscillations are amplified in the tube and as a result, we get very much greater variations in the plate circuit. If the plate circuit is coupled back to the grid circuit, the reinforced oscillations are fed back to the grid and are once more re-amplified by the tube. In this way we can build up a very weak signal until it is of sufficient amplitude to give a loud sound on detection.

This process is called regeneration. The amount of amplification is controlled by the coupling between the grid and plate circuits. In the case where a tickler coil is used in the plate circuit, the extent of regeneration depends on the magnetic coupling between the tickler coil and the grid coil. Where a variometer is employed in the plate circuit, the coupling is capacitive, due to the capacity between the grid and plate of the tube itself, and the magnitude of this coupling is determined by the value of the variometer inductance.

The effect of regeneration is to reduce the effective radio-frequency resistance of the receiving circuit to a very low value. This the operator can prove to his own satisfaction by actually inserting several hundred ohms in the tuned grid circuit. He will find that by increasing the regenerative coupling between grid and plate circuits, he will obtain the same signal as if the resistance were not present. In other words, in regeneration we have a powerful method of annulling the resistance of a receiving circuit. In this way it can be reduced to as low as a few hundredths of an ohm. This low resistance accounts for the sharpness of tuning obtained on a regenerative receiver—very often a variation of only half a degree on a tuning knob is enough to lose a signal which is otherwise of several hundred times audibility. This helps to explain the presence of vernier adjustments on all good types of such receivers.

As the coupling is increased still further, the resistance of the circuit is lowered and lowered, with consequently greater amplification. When the resistance approaches zero, the tube com-

mences oscillating at a frequency determined by the tuned circuits. These oscillations are identical to those obtained in continuous wave transmitters, except that they are much feebler. Although the signal received is very much louder, its quality is entirely lost. If it is a spark note, it becomes hoarse and mushy, losing its characteristic note—and speech and music, although their presence is apparent, become absolutely unintelligible gibberish. If no signals are coming in, the presence of oscillations can be detected as follows:

1. As the regenerative coupling is increased to the oscillating point, a sudden rushing or hissing, is heard in the phones.

2. Touching the grid terminal of the tube with the finger will produce a dull thump in the phones—and removal of the finger will cause a similar thumping noise.

THEORY UNDERLYING SUPER-REGENERATION

As explained before, much greater signal strength is obtained when regeneration is increased—but this is all upset when the tube breaks into oscillation. In his super-regenerative circuit, Armstrong increases the coupling so that the tube is far beyond the oscillation point, and the effective resistance of the circuit is made even less

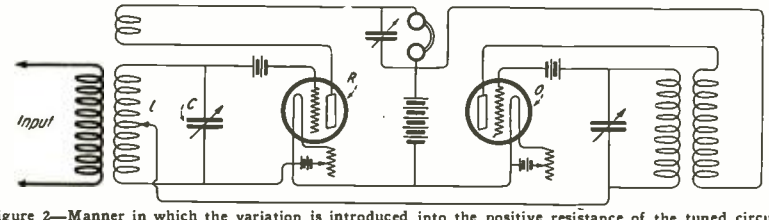


Figure 2—Manner in which the variation is introduced into the positive resistance of the tuned circuit. This is done by means of an oscillating tube O, the grid circuit of which is connected through the tuned circuit LC of the amplifying tube R

than zero;—the circuit is made to have a negative resistance. And he stops the oscillations so that he can take advantage of this negative resistance and thus obtain overwhelmingly powerful signals!

Before going any further, let us diverge a bit and delve into the theory of various tuned circuits containing (1) positive resistance, (2) zero resistance, and (3) negative resistance. In the first case, when continuous oscillations are impressed, after a short building up time, the oscillations attain and preserve a definite constant amplitude. When the impressed oscillations are removed they die away to zero. The greater this resistance, the longer it takes to build up the oscillations and the faster they die off—and vice versa. In the second case, when continuous oscillations are impressed, they keep on steadily increasing in value, depending on how long they are applied. If the source of oscillations is removed, the circuit keeps on oscillating at the same amplitude it had when the voltage was removed.

In a negative resistance circuit, if oscillations are applied, they keep right on building up to an extremely great value, regardless as to whether the voltage is removed or not. However, at any given time after the emf. is impressed, this amplitude, although very large, is always proportional to the initial applied amplitude. Thus, if we have continuous waves modulated by speech or music applied, the amplitude will be proportional to the actual amplitude of the speech waves at the moment of application. No matter how small this initial voltage is, it will at once commence to build up to an infinitely large value. So much for pure theory. In actual practice, if we go to negative resistance circuits, we cannot secure the above results, because the circuit breaks into oscillation at the slightest shock, thus paralyzing the tube.

THEORY OF THE SUPER-REGENERATIVE CIRCUIT

Armstrong now comes to the rescue with his epoch-making discovery. He takes advantage of regeneration to the limit of a tube, and still prevents it from oscillating. He has discovered that he can stop oscillations in a negative resistance circuit either by introducing resistance in the circuit at definite intervals or by reducing the amount of regeneration, so that the circuit resistance becomes positive and negative alternately. In both cases the effect is to give the circuit first a positive and then a negative resistance. This alternation is sufficient to prevent oscillations. During the negative resistance period we can make full use of the very great amplification produced—but just as the circuit is about to start oscillating of its own accord, we introduce a positive resistance. During the positive resistance period, the circuit, of course, cannot oscillate and the resulting amplification of the incoming signals is much less than before.

This variation between positive and negative resistance may be made at any frequency desired, provided that it is less than that of the incoming oscillations. No doubt it could be done mechanically by connecting a resistance in the tuned grid circuit, regenerating beyond the oscillation point, with the resistance short circuited, and then alternately short and open circuiting the resistance at any desired frequency. Variation in regeneration may be accomplished in a similar manner by mechanically varying the plate voltage of the regenerating tube, so that the grid circuit resistance is alternately positive and negative. Then again, we may use a combination of both methods.

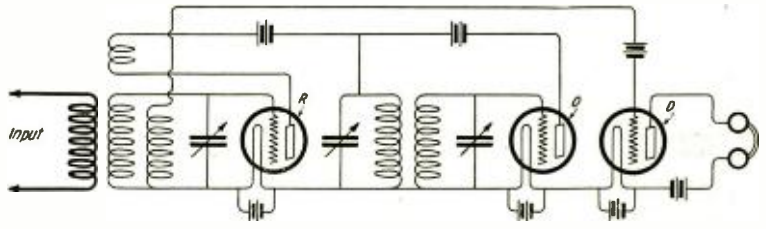


Figure 1—Method of varying the plate voltage coupled into the plate circuit. In this arrangement a third tube acts as a detector

But moving mechanical parts may be dispensed with and vacuum tube oscillators employed to produce this variation in circuit resistance or amount of regeneration. These methods are illustrated in the diagrams.

SUPER-REGENERATION BY PLATE VOLTAGE VARIATION

Figure 1 shows how the amount of regeneration is varied by varying the plate voltage. The first tube is the regenerator, which introduces negative resistance in the grid circuit. Incoming signals are coupled to the grid circuit, amplified in the first tube and fed back to the grid by means of the tickler coil. The tickler coupling is made large enough to carry the circuit beyond the oscillating point. The second tube acts as oscillator of any frequency desired. Generally, one of about 10,000 cycles is suitable. The amateur and experimenter will recognize the usual oscillating circuits. The coils and condensers should be so selected as to give this frequency (which corresponds to a wave length of about 30,000 meters).

Note that the plate oscillatory circuit is also in the plate circuit of the first tube. The plate voltage of this regenerating tube is thus varied at a frequency of 10,000 cycles. When the oscillations are such as to make the plate more positive, regeneration is increased beyond the oscillating point, and the signal amplitude increases to a very

great value. Just as the tube is ready to burst into oscillations of the circuit frequency, the applied frequency reduces the plate voltage to a low value, and thus reduces regeneration and introduces a positive resistance in the grid circuit—effectually cutting off any sign of free oscillation. A very high degree of amplification is thus obtained during those half cycles of the 10,000 cycle oscillations when the plate is made more positive.

The grid circuit of the first tube is coupled to an aperiodic coil in the grid circuit of the last tube, which acts as a detector. Rectification is accomplished by applying a negative potential to the grid, instead of the usual condenser and leak. But it is really immaterial which method is used. The

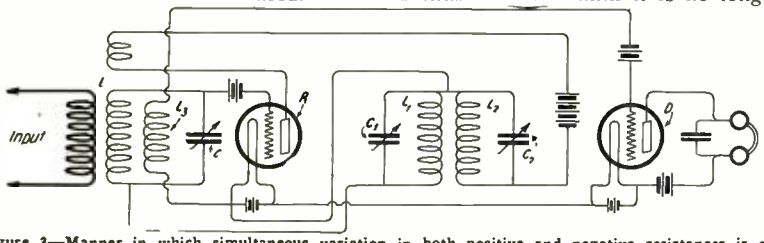


Figure 3—Manner in which simultaneous variation in both positive and negative resistances is obtained. This is accomplished by providing the amplifying tube R with a second feed back circuit L1C1 and L2C2, adjusted to oscillate at some lower frequency

first tube may be an amplifying tube, such as a UV201. But it is desirable to have power tubes, UV202, for the oscillator and detector, because of the energy they are required to handle. Nevertheless, UV201's may be used throughout. For the receiving circuits, the coils and condensers should be of values suitable for tuning to the wave length range desired. In the oscillatory circuit, the coils should be quite large—with an inductance of the order of 100 or 200 millihenries. (Honeycomb or Duo Lateral Coils No. 1250 or 1500, approximately.) Pie-shaped coils used in spark transformers, having 1,500 to 2,000 turns, are suitable here. The condensers are ordinary 43 plate variable air condensers.

The system shown in figure 1, should present no great difficulty in operating or adjusting. The condensers and coupling in the oscillator are adjusted until a very high pitched whistle is obtained. Then the receiving and regenerative circuits are tuned to the station to be received in the usual manner. In fact, the operation should be much easier than that of the average receiver.

SUPER-REGENERATION BY RESISTANCE VARIATION

Figure 2, shows a method whereby a positive resistance is introduced into the tuned grid circuit of the regenerating tube. Incoming signals are applied to the grid of the first tube and amplified by regeneration due to the tickler coupling. The second tube acts as a 10,000 cycle oscillator—and these oscillations are also impressed on the grid of the first tube. The regeneration is carried beyond the normal oscillation point of this tube. During that half cycle, when the local oscillations make the first grid negative, no grid current is drawn and the effective radio frequency resistance of the circuit is negative because of the super-regeneration. The incoming signal is built up to a very great amplitude during this interval. Just as the first tube is ready to go into oscillation, the local oscillations are reversed and tend to give the first grid a positive potential. In this case, a stream of electrons commences to flow from the filament to the grid and this is equivalent to connecting a resistance of several thousand ohms across the tuned circuit. The effective resistance of this circuit is thus increased until it is no longer negative, but positive, and thus chokes off free or self oscillation in the receiving circuits. Of course, we obtain very high amplification in the negative resistance periods. In the circuit shown, the first tube acts as the detector. Evidently, Armstrong prefers to use a grid bias battery instead of condenser and grid leak to obtain rectification.

Only two tubes are used in this arrangement, the first performing two functions; regenerator and detector; the other acting only as an oscillator. Since the only thing that controls the amount of amplification is the limit of the tube, better results could be obtained by using power tubes instead of ordinary receiving tubes in cases where extraordinarily great intensity is required.

SUPER-REGENERATION BY COMBINED RESISTANCE AND PLATE VOLTAGE VARIATION

Figure 3, shows a method of varying the resistance in the tuned grid circuit and plate voltage simultaneously. The circuit L C is tuned to the incoming signals and these are impressed on the grid of the first tube—the signal being amplified by regeneration in the manner described above. In series with L and C, we have another tuned circuit L_1 C_1 coupled to L_2 C_2, which is in series with the tickler coil. These circuits are used to produce the necessary 10,000 cycle oscillations. The condensers C_1 and C_2, should be of fairly large capacity, say .001 microfarad, in order to provide a by-pass for the incoming high frequency signals—since the latter would be blocked by the high inductance coils L_1 and L_2, (of about 200 millihenries each).

The received signals are super-regenerated as usual during that interval when the 10,000 cycle oscillation applies a negative potential to the grid, and at the same time tends to increase the effective plate voltage. The oscillations in the grid and plate circuits must be of the proper phase, so as to produce both the above effects at the same time. During this half cycle, the effective resistance of circuit L C is made negative, resulting in considerable regenerative amplification. Just as L C is on the verge of self oscillation, the polarity of the applied 10,000 cycles reverses, so that the grid is made positive and the plate voltage is lowered. The former causes grid current to flow, thus introducing positive resistance. The reduction in plate voltage decreases the amount of regeneration and thus aids in increasing the positive resistance. Under such circumstances, of course, free oscillations are completely choked off.

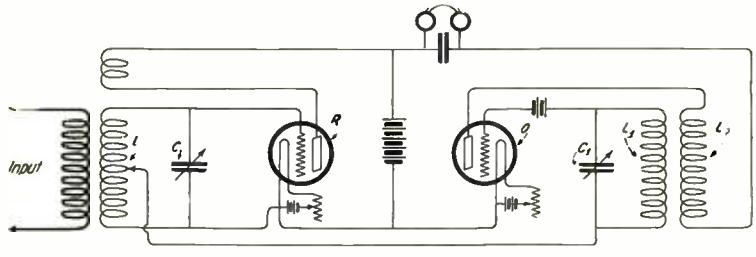


Figure 4—Shows how the oscillating tube is made to perform the additional function of a detector

In this arrangement, both regeneration and 10,000 cycle oscillation are performed within a single tube. A second tube, the grid of which is coupled to L, acts as the detector. The adjustments both for tuning and local oscillation are very critical. Hence this hook-up is not suitable for use by the average experimenter because of the great pains necessary in order to secure super-regeneration.

PRACTICAL SUPER-REGENERATIVE CIRCUIT

Figure 4, shows a practical two tube hook up. It is essentially the same as that of figure 2. The first tube is the regenerator and the second, the local

oscillator. Free oscillations in the receiver circuit are stopped by those half cycles of the local oscillations which make the first grid positive.

The unusual feature in this arrangement lies in the use of the oscillator tube as the detector of the signals which are amplified by super-regeneration by the first tube. The amplified signals are impressed upon the grid of the oscillator tube, which rectifies them, in the plate circuit, thus making them audible.

Both tubes may be Radiotrons, UV201. But better results could be obtained with a UV202, a five-watt power tube, in the detector stage. In the latter case, much greater energy is available for loud-speaker operation. In this connection, it is important to note the plate voltage required. Where UV201's are used, the B battery should be about 80 or 100 volts. In this case, a bias of about 5 to 8 volts negative on the grid of the detector tube, would be required for rectification. With UV202's, voltages above 150 volts are desirable for the plate, and about 15 to 20 volts negative on the grid for detection.

CONCLUSIONS

Although the super-regenerative circuit may be used in conjunction with an ordinary regenerative receiver and antenna, its greatest value in the future is in its application to loop reception. Since practically the same strength of signal is attained, whether using outdoor aerial or indoor loop, the latter is to be preferred, because of its convenience. There is little doubt, therefore, that within a comparatively short time after the general application of this discovery to broadcast reception, most receiving antennas will cease to grace the house tops of the countryside.

Super-regeneration offers a powerful means of amplifying signals at short wave lengths. It is effective as low as 20 meters. In other words, it is the door to the band of wave lengths below 200 meters, which have, until now, been so studiously avoided. It is well known that many more transmitting stations can be accommodated at such high frequencies. Congestion in the ether in the neighborhood of 200 meters will be considerably relieved, when amateur stations will utilize wave lengths down to 150 meters.

A brand new field of investigation is open to the amateur experimenter. May we not now expect some new discoveries in the theory of transmission of ultra-short wave lengths? American amateurs have but recently startled the radio world when they succeeded in spanning the Atlantic Ocean with but a few puny watts, at 200 meters. With infinitely better antenna radiation from 100 meter transmitters, and Armstrong Super-Regenerative Receivers, it begins to look as if big developments in amateur radio communication were close at hand.

An Operator's Wife in the Wilderness

A Glimpse of Life at an Alaskan Mining Camp Radio Station Far From Civilization

By Mrs. Howard S. Pyle

A TYPICAL Alaskan rainfall greeted me upon my arrival at Jualin. Here I was to make a home for my husband, who had preceded me to his new post as radio operator-storekeeper for an Alaskan gold mining company. All of Jualin was visible at a single glance; the wharf; ugly red buildings at the farther end; and the seemingly endless forest.

I turned toward the wireless operator from the vessel, who, having previously been employed here himself, was acting as my guide. "I guess there is no one here to meet you," he was saying, "but it's only seven miles to the upper camp, and you can't get lost if you follow the mule team track." He looked dubiously at my neatly tailored suit, new hat and oxfords, however, observing that I would probably be soaked long before I reached there. But my oldest things were in my trunk and the clothes in my hand bag were even more unsuitable. The problem was still unsolved when we reached the warehouse, where over the private telephone system I called up the upper camp, only to be informed that the operator had left the camp; should, in fact, even now be at the dock. And he was. Turning about, there at my elbow was my husband!

Somehow I knew this was my life partner; but certainly not by recognition. How changed he was from the smart young man who had left me in Seattle two weeks before! A beard of several days' growth; trousers two sizes too large; high hiking boots and

The authoress in Alaska

a rough shirt covered by a sleeveless sweater, topped with the queerest cap I had ever seen!

Then and there I burst out crying. The ship was fading into the distance, and I thought of friends I would probably never see again, of a once immaculate husband, of home amid comfortable surroundings . . . and then of this wilderness to which I had come. Dejectedly, I stood around, sinking lower in spirit as we waited while the freight was checked, and the mule cart loaded for the "upper camp."

Finally we started, and a funny sight we must have been: I with my city clothes, riding atop a load of sacks on a cart drawn by mules, and holding an umbrella over my head to save my new bonnet, and my husband in his old clothes perched on a load of freight with Big Bill, the teamster, bellowing at the mules. I chatted incessantly, till we reached the lower camp, five miles from the wharf, where we stopped for "chow." And such a feed! A plate heaped with fancy shaped sandwiches; egg, cold beef, and cheese, which Herman, the cook, had prepared for us; steaming hot tea, chocolate cake, delicious cream pie; all delicacies which I had never hoped to see after leaving the States. That meal marked a milestone; my despondency over Alaskan wilds vanished—never, incidentally, to return.

And thus it was that I came to my new home. The upper camp proved to be quite a settlement. There was a store, of which my husband had charge; the mine offices, stamp mill, superintendent's house, large modern bunkhouse with showers, and a pool room, also a cook house, besides quarters for several families, and of course, the wireless station KJA, with which communication was maintained with the outside world.

Our new home was located at the bottom of the valley, with 3,000-foot mountains towering on three sides, covered the year round with snow almost down to our level. Below the snow line were vegetation and dense forests which were almost impenetrable. Our

cabin was of two rooms: a "galley" which contained a wooden sink, table, stove, cupboard and large wardrobe for clothing, and a large front room, which served as a living room, bedroom and operating room.

The radio installation occupied almost one entire corner of this last room, and was certainly an old-timer. It was of the Marconi 5 K.W. open core type, with a sixty-cycle straight spark gap with air blast, the discharge of which could be heard for great distances up and down the valley. The key was of the type in which heavy brass contacts were immersed in a tank of water beneath the table, and the make and break occurred under water. The lever was nearly a foot long, and took two hands to work it—almost. Often the contacts would stick so that the lever would have to be lifted up by hand to assist the spring. Two large racks holding twenty-four two-quart Leyden jars each, which formed the capacity, occupied considerable floor space. The 5 K.W. "coffin" also had its place on the floor, next to the stove. The helix type of oscillation transformer rested majestically atop the condenser racks, and several spiral loading inductances on the wall—to reach the 1980-meter wave length, completed the transmitter. The receiver was a Marconi type 101 panel, known as the "piano tuner," which was quite serviceable, after we had added a vacuum tube to replace the carborundum crystal furnished with the set. A Marconi type S transfer switch, and a two-wire antenna, eighty-five feet high and 800 feet long, completed the installation at KJA.

On our very first day we set to work in earnest, painting, calcimining, cleaning, and making our new home livable. And this activity held us for many days as the place had been occupied by an unmarried youth for several weeks, and had had scant attention. Then we settled down to our routine. The wireless apparatus required constant "nursing" and kept my husband busy, in order not to miss a schedule with the Juneau Navy Station. We maintained two such schedules a day, and they had to be on time. This, together with his duties as storekeeper, kept the operator busy from 7 a. m. till 9 p. m., and included frequent seven-mile trips to the wharf in connection with the stores.

Social life at Jualin consisted of an afternoon at the Superintendent's house, with the other four women who made up the entire female population of the place. Sewing was the principal occupation and camp gossip a side line.

The trips to the wharf and lower camp became an event of some importance in the Fall, as supplies for the Winter months arrived. In Winter Jualin has snow, and plenty of it, and we practically hibernated during the cold spell. By this time the many wild berries were ripe, and salmon were coming up the small streams to spawn, both of which attracted the black and brown bears from the hills. At first their presence was merely rumored about the camp, but after several encounters by various members of the colony, the animals were seen to be a serious menace, and the women were forbidden to leave the camp limits without suitable protection. Often the bears would come almost up to the cook house, seeking scraps of food. Porcupine, too, were plentiful, but not dangerous if unmolested.

A small mail boat arrived once a week from Juneau, bringing mail and fresh supplies, but this was only during the Summer months; trips were made in the Winter when the weather warranted. Passengers in limited numbers were also handled on the mail boat, and generally two or three would come and go each week; restless characters who had been at Jualin long enough to make a stake sufficient to carry them to the next camp.

On one occasion the passengers from the steamer *City of Seattle*, mostly excursionists from Eastern States, swarmed ashore, and loaded me with fruit, candy, magazines, books and flowers. They plied me with questions faster than they could be answered. The appearance of a woman in such a place as Jualin was beyond their comprehension.

Weeks of this life followed, when rumors began to take more definite shape about camp to the effect that the mine would shortly close. The rate of exchange on foreign capital was too high for profitable operation of foreign-owned mines, and as we were financed by Belgian interests, our mine was seriously affected. Rather than be caught in the shut-down, we talked the situation over, and laid new plans. Both desiring to remain in Alaska, our final decision was to go back to the Navy, for we had promise of being stationed at one of the Navy Radio Stations in Southeastern Alaska; Sitka, Juneau or Ketchikan, all very desirable. The mines had charmed us, and we were really loath to leave, but had to look out for our own interests.

In order to take advantage of the Navy's offer of one of the three southeastern Alaskan stations, we were required to report in Juneau aboard the *U. S. S. Vicksburg* before midnight, August thirtieth, and as the last weekly mail boat had left, and no more would call before September 3, we wired the Navy Department and a sub-chaser was dispatched to Jualin to pick us up, together with our effects, and take us to Juneau.

That evening we walked off into the woods, to a favorite spot we had, near an old abandoned mine shaft, to talk over our future plans. In the distance, Old Lions' Head, said to be an extinct volcano, reared its snow-covered head, and made us feel more than ever reluctant to leave. There were also mines on the other side of Lions' Head, but only once had we seen anyone from over there, when an old prospector walked into camp one day, with his dog, gun and portable canoe.

The next morning we started for the wharf for the last time. Our boxes and trunks were to follow us to Juneau on the weekly mail boat. We reached the wharf, just as the sub-chaser came up the bay, and it was indeed a welcome sight, for we had missed our Navy associations. But were we free from the Navy and Jualin again running full blast, I know two persons who wouldn't hesitate at returning to KJA.

The mill at Jualin, with radio shack in upper left corner

Head of the valley at Jualin. Station located in bowl at foot of mountains

Ninety-Mile Voice Communication by Radiophone on Moving Train

IN a series of radiophone transmitting and receiving tests on the lines of the Frisco System, between a moving train and two stations at fixed points, speech and music were successfully transmitted and received over a distance of nearly 100 miles, undoubtedly establishing a record for this branch of radio.

The tests were made on May 30 between a temporary station on a Frisco train, Station WKY of the *Daily Oklahoman,* and the Government radio station at Post Field.

Equipped with a regenerative receiving set, with four stages of amplification, a loud speaker, a 100-watt tube transmitter and a novel antenna, consisting of four, four-wire cage antennas, strung from one end of the car to the other, the special car was attached to Frisco train No. 9 at Oklahoma City on the morning of May 30 and hauled to Lawton, Okla., a distance of 100 miles.

At Mustang, Okla., a distance of thirty miles from Oklahoma City, where the station of the *Daily Oklahoman* is located, a severe electrical storm was encountered, but signals were received and little static encountered, the signals and music being of sufficient strength to be heard above the static. In fact, constant communication was kept up between (WKY) Oklahoma City and DM6 (Post Field) and the car.

At Cement, Okla., sixty miles from Oklahoma City and forty miles from Post Field, the signals, music, weather reports and Liberty bond, and other quotations were received with as much clearness as they were at Wheatland, Okla., only sixteen miles from Oklahoma City.

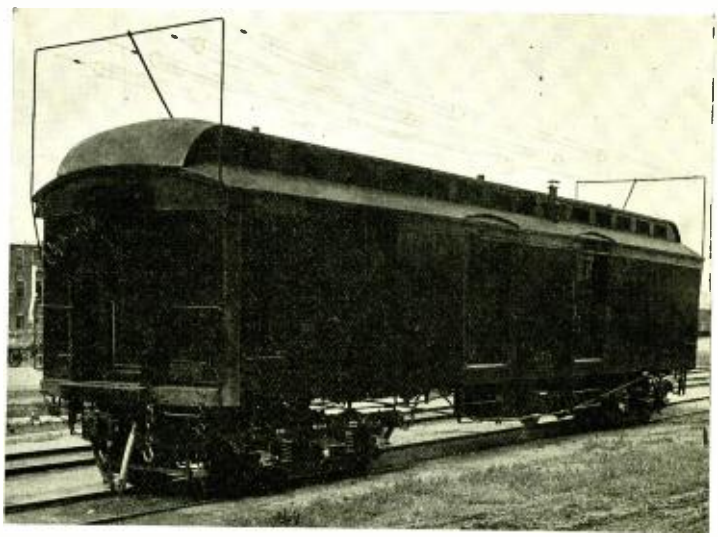
On May 31 the same trip was made with the car over the same stretch of track and proved to be even more successful than the one made on May 30. Favorable weather conditions, together with improvements in the apparatus, contributed to the success of the trip on May 31. The speech and music in these tests were transmitted for more than ninety miles and the signals were received on the Frisco train with only two stages of amplification in such volume as to make them audible above all other noises or disturbances. The return trip from Lawton was made on June 1 and the same success was had as on the two preceding trips.

Interior of the car showing set. Operator H. S. Richards at the table

J. C. Brennan, superintendent of telegraph for the Frisco lines, Carl Williamson, assistant superintendent of telegraph for the some lines, Robert M. Reed, radio editor of the *Daily Oklahoman* and Earl Hull and Sherwood Richards of the Oklahoma Radio Shop completed the testing party. On all trips made, the special car was full of passengers who had been invited to listen to the music and speech.

The Frisco officials are taking up radio in earnest and this test is the first of a series which they expect to make over the system. It is planned by the Frisco officials to first install radio receivers in dining cars and club cars as a form of entertainment for passengers, and later, if it proves practical, it will be used on various divisions for dispatching trains.

The tests made by the *Oklahoman* were a revelation to the railroad men, who entered the affair with every sort of doubt as to the success of the event and only after the twenty-five mile range had been passed were they convinced that radio could be used for practical railroad work.



Car showing antenna designed by Earl Hull, operator at WKY

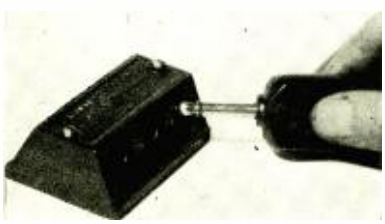
How the Britton-Leonard Championship Boxing Match on June 26, was described blow-by-blow, by voice amid the cheering of the crowd in the arena, directly from the ringside to 200,000 persons will be fully described in the August issue of The Wireless Age.

NEW APPLIANCES AND DEVICES

The Pacent Plugs and Adapter

THOSE who use radio receiving outfits know how troublesome and unsatisfactory it is to pass a single pair of phones about so that more than one person can listen in. If two sets of phones are available with only one jack on the receiver, the phones can be placed in the circuit only after trouble and inconvenience. To fill this need the Pacent twin adapter has been brought forth by Louis G. Pacent, and with it one jack can be made to serve the purpose of two. Thus the receiver can be tuned with the phones and the loud speaker can then be plugged in. The twin adapter will also be found very serviceable when making rapid connections and changes in C. W. work. The Pacent twin adapter is provided with heavy phosphor bronze spring connections and it is finished in polished brass and a velvety black composition. The adapter may be used with plugs of any make.

The Pacent multijack is really three jacks built into one. This new development followed closely on the heels of the twin adapter and it may be used in connection with the twin adapter and the Pacent plug. The three jacks



The Pacent Multijack

which make up the multijack are built into composition base that may be attached to the side of a receiving cabinet, or to a testing board, or table. The ends of the multijack are flat, so that a number of them can be placed end to end where a large number of connections are necessary. If three Pacent twin adapters are used in connection with a single multijack, as many as six connections can be made. Both the Pacent twin adapter and the Pacent universal plug fit into the multijack. Like the twin adapter, the multijack is provided with heavy spring contactors, which insure low resistance connections.

The Grebe Radiotone cabinet

Grebe CR-10 in Radiotone Cabinet

THE latest product of A. H. Grebe & Co., Richmond Hill, N. Y., takes the form of an attractively-cased receiving set for use in homes desiring to profit from the broadcast programs. The set, which has three stages of amplification, is contained in a handsome cabinet of the talking machine type. The control panel is located just back of the two swinging doors of the cabinet, and immediately under this is the large end of the loud speaker horn, bearing across its face in pierced wood a reproduction of the well-known "Grebe Radio" trade-mark. At the bottom of tne box is space for the storage battery, rectifier, battery tester and other articles.

The number of the new set in the Grebe line is CR-10. Its range is from 150 to 3,000 meters. Tuning is done by a primary inductance having ten taps, a variometer and an 11-plate variable condenser. Both the condenser and the tickler are provided with verniers for fine adjustment.

New Elementary Book by the Radio Corporation

THE Radio Corporation of America has just published a book entitled "Radio Enters the Home," which has been written especially for the man in the street who, while knowing nothing of the technicalities of wireless, wishes to benefit by the broadcasting now being conducted in all parts of the country. Written by experts in popular language, the book, which has just appeared, has shown itself to have a great appeal to the general public, as it explains radio in terms anyone can understand. It contains four sections, which lead the reader in logical steps from the uses and advantages of wireless, and especially the radio telephone, logically through the principles and apparatus used in, first receiving and then transmitting. Valuable operating directions are given for operating both receiving and transmitting equipment; these in particular are exceedingly valuable, as heretofore most novices have had to learn by experience the methods here described in print. The book, which sells for 35 cents, closes with a section containing some exceedingly valuable general information, including laws and regulations, vacuum tube hints, glossary, and a complete price list of R.C.A. equipment.

The Ace binding post

The Ace Binding Post

THE H. H. Eby Manufacturing Co., 605 Arch st., Philadelphia, have designed a new binding post which they have named "Ace." It has a nickel-plated brass base with solid 8-32 threaded stem extending approximately ½ inch below the base. The base of the post is heavily knurled to prevent turning when mounted, and a hole is drilled through the neck sufficiently large to take a No. 15 bare wire. It is supplied with a black insulated knob ½ inch in diameter by approximately 7/16 inch high.

The Harko Sr. $20.00

IN the June Issue of THE WIRELESS AGE the advertisement of the Crosley Mfg. Co. showed the price of the Harko Sr. as $16.00. This was an error, the correct price being $20.00

Condensers May Supplant Aerial Antennas

By Walter B. Clausen

RESEARCH experts in high frequency oscillatory wave action declare that experiments under way in Government laboratories, as well as on the Pacific coast indicate that static interference may be conquered and aerial antennas dispensed with through perfection of a compact high tension condenser with minimum energy loss. Astonishing results have been reported in Washington in the preliminary stages of the investigation, and still more marvelous experiments are reported from Los Angeles. In the latter place what is declared to be the most perfected condenser ever built, one with a minimum energy loss, is the subject of experiments. In Washington, radio engineers, while not having a condenser of the type utilized by the Los Angeles inventor, have achieved notable accomplishments from preliminary studies with several types of condensers, the construction of which has been known for some time.

The basic principle of the discovery is that the aerial antenna for reception or dissemination of oscillatory waves, is essentially a high tension condenser. Great static losses form what is known as the static interference. This perfected condenser antenna eliminates disturbances and irregularities caused by the ground.

Experiments remain to be made on long distance transmission sets, and it has been suggested that the static season in the Pacific, where transmission and reception between Pearl Harbor, Honolulu; Guam, Midway Island; and Cavite, Philippines, offers a more serious disturbance probably than any other place on the earth, may offer the field in which determination of successful construction of a perfected high tension condenser with minimum energy loss may be had.

The results achieved thus far in the experiments are of special interest to all amateur radio men, as it affords them the opportunity to join in the research work themselves. It is possible some of the amateurs may contribute to its success for even the most advanced radio engineers assert that condensers are far from perfect and condenser action probably offers one of the best keys to the great mysteries of electricity yet unsolved. Analysis of high frequency oscillation waves made possible by development of radio instruments, has in the opinion of many great electrical experts, contributed more to an understanding of the mystery of electricity than any other means.

The preliminary report of the radio engineer at Washington on condenser antennas offers the following interesting suggestion to radio men and students:

"Experiments have been made at the Bureau of Standards upon a special type of antenna for transmission and reception of radio signals. The antenna consists of a pair of metal plates. It is thus similar to the ordinary antenna arrangement, the wires of the ordinary antenna corresponding to one plate of the condenser antenna and the ground below the wires corresponding to the other plate of the condenser antenna.

"When the lower plate of the condenser antenna is on the ground, the two types are practically identical. It is found, however, that raising the lower plate from the ground improves the signals. This type of antenna has the advantage that it is not subject to disturbances and irregularities produced by objects on the ground.

"The work done included the construction of various forms of condenser antenna and measurement of capacity and other electrical properties. This type of antenna was compared with coil antennas which are used as direction finders. For the very short wave lengths such as are used in radio communication by amateurs, the condenser antenna gave more intense signals than the coil antenna of the same general dimensions. Compared with the ordinary antenna with which a ground connection is used, the condenser antenna is markedly free from electrical disturbances."

Of equal value, commercially, to the improvement in transmission and reception by elimination of static disturbance of such a perfect device would be the advantage of portability, for even for the largest sets the size of the compact condenser would be comparatively small.

On the Pacific Coast already the new type of antenna has been installed in a receiving set contained within the cabinet of an ordinary phonograph box. One of the interesting experiments conducted was the transfer of ordinary aerial antenna connections to a compact condenser during reception of a certain station. The immediate elimination of static, great increase in volume and clarity were observed, and in addition signals so weak that they were absorbed by the energy loss in the aerial antenna were clearly picked up and made readable by the compact condenser antenna.

The preliminary type of condenser antenna with which the first remarkable results were achieved in Los Angeles, was of the cylindrical type, a high tension glass condenser registering a minimum of absorption or energy loss. It was of 100 micro-microfarads. This particular type of condenser was constructed for commercial use in automotive ignition, and reached a high state of perfection after years of experimental work and intensive study of condenser properties.

Brush discharge had been absolutely eliminated in the method of construction, rights to which are claimed by the inventor and are the subject of application for letters patent. The dielectric is of pyrex glass of a thickness, in the capacity mentioned above, of two millimeters. The plates of the condenser are of shimstock steel and form a tight bond to the dielectric by friction. The elimination of brush discharge is effected by a seal of petrolastic cement of a special degree of hardness. The type of condenser with which particular success has been achieved was of .001 microfarad capacity.

The antenna of radio reception in the last analysis being primarily but a condenser, it seemed but natural that investigation of utility of condensers built with more thought of condenser principles in construction than the type of antenna now in use with its enormous loss factor, it being an air condenser, would be prosecuted by radio research experts, and inquiry developed that the naval radio laboratory of the Bureau of Standards at Washington is making some intensive tests. The Washington tests, however, were made without access to the particular type of condenser antenna in use by the Los Angeles inventor.

Success of the loop aerials and of subterranean antenna, particularly in naval work across the Pacific where static during summer months so seriously interferes with transmission, gave new avenues of investigation leading away from previously held opinion that the higher the antenna the more favorable for reception of signals.

Experimental work in Los Angeles is merely scratching the surface, in the opinion of investigators, and one of the next stages of experimental work will be with condensers of spherical construction. Thus the subject should be one of unusual interest as offering interesting possibilities for radio students and investigators, of contributing to the advancement of radiotelephony and radiotelegraphy by investigation and experimental work along the lines of treating the antenna as a condenser and seeking development of its utility along such lines.

In a report of the experiments so far conducted, J. C. Warner, the assistant physicist of the radio laboratory of the bureau, says:

"Experimental results show that a condenser antenna of small dimensions gives excellent results when used at wave-lengths below 400 meters. At longer wave-lengths it suffers by comparison with the coil antenna when the dimensions are kept small enough for portable use.

"It is useless for directional work unless used with a coil antenna, but may be used in places where the sharp directional characteristics of the coil are objectionable. By proper design and by taking precautions to keep dielectric losses low the effective resistance may be reduced to a value lower than can be obtained either with the coil antenna or the ordinary elevated antenna.

"On acount of this low resistance and ease of construction this form of antenna should be of great value in portable short-wave radio stations, such as are used for military purposes and on airplanes, although in the latter case some difficulty may be experienced in keeping down dielectric losses.

"It is evident that the study of this interesting form of antenna is by no means complete. Its use as a transmitting antenna offers a wide field for investigation, and a large amount of work remains to be done in following up the investigations which have only been started in this study. For example, signal intensity measurements should be made with a calibrated detector set or with a radio-frequency comparison method, so that the actual current or E.M.F. in the antenna is measured. Further work should be done in determining the best design of antenna for a given wave length and for minimum resistance. Also, this antenna furnishes a means of studying the form of the electro-magnetic wave, and a large amount of work might be spent profitably in this study, as well as in the checking of transmission formulas."

An Amplifying Circuit

A CIRCUIT developed by A. W. Hull, claims the attention of radio men generally because it is maintained that considerable amplification has been acquired with it in practice.

It is customary in receiving wireless signals to impress the received oscillations upon a resonant circuit and thereby greatly increase the amplitude of the oscillations produced by the received waves in the antenna. Every oscillating circuit has a so-called damping factor which depends upon the resistance of the circuit and this damping factor limits the maximum possible amplification of the oscillations set up in the circuit. An apparatus having a negative resistance characteristic is connected to the oscillating circuit in such a way as to compensate for the positive resistance of the circuit, thereby greatly reducing the damping factor of the circuit and increasing the maximum possible amplification of the oscillations in the circuit.

For receiving continuous wave signals the circuit is adjusted so that the negative resistance apparatus produces oscillations of a frequency slightly different from the frequency of the received oscillations. These locally produced oscillations will then be controlled by the received oscillations in such a way as to produce an audible frequency current in the receiving circuit.

The negative resistance apparatus produces an increase in voltage across the terminals and causes a decrease in the current of positive electricity flowing from the positive terminal to the negative terminal through the circuit, or a circuit in which the differential coefficient $\frac{dE}{dI}$ is negative where E is voltage across the terminals and I is the current through the apparatus. The term "current of positive electricity" has been used in this definition in accordance with the usual conception of current flow, although the current in this case is carried entirely by negative electrons.

As indicated in the drawing the receiving system comprises a tuned antenna system with an inductance 2. Inductance 3 with the variable condenser 4 forms the oscillating circuit upon which the oscillations received by the antenna are impressed. Connected in shunt to the oscillating circuit is a negative resistance device 5 of the vacuum tube type. A constant positive potential is impressed upon the anode 7 by means of the battery 10. By varying the potential impressed upon the plate 8 the current in the external circuit between cathode and plate may be made to vary in the manner indicated by the curve of figure 3. For a more complete description of the operation of this apparatus reference may be had to a paper by Mr. Hull on page 141 of the Physical Review of January, 1916. It will be noted from an inspection of the curve of figure 3 that as the potential of the third electrode is increased up to a value corresponding to the point B on the current curve the current in the external circuit will increase. As the potential is further increased to a value corresponding to point D the current will decrease from the value B to zero. If the potential is increased to a value corresponding to point E on the current curve the current will flow in a direction opposite to its original direction. Further increase in the potential of the third electrode causes the current to decrease again to zero at the point F and then increase in value in the original direction. The point G on the curve indicates the value of the current when the potential of the third electrode is equal to that of the anode 7. By properly designing the circuit the greater part of the portion B E of the curve may be made to be practically a straight line. Over this working range the apparatus has a negative resistance characteristic, that is, the current through the device increases as the potential applied thereto decreases.

Mr. Hull has shown mathematically in a paper on "The Dynatron," published in the Proceedings of the Institute of Radio Engineers, February, 1918, that the damping factor of the system is equal to $\frac{R}{2L} - \frac{1}{2Cr}$ where L and C represent the inductance and capacity respectively of the circuit and R and r the positive numerical values of positive and negative resistance. From this it will be apparent that if the value of the negative resistance is so proportioned to the positive resistance of the circuit that the product of the two is equal to the ratio of the inductance of the capacity, the damping factor of the circuit is zero, that is, the resonant value of current or voltage in the circuit is infinite except as it is limited by the length and straightness of the position B E of the current curve of the negative resistance. Since the amplitude of the resonant current in the circuit is limited by the length and straightness of the negative resistance part of the curve, it is evident that if the device is operated in a region very near one end of the curve as at H or I, figure 3, the current will be asymmetric and the apparatus may be used as a detector as well as amplifier. The battery 11 supplies the necessary potential for the plate in order that it may operate upon the desired portion of the current curve. For the purpose of detecting the signals a telephone receiver 12 with a variable condenser 13 across its terminals is inserted in the circuit. The distributed capacity across the turns of the telephone winding offers a low resistance to radio frequencies and hence the telephone does not interfere with the amplification. The high inductance of the telephone, however, will cause the circuit to oscillate at audio frequencies unless its resistance also is very high. The condenser 13 across its terminals, if properly adjusted will prevent the setting up of undesirable audio frequency oscillations. The capacity 13 and the negative resistance may be so adjusted as

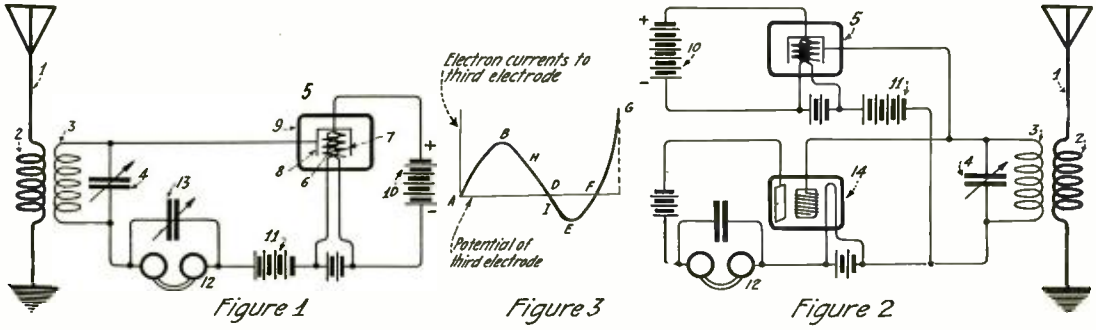


Figure 1 Figure 3 Figure 2

Hook-up to secure increased amplification and characteristic curve of the circuit

to neutralize the resistance of the telephone for the particular audio frequency, determined by the product of the capacity 13 and the telephone inductance, and if this frequency be made the same as the group frequency of the incoming waves the sensitiveness may be greatly increased. In making this and other adjustments the value of the negative resistance may conveniently be varied by varying the temperature of the cathode 6.

The sensitiveness of the system is the same whether the damping term $\frac{R}{2L}$ $-\frac{1}{2Cr}$ is positive or negative. If this term is negative, however, the system will generate oscillations of its own of a frequency slightly different from the frequency of the oscillations impressed upon the circuit. If the received waves are continuous the amplitude of the locally generated oscillations will be controlled by the received waves in such a way as to produce an audio frequency current in the local circuit.

This system offers an important advantage over the usual receiving circuit in that the coupling between 2 and 3 may be made very close without affecting the selectivity since the necessary condition for high selectivity, namely a small damping factor, may still be present. This is true both for the antenna coupling and the coupling to an auxiliary detector circuit if one is used. The fact that sensitiveness and selectivity are independent of both resistance and coefficient makes it possible to use a much more effective ratio of transformation than is practicable with the receiving systems heretofore employed.

In the system shown in figure 2 the negative resistance apparatus 5 is used only as an amplifier and to neutralize the positive resistance of the receiving circuit. In this case an ordinary detector 14 of the vacuum tube type is employed. The oscillating receiving circuit is connected to the grid circuit of the detector 14. The increase in voltage on the grid is opposed in most devices of this type by a leakage current which increases with voltage as in a positive resistance and also by the damping of its own circuit and the coupled antenna circuit. The effect of this leakage and damping may be neutralized by connecting the negative resistance apparatus shunt to the grid circuit as indicated. In this case as in the arrangement of figure 1 the damping of the receiving circuit may be made as low as desired.

Power Modulation for Radio Transmission

A METHOD of modulating the high frequency power used in wireless telephony without requiring the passage of heavy currents directly through the telephone transmitter has been described by Raymond A. Heising. The modulation of the total high-frequency power is secured by varying the impedance of a vacuum tube placed in the antenna circuit. It has been found that thermionic vacuum tubes are well adapted for this purpose because of their relatively high impedance, and because of the fact that this impedance can be varied by means of a telephone transmitter, which is required to handle only a limited amount of power.

In general, however, a thermionic device is unilateral, and, in order to permit the passage of both halves of the high-frequency oscillations, it is necessary to make the system symmetrical by using two such thermionic impedances suitably connected or by using a specially constructed impedance of this character which is symmetrical.

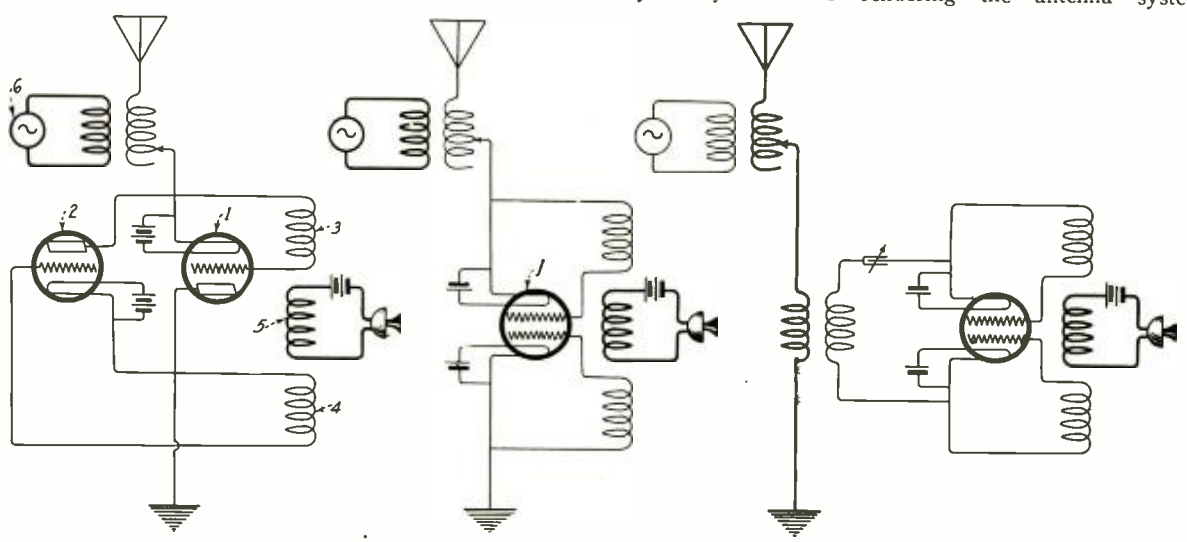


Fig. 1 Fig. 2 Fig. 3

Types of circuits for power modulation in radio telephony

In figure 1 there is shown in series with the secondary of the transformer a thermionic amplifier 1 of the vacuum tube type having a heating filament, grid and plate, the output circuit of the amplifier being connected to the antenna circuit. In parallel to this thermionic amplifier is placed a similar amplifier 2, which has similar electrodes. This amplifier 2, however, is connected in the reverse direction. This reversal of direction is for the purpose of rendering the antenna system bilateral, in order that oscillations may take place in either direction, because positive current can flow only from the plates to the filaments. Connected to the input circuit of the amplifier 1 is the inductance 3, and to the input circuit of the amplifier 2 is the inductance 4. Coupled to both of these inductances is the inductance 5, which is included in a circuit containing a battery and microphone transmitter. The antenna is grounded.

The operation of the system is as

follows: High-frequency oscillations of uniform amplitude are generated by a generator 6, and are impressed upon the antenna. The amplitude of these oscillations is determined by the impedance of effective resistance of the antenna. If this impedance is varied or modulated in accordance with signals, the oscillations will be similarly modulated. When signals, or control impulses, are impressed upon the microphone, low-frequency currents of low power are impressed upon the input circuits of both tubes by means of the three-winding transformer. The changes in the potentials of the grids bring about a relatively large change in the impedance of these thermionic amplifiers, and accordingly the oscillations in the radiating system are modulated in the same manner.

Figure 2 shows a modification in which the two amplifiers of figure 1 are combined in a single tube. In this case the plates are unnecessary, and accordingly the thermionic impedance comprises merely a tube 1 inclosing the heated electrodes and the grids. In view of the fact that both filaments are heated elements, this device is bilateral; that is, current may flow in either direction. A three-coil transformer with microphone and battery is connected to the input circuits in precisely the same manner as shown in connection with figure 1.

In view of the fact that the impedances shown have a very large resistance, there results the introduction of a large resistance into the antenna. A circuit arrangement by which this difficulty is overcome is shown in figure 3. A transformer is introduced into the antenna circuit, and the secondary of this transformer, consisting of a large number of turns, is connected by a circuit including a variable condenser to such a modulating device as is shown in figure 2. It is obvious that in place of this modulating device the one shown in figure 1 may be used in the arrangement of figure 3. In using this transformer the apparent resistance introduced into the antenna may be made of any desired value.

In general, the antenna is tuned to the sending frequency, which is the frequency of the generator, and the value of the current flowing in the antenna circuit will depend only upon the voltage impressed and the sum of the resistance of the antenna, the coil and the resistance introduced by the tubes. In all the modifications shown the modulation is produced by the variation of the effective resistance in the antenna circuit, which variation is due to the variations of the tubes. For complete modulation, it is, therefore, necessary that the resistance introduced by the tubes be large enough to reduce the high-frequency current in this circuit to zero, when the low-frequency input to the modulating device has its maximum negative value. It is also necessary for efficiency that the resistance of the tubes become very small when the low frequency output has its maximum positive value.

It is important that the transformers 3, 4 and 5, be so connected that both grids are at all times of the same sign with regard to their respective filaments.

A High Potential Condenser

MR. ELIHU THOMPSON has recently developed a high-potential condenser which consists of a plurality of condenser elements in series relation in such a way that an electrode of each element serves also as an electrode of an element adjacent thereto. Terminals are provided for the first and last elements only of the series so that when a high voltage is applied to the terminals it will be distributed among all the elements, each individual element being required to withstand only a fractional part of the entire voltage. The electrodes are made of greater thickness than the dielectric which separates them and the edges are rounded off in such a way that there is a gradual tapering away of the surface of the electrode from the dielectric, thereby avoiding the formation of corona discharges at the edges of the electrodes.

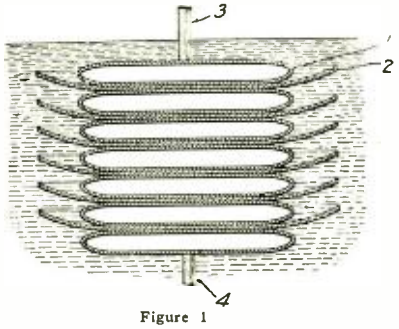


Figure 1

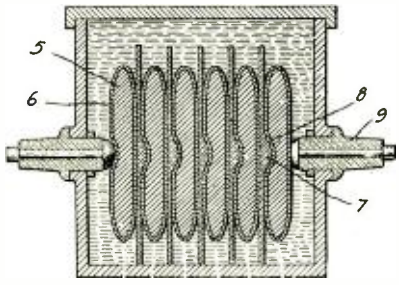


Figure 2
Constructional details of the high potential condenser

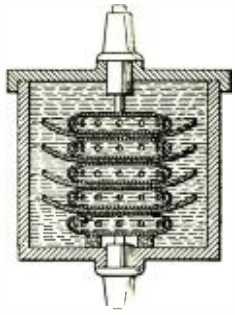


Figure 3

As illustrated in figure 1, the condenser comprises a plurality of electrodes 1, super-imposed upon each other and separated by the dielectric members 2. It is noted that with the arrangement shown the second electrode, for example, serves as electrode for both the upper element of the condenser and for the element immediately beneath. In the same way the other electrodes each serve as electrode for two adjacent elements. The end electrodes are provided with terminals 3 and 4 for connection to the distribution system with which the condenser is to be employed. With the construction shown each individual element may be adapted for a moderate voltage and all of the elements in series may be employed with high voltages, the total voltage applied to the terminals being distributed among the individual elements. In the form indicated the electrodes are hollow and the edges are rounded so that the surface adjacent to the dielectric will taper away from the dielectric in a curved line. By this construction the formation of destructive corona discharges at the edges of the electrode may be avoided. It will be seen that the electrodes may be made solid instead of hollow, but this would involve the use of a much larger amount of metal and no appreciable advantage would result therefrom since it is only the metal near the surface which plays a part in the operation of the condenser. It is, however, essential, that the electrodes should have an appreciable thickness with relation to the dielectric in order that the desired rounding off of the edges may be secured. I have shown the dielectric members as being dish shaped for convenience in holding the parts in the proper relation to each other. This construction also allows any gas bubbles which may form on the under surface of the dielectric to readily rise when the condenser is immersed in an insulating material

such as oil, as indicated in the drawings.

Figure 2 shows the condenser entirely inclosed in a case which may be made either of metal or of insulating material, as desired. In this case the body 5 of the electrodes is composed of any cheap material which may be non-conducting if desired, and this body is covered by a conducting coating 6 which serves as the electrode proper. The coating in effect constitutes a conducting shell which has been reinforced by a suitable filling. In this case the units being assembled in vertical instead of horizontal planes, projections 7 are provided on the sheets of dielectric material which fit into corresponding depressions 8 in the electrodes, and thus serve to hold the electrodes in proper relation to each other. In case the container is made of conducting material, insulating bushings 9 of any desired form may be employed for insulating the terminals from the casing.

Figure 3 differs from figure 1 in that the electrodes are hollow and provided with perforations which allow the insulating material, in which the condenser is immersed, to penetrate the interior of the electrodes. This will prevent any tendency of the electrodes to float and will also provide for a better cooling of the electrodes in case the insulating material in which the condenser is immersed consists of a fluid which is adapted for cooling purposes.

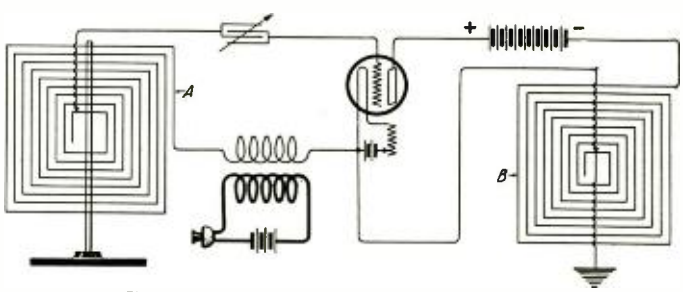
Tuning Loops Used For Transmission

HENRY K. SANDELL describes a novel circuit, which uses coupling coils as the radiators or antenna.

Figure 1 shows a vacuum tube used as a generator of oscillations. The plate is connected to the positive pole of the "B" battery and the output circuit is completed by the connection to the negative side of the "B" battery, the loop aerial, and the conductor leading to the filament. The loop B is grounded through a variable contact to which is also connected the filament lead. The grid condenser should be of low capacity and is connected to aerial loop A through a variable contact.

The loop for the aerial A is rotatably mounted upon a suitable standard from which it is insulated, and is placed in proximity to the loop B of the output circuit, as indicated in figure 1. Its angular position relative thereto may be varied by rotating it to any desired position.

In operation, on closing the plate circuit, the reaction produced upon the loop A in the intake circuit results in the production of oscillating currents in the output circuit, the two loops acting as a coupling for the production of this effect. By varying the angular position of the loop A relative to the loop B, the adjustments for most efficient operation may be readily determined. By use of the microphone variations in the current in the input circuit may be produced, which are reproduced in the output circuit by which they are transmitted as impressed upon the oscillating circuit. It is seen that the signals may be directly impressed upon the output circuit instead of upon the input circuit, but the latter method is preferred on account of its greater efficiency as demonstrated by practical operation.



Circuit showing coupling coils used as the antenna

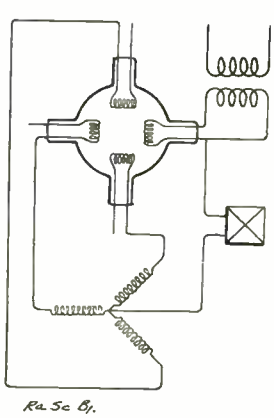
Improved Alternating Current Rectifier

G. HOLST and E. Oosterhuis of Eindhoven, Holland, have developed a tube for rectifying alternating current which is a step forward in the way of economy.

For rectifying alternating currents, discharging tubes are used in which one of the electrodes is brought to a high temperature and it then acts as a cathode. Generally the cathode is constructed as an incandescent filament while the anode is usually constructed in the form of a sheet or a rod.

In the new tube of this type, however, the electrodes are constructed so that they can be used successively either as incandescent cathodes or as anodes, while an electrode which is no longer fit for use as a cathode can then be used as an anode. This construction extends the life of the tube. In case the incandescent filament is burned out, one of the other electrodes is used for this purpose while the defective incandescent filament can be used as an anode.

The drawing shows a rectifier for three-phase current. The rectifier consists of a discharging tube in which four spirals of tungsten or other suitable material are used. One of the spirals is brought to incandescence. The three others are used as anodes. If the first spiral is burnt out, one of the others can act as the cathode and this can be repeated until none of the four spirals is any longer fit for use.



The rectifier for three-phase current

EXPERIMENTERS' WORLD

Views of readers on subjects and specific problems they would like to have discussed in this department will be appreciated by the Editor

Radio Frequency Amplifiers and Their Application to Loop Reception

By Abraham Ringel, A. I. R. E.

FIRST PRIZE $10.00

FOR the average radio amateur, who wishes to increase the range of his receiving set, radio frequeny amplification is an invaluable asset. It is a blessing to those unfortunates who are forbidden the use of outdoor antennae by their hard-hearted landlords. Although the writer holds no brief for the latter, he can very well understand the position of the owners of large apartment houses, in refusing to have the premises disfigured by some ten or twenty antennae.

In fact, the close proximity of a number of antennae, all tuned to the same wave length, is not conducive to good reception. It is very well known that conductors tuned to a certain wave length tend to increase the resistance at that wave length of any aerial in the neighborhood. As a result, the received signal becomes noticeably weaker. The general use of regenerative receivers for broadcast reception is also an important factor, especially when the receiver is on the verge of oscillation. Even a slight change in tuning will then throw the set into an oscillating condition.

This accounts for the fluttering, whistling notes, that are only too often heard when receiving from a broadcasting station. The oscillations which are generated by an oscillating receiver, are radiated and combined with the carrier wave frequency of the broadcast station to produce beats of an audible frequency, in some other receiving set. If the antenna from which the disturbance is radiated is relatively near, the whistling may be several times as loud as the speech or music. Thus we can readily perceive the disadvantage in having receiving antennae close together, aside from the artistic point of view.

The remedy, of course, lies in a judicious combination of radio frequency amplification and loop reception. High frequency amplification, by means of transformers at the short wave lengths, is a problem which has baffled radio engineers of the whole world for a number of years, but it seems as if the engineers of the Radio Corporation and the General Electric Company, have solved it to a considerable extent.

Before considering the amplifier built by the writer, it would be well to study the various methods of amplifying that can be used.

Direct Coupled Amplifiers

a. Aperiodic Plate Circuit—One form of high frequency amplifier, illustrated in figure 1, makes use of auto-transformer coupling between two stages. It is analogous to audio frequency amplification by means of choke coils. Incoming signals are impressed between the grid and filament of the first tube. These oscillations are amplified by the tube, and we get much larger radio frequency voltages across the coil L in the plate circuit, than that in the input.

The radio frequency voltages across L is in turn applied to the grid of the second tube, care being taken to insert a condenser in series, as shown, to insulate the grid from the high plate voltage. In this manner, the original signal is magnified a good many times, depending on the number of stages used.

The coils, L, are aperiodic. To make sure of this, they should be wound of resistance wire, and the turns should be spaced in order to avoid large capacity in the windings. For amplifiers around 360 meters, about 400 turns of about No. 30 Advance resistance wire, on a form about two inches in diameter, would be suitable, but it is best for the experimenter to try coils of various sizes, until best results are secured.

The condensers, C_2, should be of about .002 microfarad capacity. Grid leaks, G, of about 2 megohms are sometimes used to prevent the grids from acquiring a negative charge, and thus plugging the tubes.

b. Tuned Plate Circuit—in direct coupled amplifiers the plate circuits may also be tuned. For short wave lengths a very effective method is the employment of variometers instead of the aperiodic choke coils described above. For longer wave lengths, variable condensers are connected across the coils in the plate circuit. Best results are generally obtained when these coils are as large as possible, and for this reason, the variometer method, which makes use of the capacity of the tube is to be preferred.

In such cases we often run into oscillations in the amplifier, and it is necessary to apply a considerable positive bias to the grids of the tubes. This may be done by connecting dry cells in the grid circuit of the correct value. But a more desirable scheme is to use a potentiometer across the filament battery and connect the slider to the grid leaks in the manner indicated in figure 1. In this way as much as 6 volts positive bias can be given to the grids of the tubes.

The wiring of a tuned plate amplifier is essentially the same as that of an aperiodic plate circuit, shown in figure 1, with the aperiodic coil replaced by either a variometer, or a combination of coil and variable condenser in parallel.

c. Resistance Coupling—Resistance coupling, which is often used in audio-frequency amplifiers to secure distortionless amplification, may also be employed at radio frequencies.

The circuits for a resistance coupled amplifier, are identical to those using choke

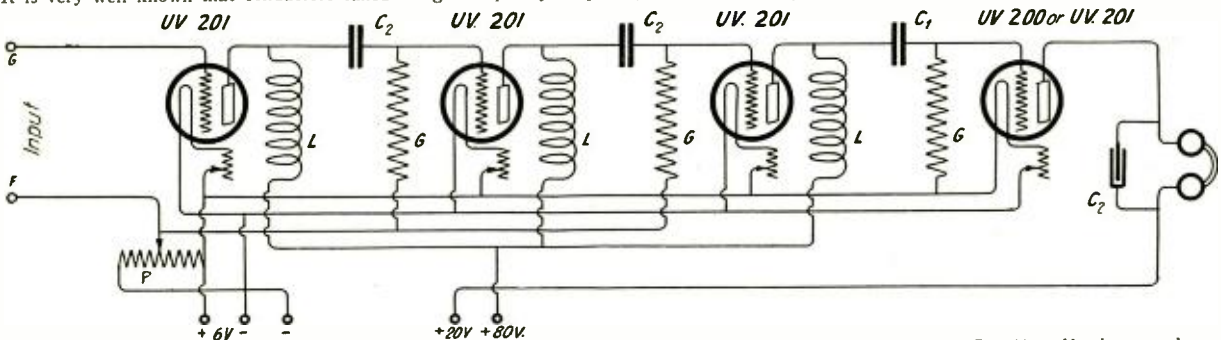


Figure 1—3-stage R.F. amplifier (choke coil coupling) and detector. L—Choke coils. C_1—.00025 mfd. grid condenser. C_2—.002 mfd. phone condenser. G—2-megohm grid leaks. P—Potentiometer.

coils, with the coils replaced by resistances. The resistances should be of the order of 50,000 ohms, when using Radiotrons UV201. Resistance-coupled amplifiers, have, however, certain inherent disadvantages. The plate battery must be at least twice the voltage ordinarily used, and especially built low capacity tubes are required at short wave lengths. Besides, only a portion of the amplification of the tube is available in a resistance coupled amplifier. On the whole, the author does not recommend it for amateur or broadcast wave lengths.

INDIRECT COUPLED AMPLIFIERS

a. Tuned Grid Circuit—A method of high frequency amplification which was used quite successfully by the British Amateurs in copying American stations in the recent trans-Atlantic tests, is shown in figure 2. The received oscillations are amplified by the first tube, and then induced into the tuned grid circuit of the second tube, by means of the magnetic coupling between the coils L_1 and L_2. If the coupling between L_1 and L_2, is made very loose, a high degree of selectivity can be obtained, thus discriminating against interfering signals at slightly different wave lengths. The plate coils may be similar to the aperiodic coils used in the choke coil amplifier. The coils in the grid circuit must be of a suitable value so that the grid can be tuned to the desired wave length. A potentiometer should be used to prevent oscillations in the amplifier. The tuning of a number of stages would present no little difficulty to most amateurs, and it is usually necessary to calibrate each of the tuned circuits in terms of wave length.

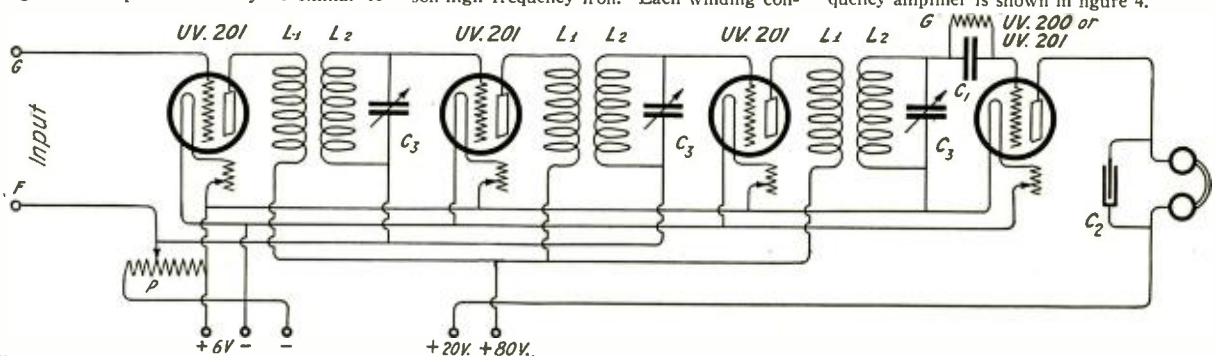


Figure 2—R.F. amplifier (tuned grid type) and detector. L_1, L_2—Coils coupled to each other. C_1—.00025 mf. grid condenser. C_2—.002 mf. phone condenser. G—2-megohm grid leak. C_3—.0005 mf. max. var. condenser. P—Potentiometer

TRANSFORMER COUPLED AMPLIFIERS

Of the methods of radio-frequency amplification so far described, the use of the tuned grid is probably the best, but the additional tuning required, especially if several stages are used, is not likely to appeal to the amateur who already has to cope with half a dozen knobs on his receiver. The radio frequency amplifying transformer fills a long felt want in this direction.

The wiring of a typical transformer-coupled radio-frequency amplifier is shown in figure 3. No tuning adjustment is required, which makes it highly desirable. Note the potentiometer, or stabilizer, which is used to prevent oscillations. The behavior is similar to that of a transformer-coupled audio-frequency amplifier. Incoming oscillations are amplified in the plate circuit, and by means of the transformer coupled to the grid of the following tube. A number of stages may be used with great success and with no more attention than an ordinary a.f. amplifier.

The radio-frequency transformer consists of an aperiodic primary and an aperiodic secondary coil, coupled to each other. Either an air core or an iron core, (Alexanderson high frequency iron about .001 inch thick) are used. The British Marconi Company has standardized an air core transformer, using several hundred turns of very high resistance wire (100 ohms per foot). With very high resistance transformers, coupling condensers of 0.002 microfarad capacity should be connected between grid and plate.

The French radio concerns prefer to use moderately high resistance winding on a core of high frequency iron. The writer has come across a number of transformers of American manufacture. Iron and air core transformers of both high and low resistance windings are used here.

In comparisons and tests the writer has found the Radio Corporation's UV1714 transformer to be superior to most of the others, especially in the neghborhood of 360 meters.

In this connection, a description of the UV1714 transformer will not be amiss. It contains two coils on a core of Alexanderson high frequency iron. Each winding contains several hundred turns of moderately low resistance copper wire, with a tap off taken for the shorter wave lengths. When used within the wave length range of from 200 to 500 meters, part of each winding is short circuited, by means of a special jumper on the transformer. When used on the 500 to 5000-meter wave length range, this jumper is disconnected from one of the terminals, so that all the coil is used. This should be done on both primary and secondary. We thus have a convenient means of amplifying a great range of wave lengths with very little trouble.

The writer, interested only in the shorter wave length range, tested the amplification at wave lengths from 200 to 500 meters. The amplification at 200 meters was quite good, being equal to most of the other transformers which were available. It showed great superiority at wave lengths from 300 to 500 meters.

LOOP RECEPTION, USING RADIO FREQUENCY AMPLIFICATION

In an experimental radio-frequency amplifier, which was set up, the writer has received the radiophone music from WJZ, at Newark, on a three-foot loop, in the basement of a building with a steel framework. This building is located in Upper Manhattan—about fifteen miles away from WJZ. Only two stages of radio frequency, a detector and two stages of audio-frequency were used. The music could be heard comfortably, one hundred feet away, when using an ordinary loud speaker.

The loop in question, contained nine turns of No. 18 lampcord, wound on a frame 3 feet by 3 feet. The turns were spaced one-half inch apart, in order to have as low a distributed capacity as possible. This loop tuned to 360 meters, with the condenser shunting it, a Wireless Specialty Company, Model U.C.1820, at 50 degrees. For amateur wave lengths, it is recommended that the number of turns in the loop, be cut down to six instead of nine.

The schematic arrangement for connecting the receiving circuit to the radio frequency amplifying detector, and audio frequency amplifier is shown in figure 4.

CONSTRUCTION OF AMPLIFIER

Although very good results were secured with only two stages of r.f. amplification, it was decided to use three, in order to be on the safe side. The radio-frequency amplifier was built to conform with a detector and two-stage audio-frequency amplifier, already available.

The general construction scheme is shown in figure 5. It consists of a vertical panel, 10 inches high by 11 inches long, of ¼ inch bakelite, on which are mounted the control elements; such as the three rheostats and a potentiometer. In back of the panel are two horizontal shelves. On the upper shelf, three tube sockets are mounted, and on the lower, three radio frequency transformers. This arrangement was selected because the leads connecting grid and plate of the tubes to the transformers, could be made extremely short.

This is of great importance, especially with short wave lengths, where capacities of the

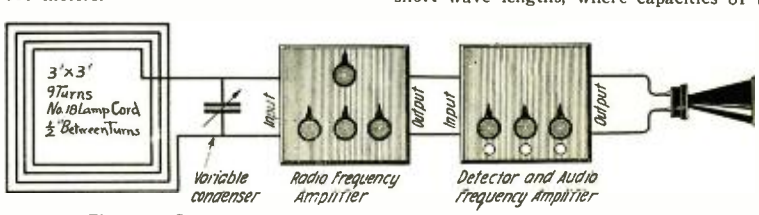


Figure 4—Combination of loop receiver with R.F. and A.F. amplifiers

connecting wires are of great importance.

The detector and two-stage audio amplifier runs along similar lines; with the tubes in the upper shelf, and the transformers below. In addition, the upper shelf contained grid condenser and grid leak for the detector, and grid leaks used in shunting the primary winding of each audio-frequency amplifying transformer, the reason for which will be explained later.

Input and output binding posts are on either side of the base, and battery posts are

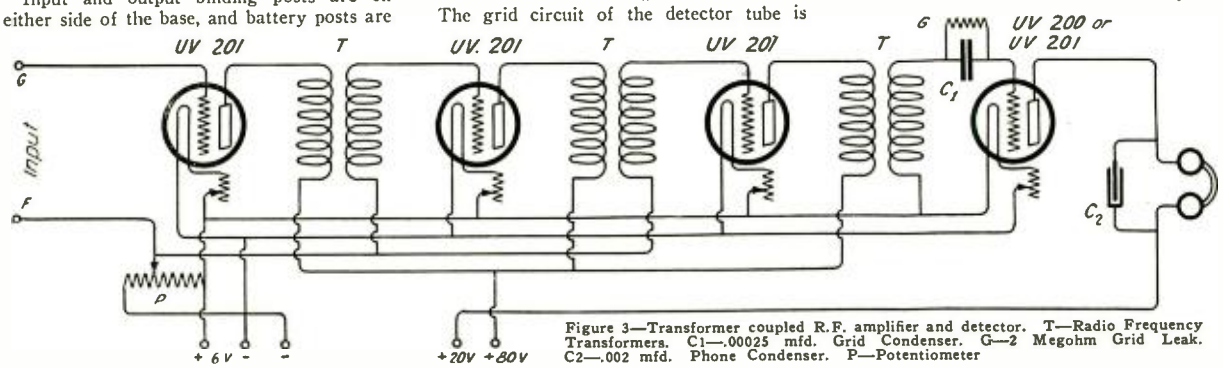


Figure 3—Transformer coupled R.F. amplifier and detector. T—Radio Frequency Transformers. C1—.00025 mfd. Grid Condenser. G—2 Megohm Grid Leak. C2—.002 mfd. Phone Condenser. P—Potentiometer

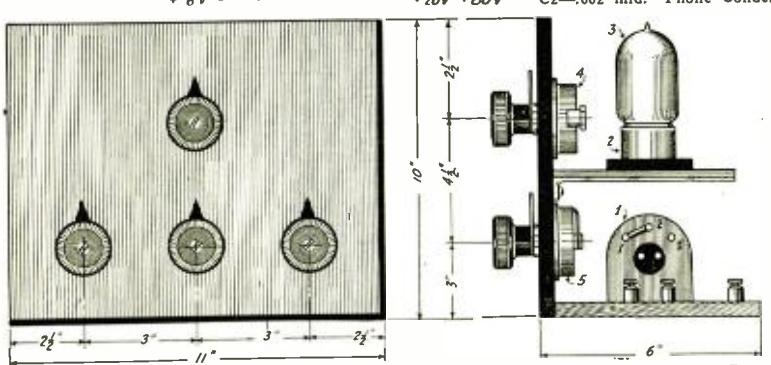


Figure 5A—Constructional dimensions of the radio frequency amplifier panel. 1—UV-1714 R.F. Amplifying Transformer; 2—Radio Corp. UR 542 Tube Socket; 3—Radiotrons—UV 201; 4—A-Battery Potentiometer—PR 536; 5—Filament Rheostats

in the rear. Thus the set is not disfigured by unsightly wires in front of the panels. Jacks are so connected that the loud speaker may be plugged in on any stage desired.

The wiring of the combined radio and audio-frequency amplifiers is shown in figure 6. Note that a potentiometer is used to bias the grids of all three r.f. tubes. The input terminal marked G, connects to the grid of the input tube, and that marked F, to the slider of the potentiometer. It is advisable to connect a condenser of 0.002 microfarad between the slider and one side of the filament battery, as shown, in order to provide a by-pass for the radio frequency.

The plate of the first tube contains one winding of a UV1714 transformer, as a primary, the other winding being connected to the grid of the following tube. It is important that the terminals 1 and 2 of each winding be short circuited by the jumper provided, and terminals 3 be connected to grid and plate. These leads should be as short as possible in order to avoid excessive capacity.

The tube sockets were selected with special care for the same reason. The Radio Corporation's porcelain base socket, model UR 542, was used, not only because of the small capacity between the spring contacts, but also because of the reliable contact made with the prongs on the base of the tube. With some of the cheaper sockets on the market, this contact is so poor, it is necessary to solder the tube to the socket, in order to obtain reliable action. The importance of this point cannot be over-emphasized. The entire set may be inoperative because of a single imperfect contact point.

Any of the rheostats now on the market are suitable. For the potentiometer, the Radio Corporation's modoel PR536 is about the best.

Detector and Audio-Frequency Amplifier

The grid circuit of the detector tube is coupled to the plate of the last r.f. tube, by means of another UV1714 transformer. Detection is accomplished by means of a grid condenser and grid leak, the values being 0.00025 microfarad and 2 megohms respectively. It is advisable to use the Radio Corporation's condensers and leaks, which are designed to fit their standard grid leak mountings. In this way the experimenter may easily determine for himself the best values for these elements. Provision is made in the plate circuit of the detector for a tickler coil or plate variometer for regeneration, or oscillation for receiving C.W. These terminals are short circuited, when no regeneration is required.

The audio-frequency amplifier is wired in the usual manner (see figure 6). It is necessary to connect a condenser of about 0.0025 microfarad capacity across the primary of the first transformer in order to provide a by-pass for the radio frequency oscillations. The loud speaker or telephones may be plugged in on any stage of the amplifier, by means of jacks as shown in the wiring diagram. The transformers are Radio Corporation's UV712's, which are especially designed to match the Radiotron tubes.

The unusual feature of the amplifier is the connection of resistances of 1 megohm across the primaries of each transformer. This helps to broaden the characteristic curve of the amplifier, so that it responds equally well to low frequencies as well as high frequencies. In this way speech and music are amplified with very little distortion.

In order to receive music properly we must include a range of frequencies between 200 and 5000 cycles per second. This takes in the lowest baritone and piano notes, and the highest soprano, and practically all the harmonics or overtones, which are required for good quality. Standard grid leak mountings should be used so that the amateur may decide for himself the proper resistances to use, by experimenting with grid leaks of different values. This practise results in a slight decrease in signal strength, but this loss is more than compensated for by the vast improvement in the quality of the speech or music.

The loud speaker is improved by the use of a condenser of 0.05 microfarad capacity connected across it. This also helps to bring in the lower notes, and tone down the higher ones, which most loud speakers seem to favor. When using this condenser, the experimenter will probably observe that the S's in the radiophone speech are no longer present. This is due to their absorption by the condenser of extremely high sound frequencies. (The S's have a frequency of about 6000 cycles per second and are thus absorbed by the condenser which has a low reactance at this frequency, when compared with that of the loud speaker.) But it seems worth while to make this sacrifice, in order to obtain good music. The condensers may be ordinary paper condensers, obtained from the Federal Telephone and Telegraph Company of Buffalo, New York.

It is important to use UV201 Radiotrons, in both the r.f. and a.f. amplifier, inasmuch as the transformers are designed for these tubes. For the detector, a UV200 or a UV201 may be employed. The plate voltage of the amplifier tubes should be 60 to 80 volts, and that of the detector, 22.5 volts. Any reliable make of B-battery is satisfactory. The filaments are run off a 6-volt storage battery of about 80 ampere hours capacity.

Operation of Amplifier

The following procedure should be followed when using the amplifier with a loop receiver. First adjust the filaments of all the tubes, so that they are a bright yellow. Then set the slider of the potentiometer at about the middle of the resistance. Now tune with the condenser across the loop for the desired radiophone station. Leave the condenser at this setting and rotate the loop until the music is loudest. Readjust the potentiometer, obtaining the best possible signal. At this stage it may be necessary to

retune the loop slightly. The temperature of each filament should now be varied until the very best results are obtained. As a matter of fact, once the filament rheostats are set, it is unnecessary to alter their position any further. Thus only two adjustments are actually required: 1. Tuning condenser. 2. Potentiometer. The potentiometer setting for optimum signals is not the same for all wave lengths. It is therefore important to change it when tuning to a different wave length.

The amplifier can be used with an ordinary short wave regenerative receiver. The terminals of the receiver, usually connected to the detector, are led to the input of the amplifier. The plate variometer is connected to the tickler terminals in the plate circuit of the detector tube. The operation is no more difficult than that of the ordinary regenerative receiver, only one additional control, the potentiometer, being added.

With the increased use of radio frequency amplification, we will no doubt see the gradual disappearance of outdoor antennae for broadcast reception. Roofs and buildings in the crowded urban districts, will no longer be disfigured by a thousand and one heterogeneous aerials. Interference from oscillating regenerative receivers will be considerably abated by the insertion of a radio frequency amplifier which will prevent radiation of oscillations, and fans will really be able to appreciate the fine programs broadcasted.

The dyed in the wool ham, especially the DX man, will not be slow in taking advantage of the opportunities offered by r.f. amplifiers. Not only is the range of his receiver increased, but it also permits duplex operation, the simultaneous transmission on an outdoor antenna, and the receiving on an indoor aerial. The latter may be either a loop, or a few wires strung across the attic.

J. O. Smith of 2ZL fame, has been working duplex all along in this way, and under favorable conditions receives stations located as far away as New Mexico, a distance of 1,800 miles regularly, using three stages of r.f. in addition to his detector and two-step a.f. amplifier.

We are now on the threshold of a new era in radio communication; the elimination of interference from oscillating receivers—a shattering of all DX records. The whole world is our sphere. Let's go!

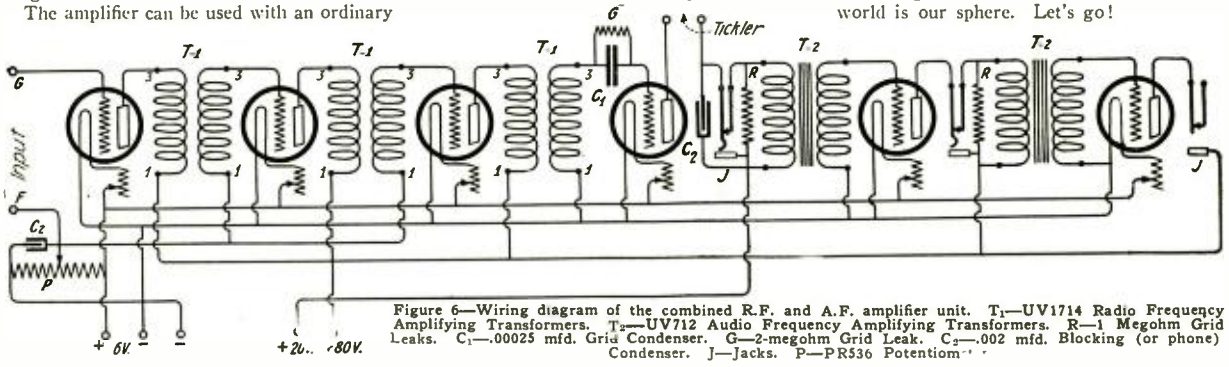


Figure 6—Wiring diagram of the combined R.F. and A.F. amplifier unit. T_1—UV1714 Radio Frequency Amplifying Transformers. T_2—UV712 Audio Frequency Amplifying Transformers. R—1 Megohm Grid Leaks. C_1—.00025 mfd. Grid Condenser. G—2-megohm Grid Leak. C_2—.002 mfd. Blocking (or phone) Condenser. J—Jacks. P—PR536 Potentiometer.

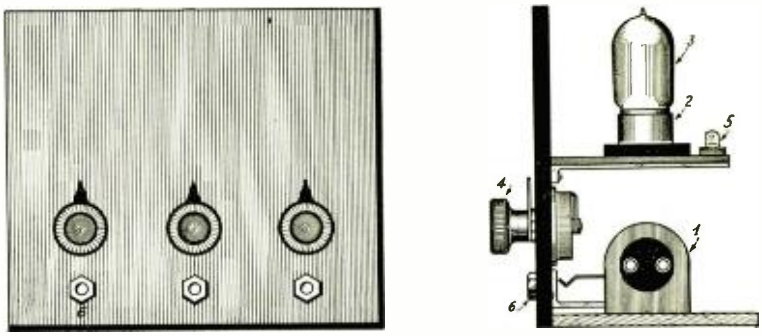


Figure 5B—Detector and audio frequency amplifier—Dimensions same as on figure 5A

A Maximum Receiver

By A. Hazelton Rice, Jr.

SECOND PRIZE $5.00

FOR the man who wishes to obtain maximum results from his radio receiver, a combination of radio-frequency and audio-frequency amplification is indispensable; the only practical limitation to the degree of amplification being the amount of money the experimenter is prepared to invest. For general use, however, amplification at audio-frequencies beyond the third stage is inadvisable for several reasons, unless a loud speaker of the Magnavox type is to be used, and even then, only when it is necessary to give open-air demonstrations to large audiences; first, because of the strain brought to bear upon the diaphragms of the phones and their tendency to "chatter" and second, because of undesirable amplification of tube noises, atmospherics, etc. as well as that most abominable of all goat getters, known as "howling."

Tubes in excess of four, including the detector, also require a second storage battery and the attendant expense of keeping it charged. At this point let me urge the experimenter, who seriously considers the use of vacuum tubes, to purchase a storage battery which has been specially designed for radio work and a battery charger either of the vibrating or tungar type, providing, that he has access to a 110-volt A.C. supply. The latter is more quiet in operation and is generally preferred for its dependability. A battery charger is an excellent investment for it will save its cost many times over, not only through the difference in cost of charging, but by obtaining maximum life from the battery.

To return to the main subject, it would seem that the ideal amplifier is the one which may be constructed and put into operation for the smallest initial expense, and yet is so designed that additional stages of radio and audio-frequency amplification may be installed without necessitating drastic changes in cabinet and panel design.

This article, therefore, will be devoted to the construction of such a detector-amplifier, the operation of which leaves little to be desired.

The Radio Frequency Amplifier

At the present time there are three methods of amplification at radio frequencies in general use: First, the resistance-coupled amplifier. Second, by tuning the plate circuits of the various tubes. Third, by the use of air or iron cored transformers.

Resistance-coupled amplifiers are highly efficient on the higher commercial waves—from 2,000 to 25,000 meters—but due to certain limitations it is impossible to use this method for receiving broadcasting stations on 360 meters or for the amateur wave of 200 meters without the use of an extra tube to heterodyne the signals to a lower frequency.

The tuned circuit method is generally considered efficient, but due to the inconvenience of adjusting numerous dials, has not met with much popularity.

It follows, therefore, that the transformer-coupled radio frequency amplifier is the most satisfactory for reception on the amateur and broadcasting waves, and while the transformers available at the present time are efficient only on a narrow band of wave lengths, we need not be concerned about this for radio-frequency amplification is generally unnecessary on the longer commercial waves due to the enormous powers employed at the transmitting stations.

While r.f. transformers may be constructed by the experimenter, it is better practice to buy them, as the quality and volume of amplification depends largely on their correct design and careful construction. There are several types from which to choose, each of which has its individual good qualities.

For the purpose of the set under consideration, the writer has selected the Mu-Rad, type T-11, manufactured by the Mu-Rad Laboratories of Asbury Park, N. J., not necessarily because of any superiority, but because the retailers seem to be generally supplied at the present time with them. It is well to start with one stage of r.f. amplification and to add the second and third stages as the necessity for them becomes apparent.

All wiring of the r.f. amplifier should be as direct and short as possible in order to minimize capacity effects and the wiring of the grid circuits should be kept as far as possible from that of the plates.

Tube sockets should be selected with care as they are often the source of considerable trouble. They should be of bakelite and not a moulded composition as the latter will not stand up under the heat of the soldering iron. While the spring connections to plate, grid and filament may be positive, it is advisable to solder the tube to them as tubes when properly handled, last for a year or two and it is but little trouble to thus permanently install them and it will generally result in more quiet operation. However, before the tubes are thus soldered, they should be carefully tested in each circuit as it will be found that certain combinations of tubes will work better than others.

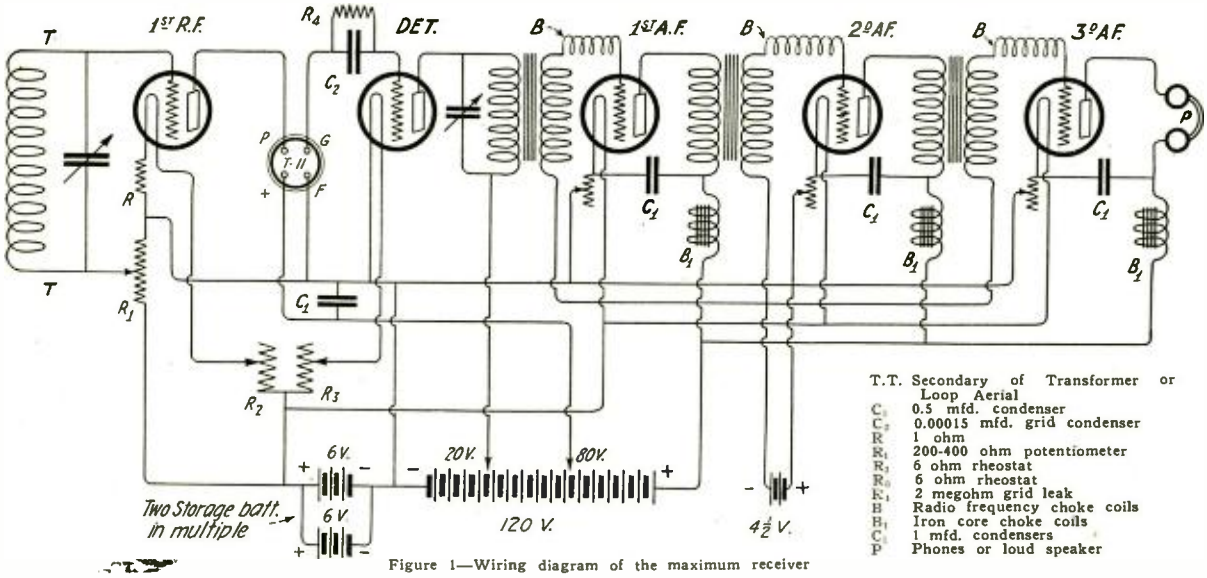


Figure 1—Wiring diagram of the maximum receiver

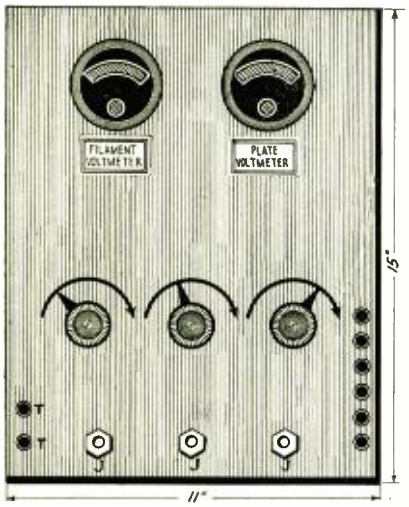


Figure 2

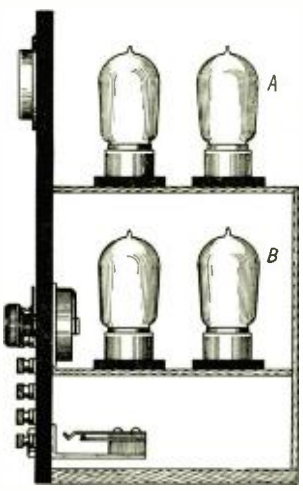


Figure 3

Dimensions of the panel and arrangement of apparatus

The wiring diagram should be carefully studied as the actual wiring of the amplifier progresses in order that costly errors may be avoided. The accompanying drawings allow ample space for two or three stages of radio-frequency amplification, but as stated previously it is better to start with one stage and learn to obtain maximum results from it.

The Detector

Here again all connections should be carefully soldered and the use of binding posts avoided wherever possible. During the earlier days of radio when vacuum tubes first made their appearance, they were exceedingly critical of adjustment and required a potentiometer for close adjustment of the "B" battery voltage. Potentiometers, however, for the adjustment of the plate voltage, are no longer necessary if "B" batteries having the customary 1½-volt taps are used. The detector rheostat, however, (R3 in the diagram) should be capable of micrometer adjustment. Several rheostats of this type are now available on the market.

The length of the "A" battery leads seems to make no difference in the performance of the outfit, but care should be taken to have the "B" battery leads as short as possible.

The Audio-Frequency Amplifier

The amplifying of signals at audio-frequency to the extent of one or two stages is a comparatively simple undertaking; each stage consisting merely of its transformer, tube and rheostat. The addition of the third stage, however, usually introduces unlooked for complications. It is well, therefore, to take the necessary precautions in the beginning to eliminate howling and secure maximum amplification. This is usually accomplished by thorough shielding of one stage from the other in order to prevent undesirable oscillations being set up. It is sometimes found that a metal cover placed over each tube and grounded and also the grounding and connecting together of the transformer cores is sufficient. It is better, however, to enclose each stage completely in a steel or iron box. This means that the rheostat, tube, transformer and wiring of each stage should be enclosed separately and each metal box should also be grounded. Other refinements which make for increased amplification are found in the connection of the primary of each transformer—in the second and third stages—to the positive terminals of the "B" battery through an iron cored choke coil. A small spark coil or bell ringing transformer primary may be used. A 1-mfd. condenser should then be connected between the filament and choke as shown in the accompanying drawing. Small radio-frequency chokes should also be connected in the grid leads of the amplifying tubes. These may be made by winding twenty-five turns of No. 30 D.C.C. wire on a one-inch tube.

If it is decided that the shielding of the amplifying transformers is too difficult they should be placed as far apart as possible with their windings at right angles, and if less than three stages of amplification are used, it is probable that no trouble will be experienced. It is also important that a .001 mfd. variable condenser be connected across the primary of the first amplifying transformer.

For such an amplifier, storage "B" batteries of the alkaline type are preferable as the "B" battery is often the source of disturbing noises, especially is this true of the so-called block battery, the latter part of its life.

A panel of adequate size and pleasing appearance of ⅛ inch bakelite has been indicated in figs. 2 and 3. However, it is suggested that tubes, rheostats and all other apparatus be set up and connected on a table where there is plenty of room in order that the irregularities of the set may be studied.

When everything is working smoothly and the circuits are thoroughly understood, it is then time to mount the apparatus on the panel. No more dials than are absolutely necessary should be placed on the panel as they detract from, rather than add to, its appearance. For instance the audio frequency rheostats, when once adjusted, seldom require attention and therefore, need not be placed on the panel. Weston filament and plate volt meters, as shown on the panel, are also refinements that assist in the correct operation of the tubes, and hence lengthen their life.

In conclusion the writer wishes it understood that no particular credit is due him for the above as it is merely a compilation of data which is generally accepted as the best engineering practice in the construction of an ultra-modern, super-sensitive amplifier.

Radio-Audio Frequency Amplification

By George J. Smith

THIRD PRIZE $3.00

ON a recent morning daylight disclosed the fact that my antenna had strewn itself over my house and yard and a neighboring garden. Investigation disclosed the fact that the sustaining insulator in the halyard of a 75-foot pipe mast had broken and although the end of the halyard had stuck in the pulley there wasn't any easy way of getting it down.

As the season for long-distance amateur work was over, and as electrical storms loomed in the offing, I decided to confine my activities to reception, at least for the summer. Immediately radio-frequency reception suggested itself, with the probability of being able to use an indoor aerial, in the attic of the house, for receiving purposes.

In the course of time the aerial was built and the set assembled, the latter consisting of three steps of radio-frequency, a detector and two steps of audio-frequency, as shown by the following diagram:

The strength of the signal obtained when the indoor antenna was connected was so great as to indicate that satisfactory results could be obtained with a small loop. One was therefore, built approximately 4x4 feet, with three turns of lampcord, spaced 3/16 inch apart, with which excellent results were obtained. The same was also true of another loop, 3x3 feet, with four turns of wire. Then an experiment was tried with a transmitting inductance, of 3/16 inch copper tubing, approximately one foot in diameter. When 15 turns of this were used, broadcasting from WJZ, WGY, and KDKA came in clear and strong at 50 degrees on a 23 plate condenser. Amateur stations in the First, Second, Third and Eighth Districts were heard in large numbers at 23 degrees on the condenser.

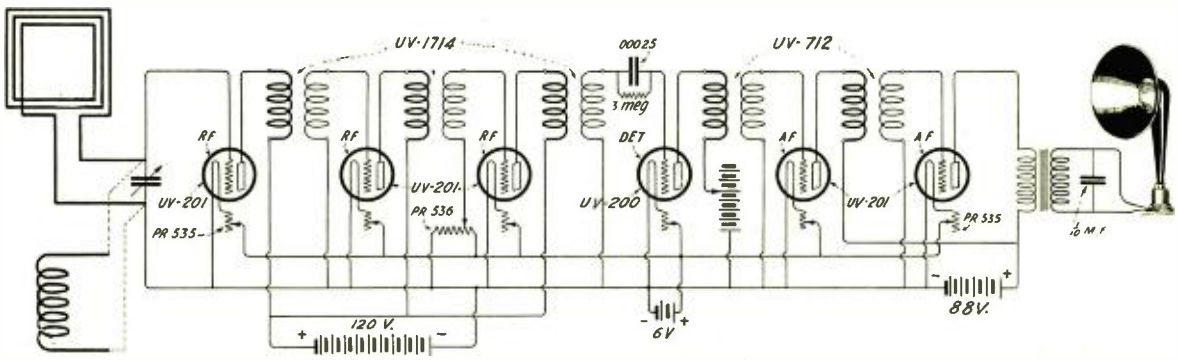


Figure 1—Hook-up of the R.F.-A.F. amplifier

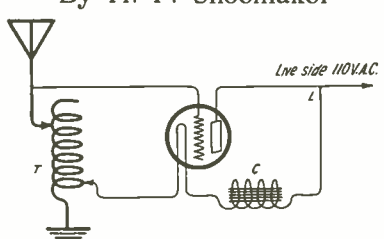
When the set was first installed some trouble was experienced because of oscillation of the radio-frequency tubes. This was remedied by means of the grid-biasing potentiometer across the filament battery leads. The 1/10 mfd. condenser across the leads to the loud speaker was inserted for the purpose of modifying the high notes of instruments or singers. It materially reduces the harshness so often heard in loud speakers.

A. C. on Filament and Plate

By H. F. Shoemaker

THE articles in the April issue of THE WIRELESS AGE on the use of A. C. on the filaments of receiving tubes have prompted me to describe a circuit arrangement whereby A. C. was successfully used on both plate and filament of a 5-watt transmitting tube.

I had one 5-watt Radiotron, but no transformer, so had been using a storage battery to light the filament and 110 volts 25-cycle A. C. direct on the plate with good results. Finally, however, the battery died a natural death and I began experimenting to see if I could apply the same A. C. to the filament. At first without thinking I put



Hook-up for use of A.C. on filament and plate

an ordinary resistance of the electric iron element type in the position shown at "C" but of course it could not possibly work as the plate was shorted to the filament. Finally an inductive resistance varied by an iron core was put in as shown. This passed the A. C. to the filament, but successfully prevented the H. F. current being short-circuited between the plate and the filament. The point "L" in the diagram is connected to the underground side of the 110 A. C., the ground of the tuning coil "T" acting as the other connection and also supplying the other lead to the filament. Stations several miles away have reported the signals as very QSA on one tube. An ammeter in the antenna circuit indicated about .2 amp. with the storage battery on the filament and about .25 with the above hook-up.

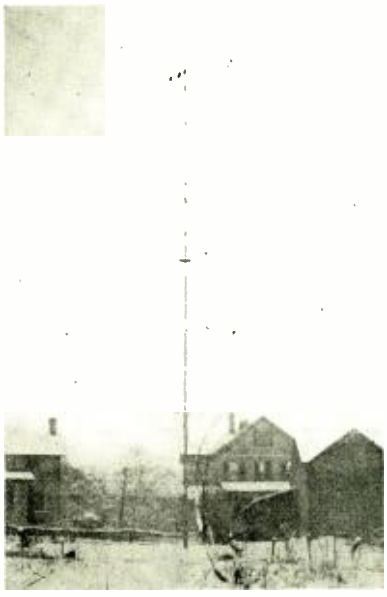
Consistent "DX" Work by 2 OM

This New Jersey Station Using 1 K. W. Synchronous Spark Set Has Been Reported From Thirty-five States and Has Worked Stations in Thirty-four of Them

RADIO STATION 2OM is located at 180 Broad Street, Ridgewood, N. J., and is owned and operated by F. B. Ostman, Prescott Smith, W. H. Ostman and L. Clark. The antenna is a slanting flat top type of 6 wires on 20-foot spreaders, 35 and 80 feet high, 75 feet long having a natural period of 169 meters. The far high end spreader is a one-inch iron pipe to which is soldered all the wires. The bridle is of rope, and two 10-inch electrose strain insulators are in series with the halyard. The lead-in which is a 10-inch cage is taken from the low end and runs directly through a deck electrose insulator into the operating room. The spreader at this end is of wood, each wire being insulated with an electrose ball insulator. This bridle is also of rope in series with which is a 10-inch insulator. The low end is supported at the peak of the house.

The ground system consists of the water mains, all connected with heavy jumpers and soldered; a well, in which was sunk a long length of tin besides well pipe; a cistern, in which are immersed large plates and in which was put 50 pounds of salt; buried strips of roofing tin, 1 foot wide, 50 ft. long, underneath the antenna. A two-wire counterpoise, triangle shaped, 8 feet high, each wire being 150 feet long, 60 feet apart at far end connected, and extending 60 feet past end of antenna. All leads run direct to secondary of oscillation transformer and are tuned separately.

Because of a barn, high bushes and antenna guy wires, it was not practical to put up more than a two-wire counterpoise.



Antenna system of 2OM station consists of six wires on 20 ft. spreaders, 35 ft. x 80 ft. above ground, total length 75 ft. natural period

It might be well to mention that this counterpoise alone gave 1 ampere more radiation than all the tuned ground system, and with grounds and counterpoise tuned separately an increase of 1¾ amperes was noted.

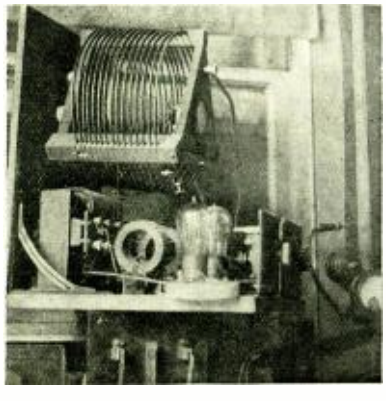
Power is furnished by a separate 110-volt, 60-cycle A.C. supply with No. 10 leads running from meter to switch board. All power leads are in B. & X. cable, gap and primary power mains are protected with large Dubilier kick back preventors.

The spark transmitter consists of a United Wireless 1 kw. 25,000 secondary voltage. Two special .014 Dubilier condensers in series and a large section of glass plate condenser immersed in oil in parallel to these giving an approximate capacity of .014 mfd. The primary of the oscillation transformer is of 3-inch brass ribbon 2 complete turns, but with only one turn in use. The secondary is of ten turns of one-inch brass ribbon, five of which are used. The oscillation transformer is of pancake type, constructed throughout of ½-inch bakelite. The gap is a Grebe synchronous, 8-point rotor, 10½ inches in diameter. Closed circuit leads are all of short heavy copper braid.

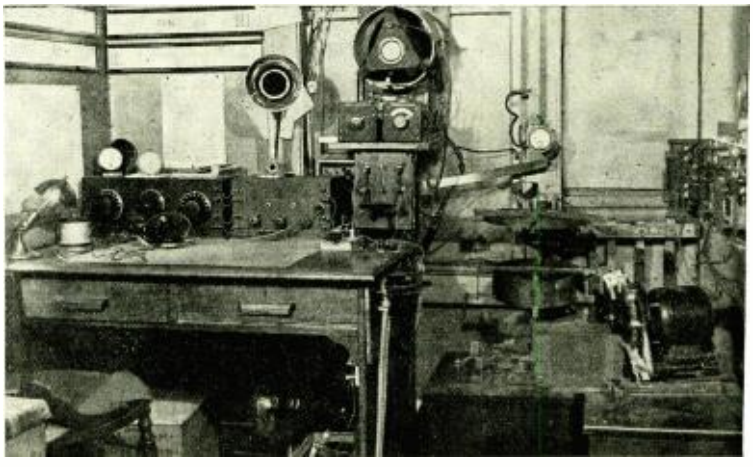
The antenna transfer switch is an angle triple pole switch mounted on half-inch bakelite. The gap and the primary power are controlled by two knife switches on the side of the operating table.

From the lead-in insulator the lead is of 1½ inch brass ribbon to a lighting switch from which this ribbon continues to the antenna switch. In series with this lead is a 6-ampere Western thermo-coupled ammeter, with a clip lead for shorting it out of circuit. On full power the input is 930 watts. Power is varied by the use of taps on a large choke coil and also by means of a sliding core. The normal antenna current is 5½ amperes with a 7-inch coupling.

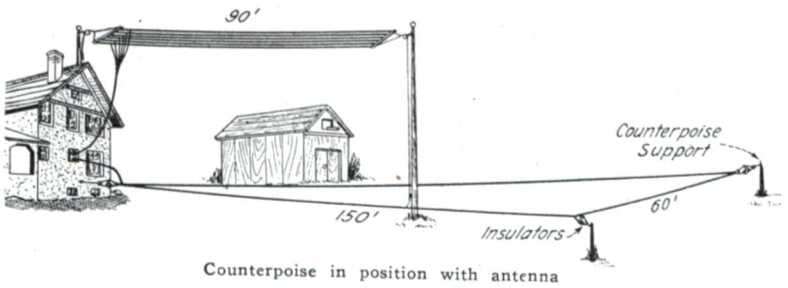
The receiving set consists of a home-made regenerative receiver, one step of radio frequency amplification, a detector and one step of audio-frequency amplification, using Marconi VT II



Self-rectification 10-watt C.W. set of 2OM station which has covered remarkable distances considering the receiver used



Transmitting and receiving equipment of 2OM station, Ridgewood, N. J.

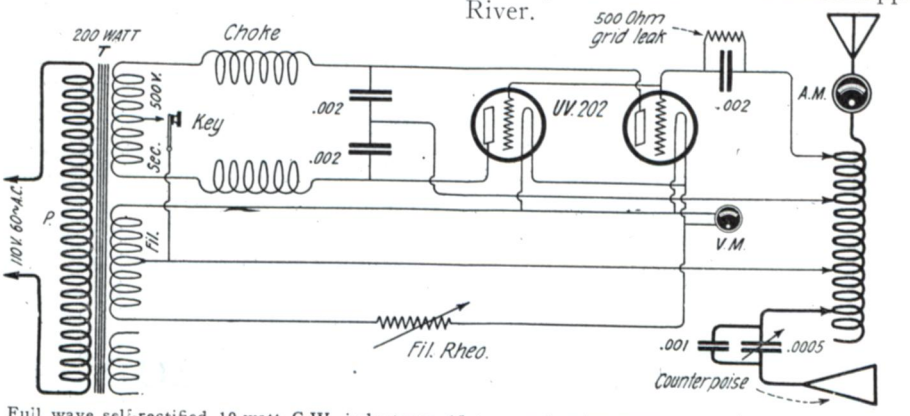


Counterpoise in position with antenna

amplifiers and an E. R. detector tube. A Grebe CR3 and Paragon RA10 has also been used. Signals from all districts have been copied. A variable condenser in series with the ground is used at all times.

The small C.W. transmitter now in use consists of two UV202 Radiotrons in a full-wave self-rectified circuit. The counterpoise ground alone is used with this C.W. transmitter, the normal antenna current being 1.5 to 1.7 amperes. After two weeks in operation, all districts except the 6th and 7th, have been worked with this set—the record transmission being 1100 miles on 10 watts. A 50-watt UV203 is now being installed. 5EK Memphis, Tenn., reported the sigs of 2OM as QSA when using one 5-watt tube, the other having burned out.

Station 2OM has worked stations in 34 out of the 35 states. Reception of 2OM messages has been accomplished in every state east of the Mississippi River.



Full wave self-rectified 10-watt C.W. inductance 15 turns edgewise wound copper ribbon, 10 inches diameter—counterpoise alone used for ground as described

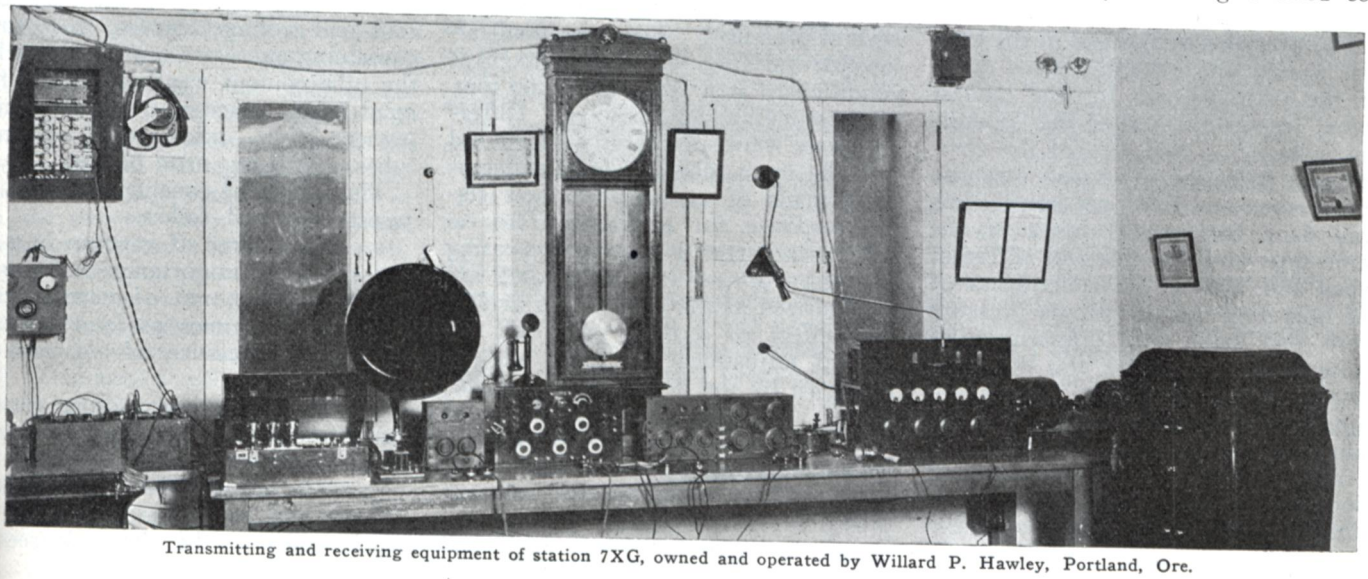
Voice from 7XG Reported from Hawaii

THE Experimental Station of Willard P. Hawley, 400 East 22nd St. North, Portland, Ore., using a C.W. transmitter, call 7XG, has made some exceptional records recently. In one case he has been reported from Hawaii, a distance of 2,500 miles. Four 50-watt Radiotrons UV-203 are used, two as oscillators and two as modulators. The Colpitts oscillation and the Heising modulation systems are used.

To supply the filament current an Acme transformer is used, giving 9.75 volts A.C. on the filament. The plate current is supplied by a Robbins & Myers motor generator set, the motor being a ¾ horsepower single-phase 110-volt A.C. direct connected to a special double-wound generator with a 72-bar commutator at each end, each generator being ¼ K.W., and giving far in excess of the 500 volts required. By connecting the two generator output leads in series a voltage up to 1,500 volts direct current is easily obtained. A voltage regulation from 300 to 1,500 volts is obtained by a 10,000-ohm Ward Leonard rheostat.

At the lower left hand corner of the transmitting panel is a drum switch control which is marked "Voice," "Receiving," "Off," "C.W." and "Chopper." When turned to "Voice," the transmitting panel is ready for the transmission of speech or music, the filaments are lighted, the motor generator is started, furnishing current to the plates and the set is in full working order. The same holds true when control is turned to C.W. or chopper. When the operator is finished with transmitting, the drum switch is always turned to receiving position, and the apparatus is then ready for receiving. To the right of the drum switch control, first, is the wavelength control; second, the coupling control, and third, the condenser control. A chopper, with a 900-cycle note, is used for I.C.W.

The receiving apparatus was designed for short wave work and was built by the Northwestern Radio Mfg. Co. It consists of a plate variometer, grid variometer, variocoupler, primary inductance and primary condenser. This handles wavelengths from 160-450 meters. The 450-900 meter range is obtained by shunting a fixed con-



Transmitting and receiving equipment of station 7XG, owned and operated by Willard P. Hawley, Portland, Ore.

denser in the secondary circuit. Connected to the short wave set is a detector and 2-step amplifier of the same make. For long waves from 600-20,000 meters, a Colin B. Kennedy long wave receiver is used.

The transmitting and short-wave receiving aerial is of the "T" type. The flat top portion is 40 feet long and consists of four wires equally spaced on 10-foot spruce spreaders. Each wire of the flat top portion is insulated at both ends with a Victor insulator. The long-wave receiving aerial is a 7-strand No. 20 phosphor bronze single wire, and is 350 feet long with an average height of 70 feet.

The poles supporting the top portion of the antenna are both 100 feet high and 70 feet apart, each pole weighing 3½ tons and are 22 inches at the base and 8 inches at the top. These masts are one piece and turned true on a lathe, and there are no guys used whatsoever. They are bolted between concrete saddles with 1⅞-inch bolts and do not go into the ground; hence, will not rot at the base.

The lead-in consists of four wires brought together about 50 feet above the ground, forming a rat tail from that point to the instruments. The wire used is 7-strand No. 20 phosphor bronze. A 6-wire counterpoise made up of 7-strand No. 20 phosphor bronze wire runs parallel with the antenna flat top portion, and directly beneath the antenna, the wires being about 1½ feet apart and 70 feet long, and very carefully insulated. The counterpoise extends 15 feet beyond the antenna at both ends. This counterpoise is connected to the inductance on the transmitting set being used in addition to the ground. This gives greater radiation as it reduces the antenna resistance to a minimum. The transmitting set radiates 4 amperes on modulated voice and 5 to 5½ amperes on straight C.W., using two 50-watt tubes as oscillators. The ground system consists of four 60-foot strips of three-inch flat copper ribbon, buried about 8 inches deep, directly underneath the aerial; each strip being spaced two feet apart.

In addition to having been reported from practically all States in the western half of the country, this station has been heard on CW, ICW, and modulated voice in the Hawaiian Islands, near Honolulu, a distance of about 2,500 miles airline.

Pressure and Gas Content in Vacuum Tube Detectors

H. A. Brown and Chas. T. Knipp
Laboratory of Physics, University of Illinois

IN recent years there has been put on the market a class of vacuum tubes knowns as "gas content detector tubes." The advantage of using this type of tube as a detector lies in the fact that it does not require a high-plate voltage for its operation and it is commonly believed that such a tube gives louder response to signals than one having a higher vacuum. The low-voltage vacuum tubes have critical adjustments of plate voltage and filament current to secure the best response to signal currents, but this is not the case for high-voltage vacuum tubes. The purpose of the present discussion is to show from experimental data just how the degree of vacuum and the nature of the gas in the tube affect its operation as a detector.

The pressure of the gas in the tube was varied and readings were taken of the plate voltage for the loudest signal response — called the "operating voltage" — and also of the comparative intensity of signal response for various measured pressures. This was done for several tubes of the same type and for tubes of different types and makes. Measurements of the operating voltage versus pressure were also made with different gases successively introduced into the same tube. Sample or typical curves obtained for pressure variation with the same gas are shown in figure 1.

The effect of various pressures and kinds of gas upon the critical adjustment characteristics was also measured. The intensity of response

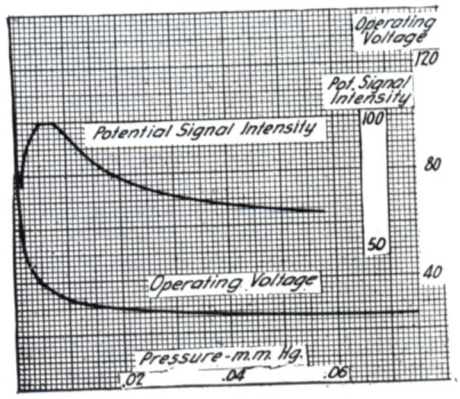


Figure 1—Pressure variation with same gas

passes through a maximum for each pressure as plate voltage or filament current increases. In figure 2 curves are shown for only three pressures although curves were obtained for several pressures. The very small allowable variation of plate voltage at condition of best response at .06 mm. of mercury should be noted. Different gases were successfully introduced into the same tube and measurements were made of comparative best signal response for each gas. The results were arrived at after repeating the test for several tubes, and are summarized at the end of this article. The effect of various gases on the critical adjustment of plate voltage is shown by the dotted curves in figure 2. Measurements were made of the amplification constant and mutual conductance of different tubes with varying plate voltages for different pressures, and typical results are shown in figure 3. Only high and low pressure curves are shown for lack of space. If the amplification constant is a function of the geometry of the tube, the presence of gas alters the effective geometry of the tube as the curves clearly show. When gas is present the amplification constant decreased with increasing filament current above normal values while the measured value of mutual conductance increased. However, the intensity of signal response passed through a maximum for increasing filament current. The variations of the mutual conductance, as shown in figure 2, were very similar to the variations of intensity of signal response with varying plate voltage at different pressures. Data were taken which showed that the characteristic humps in the plate current-grid voltage curves for tubes containing gas were not present when the tube content was helium, the filament being tungsten, nor were humps present for oxide-coated filament tubes containing neon or air.

The tabulated conclusions from the results obtained follow:

1. The degree of vacuum in a detector tube is important. A pressure of .0025 to .005 mm. of mercury gives two or three times as loud response as does a pressure of .05 mm. of mercury.

2. The operating voltage for the most desirable vacua above mentioned is 40 to 50 volts.

3. The adjustments of operating voltage and best filament current are much easier at the above degrees of

vacua, and this fact, with the doubled intensity of audible response fully justifies the provision of a higher plate voltage than is now needed for many low vacuum detector tubes.

4. The operating voltage varies with the pressure in the tube along a curve of the form of $E_o = e_1 (a)^{\frac{1}{P}}$. E_o is the operating voltage, e_1 is probably the ionizing potential of the gas P is the pressure, and "a" is constant. For various gases the variation gives very similar curves.

5. The bend in the above curve occurs at the point of best audibility of response, or .003 to .005 mm. of mercury, and operating voltages of about 40 ot 50 volts. To the right of the bend (increasing pressure) adjustments of operating voltage and filament current become critical.

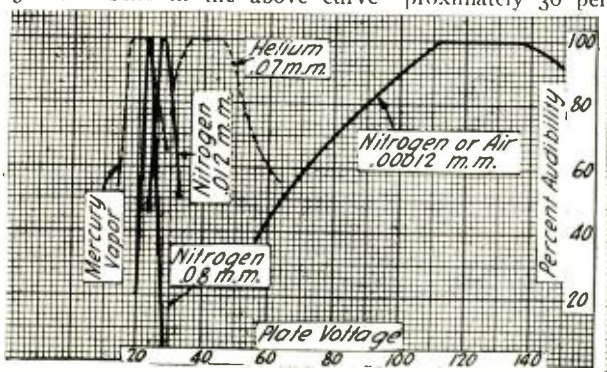


Figure 2—Effect of various gases on critical adjustment of voltage

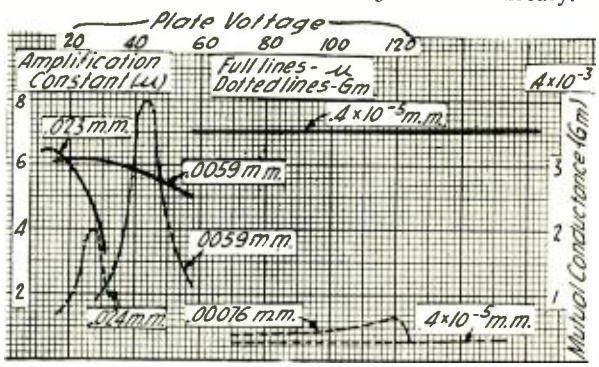


Figure 3—Amplification and conductance under varying plate voltages for different pressures

6. The introduction of neon, nitrogen, or carbon dioxide, does not show any change in audibility or intensity of response from that obtained with air in the tube. Argon gives a somewhat louder response, and helium a slightly weaker response.

7. Hydrogen gives a very much weaker audibility of response.

8. The degree of critical adjustment of plate voltage and filament current for best response is about the same for air, nitrogen, neon, and carbon dioxide. Hydrogen tubes are somewhat more critical.

9. The operating voltage is approximately 30 per cent. higher for helium-filled tubes than for those mentioned above at the same degree of vacuum.

10. The operating voltage is considerably less critical for helium-filled tubes than for any other gas content, and compares with those tubes having fair vacuum.

11. Mercury vapor gives better signal response than the other gases tried, while for the former the operating voltage is lower at similar pressures. The operating voltage for mercury vapor varies from 16 to 22 volts depending on the vapor pressure and hence on the temperature of the walls of the tube. The operating voltage and best filament current are also less critical for mercury vapor than for neon, argon, air, or carbon dioxide.

12. For all of the gases tried the audibility of signal response rises to a maximum as the pressure is lowered below .005 mm. of mercury.

13. The operating voltage at low vacuum depends on the ionization potential of the gas in the tube, but the former is about five or six volts higher than the latter up to pressures of .06 to .08 mm. of mercury. Comparative operating voltages for helium, argon, neon, and mercury vapor tube content shows this to be true.

Revision of British Post Office Regulations Covering Amateur Transmission

THE Wireless Society of London has been advised by the British Postmaster-General that the regulations governing amateur communication have been modified to allow the amateurs greater liberties in transmission. The detailed modifications are as follows:

(1) The restriction that transmission must be confined to five other stations will be withdrawn, on the understanding that the matter transmitted will be confined to communications relating to the experiments in hand and intended solely for the stations actually cooperating in those experiments. The broadcasting of general calls, news, or advertisements, or of matter similar to that which will be transmitted from the proposed broadcasting stations, are expressly forbidden.

(2) Transmission will be permitted for an aggregate maximum of two hours in each 24 hours provided—(a) that no transmission shall commence without previous listening-in on the wavelength which is to be used in order to ascertain whether the proposed transmission is likely to interfere with any other station which may be working, and (b) that no single transmission shall last more than 10 consecutive minutes, and each transmission shall be followed by a period of not less than three minutes listening-in on the wavelength used for transmission.

(3) The following wavelengths will be allocated for amateur transmission:

150 meters to 200 meters inclusive (spark, C.W. and telephony).

440 meters (C.W. and telephony only).

The wave of 1,000 meters for amateur use will be withdrawn.

At the recent annual conference of the Affiliated Wireless Societies of Great Britain a resolution was passed requesting the Wireless Society of London to open negotiations with the postoffice authorities regarding regulations of amateur wireless transmission. As a result a committee of the Wireless Society of London has submitted the following requests to the Postmaster General:

1. That no restrictions be placed on amateur transmitting stations communicating with other amateur stations. At present, an amateur is limited to communicate with only five other alloted stations.

2. That amateurs be permitted to transmit for an aggregate maximum of two hours in each twenty-four, limiting each transmission to ten minutes. This would invalidate the regulation requiring an amateur to transmit only during the two hours specified in his license.

3. That wave lengths for amateurs be reduced from the present 1,000 meters to about 400 meters and an experimental length of about 180 meters.

The last suggestion is due to complaints of the Air Ministry that aircraft traffic has been seriously interfered with by amateurs who have been allotted the general wave length of 1,000 meters.

The amateurs of the British Isles are, in general, still restricted to 10 watts input. Exception has been made, however, in the case of one or two participants in the recent Trans-Atlantic Amateur Transmissions, who have been authorized to use higher power in the Trans-Atlantic tests to be made next fall and winter.

Left to right: C. M. Hollar, R. S. Bruneau, T. A. Marshall, A. L. Newton, L. G. Davies

The shack where the receiving set was installed

R. S. Bruneau and L. G. Davies listening for Pacific Coast Amateurs

Pacific Coast Amateurs Heard in Hawaii

By R. S. Bruneau, (I LAM)

OAHU, one of the islands in the Hawaiian group is, in my opinion and also the opinion of any "Op" who has tried to do any long distance work from there, one of the worst QRM vicinities in the world. NPM's big arc going practically all the time, with its harmonics, the broad-tuned spark of KHK to help draw the sweet forbidden words from our mouths, and about 'steen million smaller stations, make it anything but an ideal location for long-distance reception.

Besides this, we are on the wrong side of a large mountain range; the range being located between us and the west coast of the States, and to make matters worse we are right in one of those places known in radio circles as a "pocket." To be sure, mates, we have anything but good radio conditions here.

We are all head-over-heels with the advent of C.W. and the news has arrived of the good work done by Brother Dow (6ZAC) over on Maui, another island of this group and about 100 miles from us.

Being "bugs" of the first degree we couldn't sit still with the thought that even out here in "No Man's Land" our brothers on the Coast could be heard bawling each other out and trying to work the King of Siam and make a date with his daughter on a 5-watt tube. Therefore we resolved to have a finger in the pie to see how sweet it really did taste.

Friday morning, April 21, we gathered the gang for a hasty pow-wow and all sorts of suggestions were advanced. The idea of cutting a Culebra through the mountains to see if a few stray sigs would find their way through was looked upon as too much work, so we decided to borrow a truck and pack some gear to the other side of the rock and see what the outcome would be.

The start was made Saturday noon, April 22, with a Ford truck loaded with radio gear and chow (mostly chow). The gang consisted of T. A. Marshall, A. L. Newton, L. G. Davies, C. M. Hollar and R. S. Bruneau.

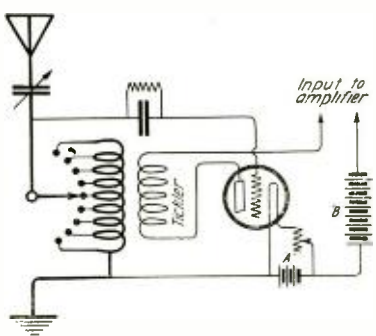
Makapuu Point had been decided upon as the best place for a test, it being the furthest away from the QRM center, which was about 40 miles. After much bumping and spilling of battery water over the chow we at last arrived at our destination.

The point is an ideal location for radio work, being about 700 feet above sea level. There are no trees or obstructions of any kind and the only buildings near were three houses where dwelt the lightkeepers and their families.

By dint of haste and hard work we had a portable field antenna of bamboo poles erected before dark. A wash house in the rear of the light-keepers' home was used as a shack to house the instruments. We then wired up our set which consisted of a honeycomb outfit, for long wave arc, and a short wave receiver, made by Mr. Marshall the afternoon before.

The short-wave receiver consisted of a Remler variocoupler, DeForest variable condensers (vernier type) and Western Electric phones. We used both Western Electric VT1's and UV200 Radiotrons.

To 6ZX goes the honor of being the first to be heard on this island, that station being logged at 7.32 p. m. on April 22. Next in order came 6KY at 7.40 p. m. We were bothered for a while by the harmonics from KIE. NPM'S big arc was heard most of the time, but did not bother us.



The hook-up used in the short-wave receiver at Oahu, H. T., for reception of Pacific Coast amateur signals

At 9.00 o'clock we put in a UV200 in place of a VT1 in the detector and 6KI calling 6ZZ came trickling through the phones at 9.02 p. m. From then on they came rolling in pretty steady. At 9.57 p. m. 6ZI was heard working 6ZAC and up to 10.30 p. m. telling 6ZAC to QRL. At 10.20 p. m. 6ZG calling 6ZAC with QRK? and QTC at 10.23 p. m. 6ZI then told 6ZAC to QRL if he wanted to get traffic through. 6ZI QSA at 11.17 p. m. calling 6ZAC. 6ZAC was very QSA at all times, as he is our next door neighbor over on Maui. At 12.26 a. m., April 23, 6ASJ called 6ASM with QRK? We then started to log a few messages as further proof of our claims and 6ZG helped us out.

At 1.22 a. m. 6NY heard, but QRZ. It was a pleasure to copy 6ZI and 6ZG as their operating ability was of the best. Since our trip 6ZI has been heard almost nightly, working 6ZAC. This was done from the side of the island farthest from the coast and with the mountain range between. On May 11 6ZI was working 6ZAC and sending double. 6ZAC replied with OK'S and "Go ahead single fast." So it seems safe to say that from now on amateur communication between here and the States is assured.

We are planning another trip about the 20th of May and expect to get even better results next time. Other trips from time to time have been planned. I am constructing a C.W. set now and am in hopes to have it finished by the time of our next trip.

Anyone wishing to try their luck with their transmitters can arrange a schedule with us by communicating with R. S. Bruneau, Submarine Base, Pearl Harbor, T. H.

New Bill to Regulate Radio Communication

Secretary of Commerce is Given Authority to Make, Alter and Revoke Regulations Applicable to All Licensed Stations

A NEW bill to regulate radio communication, known as S-3694, was introduced in the Senate on June 8, by Senator F. B. Kellogg, and after two readings was referred to the Committee on Interstate Commerce of the Senate. The same bill was introduced in the House by Representative White.

This new bill contains some radical changes as compared to the existing law of August 13, 1912. In the new bill the Secretary of Commerce is given authority to make, alter and revoke regulations applicable to all classes of licensed stations. He is also authorized to specify the area to be served by any station and the times and methods of operating any station or the apparatus therein.

Another new provision authorizes the Secretary of Commerce to refuse a license to any person, company or corporation which in his judgment "is monopolizing, or seeking to monopolize, radio communication, through the control of the manufacture, or sale, of radio apparatus, or by any other means."

An advisory committee is provided for, six members of which are to be designated by secretaries of government departments and six members of recognized attainment in radio communication, not otherwise employed in the government service, to be designated by the Secretary of Commerce.

Another section of the new bill provides that radio telephone stations, the signals of which can interfere with ship communication are required to keep a licensed radio operator of a class to be determined by the Secretary of Commerce, listening in on the wavelength designated for the distress signals during the entire period the transmitter of such station is in operation.

Amateur operation is specifically provided for in the new law. Wavelengths of not less than 150 meters, nor more than 275 meters, are assigned to amateur stations.

Another provision of the new law provides a schedule of fees to be collected both for station licenses, for operator's licenses, and for examination for such licenses.

The complete bill follows:

An Act to amend "An Act to regulate radio communication," approved August 13, 1912, and for other purposes.

Be it enacted by the Senate and the House of Representatives of the United States in Congress Assembled, that the Act of Congress entitled "An Act to Regulate Radio Communication," approved August 13, 1912, is amended by striking out sections one, two and three thereof and by inserting in lieu thereof the sections one, two and three following:

Section 1. A. No person, company or corporation within the jurisdiction of the United States shall use or operate any apparatus for radio communication by telegraphy or telephony as a means of intercourse among the several states or with foreign nations or upon any vessel of the United States engaged in interstate or foreign commerce, or for the transmission of radiograms or signals by telegraphy or telephony the effects of which extend beyond the jurisdiction of the state or territory in which the same are made or where interference would be caused thereby with the transmission or reception of messages or signals from beyond the jurisdiction of said state or territory, except under and in accordance with a license in that behalf granted by the Secretary of Commerce and except as hereinafter authorized.

B. The Secretary of Commerce from time to time shall:

a. classify licensed radio stations and the operators required therein;

b. prescribe the nature of the service to be rendered by each class of licensed station and assign bands of wave lengths thereto;

c. make, alter and revoke regulations, applicable to all licensed stations, not inconsistent with this Act or any other Act of Congress or with the terms of any radio communication convention to which the United States is a party, concerning the service to be rendered by each class of stations so established; the location of any station; the wave lengths to be used by any station; the kinds of instruments or apparatus in any station, with respect to the external effect produced thereby; the power and the purity and sharpness of the waves of each station or the apparatus therein; the area to be served by any station, and the times and methods of operating any station or the apparatus therein.

d. make such other regulations not inconsistent with law as he may deem necessary to prevent interference between all stations affected by this Act.

C. Radio stations belonging to and operated by the United States and used exclusively for communication of official business shall not be subject to the provisions of paragraphs A and B of this Section. Every other station owned and operated by the United States shall be subject to the provisions of said paragraphs A and B of this Section. All stations owned and operated by the United States and all other licensed stations on land or sea shall have special call letters designated by the Secretary of Commerce, and such stations and the designated call letters shall be included in the list of radio stations of the United States as published by the Department of Commerce. Radio stations owned and operated by the United States and used exclusively for the communication of official business shall use such wave lengths as shall be assigned to each by the President and shall observe such regulations as the Secretary of Commerce may make to prevent undue interference with other radio stations and the rights of others, except that upon proclamation by the President that there exists war or a threat of war or a state of public peril or disaster, or other emergency, the President may suspend for such time as he may see fit, all such regulations of the Secretary of Commerce applicable to such stations owned and operated by the United States.

D. Every such license shall provide that the President of the United States in time of war or public peril or disaster may cause the closing of any station for radio communication and the removal therefrom of all radio apparatus, or may authorize the use or control of any such station or apparatus by any department of the Government, upon just compensation to the owners.

Section 2. A. Paragraph A of Section 1 of this Act shall not apply to persons sending radio messages or signals through a Radio Station belonging to and operated by the United States for the transmission exclusively of official business nor to persons sending such messages on a foreign ship while the same is within the jurisdiction of the United States.

B. The station license required hereby shall not be granted to or after the granting thereof such license shall not in any manner, either voluntarily or involuntarily, be transferred to

a. Any alien or the representative of any alien;

b. Nor to any foreign government or the representative thereof;

c. Nor to any company, corporation, or association organized under the laws of any foreign government;

d. Nor to any company, corporation or association of which any officer or director is an alien or of which more than one-fifth of the capital stock having voting power is owned or controlled by aliens or their representatives or by a foreign government or representative thereof, or by any company, corporation or association organized under the laws of a foreign country.

Such station license, the wave length or lengths authorized to be used by the licensee and the rights therein granted shall not be transferred, assigned or in any manner, either voluntarily or involuntarily, disposed of to any other person, company or corporation without the consent in writing of the Secretary of Commerce.

C. The Secretary of Commerce, subject to the limitations of this Act, in his discretion, may grant to any applicant therefor, a station license provided for in sections 1 and 2 hereof, *except* that he may grant such license only to a station which is in the interest of the general public service.

No license granted by the Secretary shall be for a longer term than 10 years and any license granted may be revoked as hereinafter provided. Upon the expiration of any license, the Secretary in his discretion upon application therefor, may grant a renewal of such license for the same or for a lesser period of time.

The Secretary of Commerce is hereby authorized to refuse a license to any person, company or corporation, or any subsidiary thereof which, in the judgment of the Secretary, is monopolizing or seeking to monopolize Radio communication, directly or indirectly, through the control of the manufacture or sale of Radio apparatus or by any other means. The granting of a license shall not stop the United States from prosecuting such person, company or corporation for a violation of the law against monoplies or restraint of trade.

D. The Secretary of Commerce may grant licenses only upon written application therefor addressed to him, which application shall set forth such facts as he by regulation may prescribe as to the citizenship, character and financial, technical and other ability of the applicant to operate the station; the ownership and location of the proposed station and of the stations with which it is proposed to communicate; the wave lengths and the power desired to be used; the hours of the day or other periods of time during which it is proposed to operate the station; the purposes for which the station is to be used, and such other information as he may require. Such application shall be signed by the applicant under oath or affirmation.

E. Such station license as the Secretary of Commerce may grant shall be in such general form as he may prescribe but each license shall contain in addition to other provisions, a statement of the following conditions to which such license shall be subject:

a. The ownership or management of the station or apparatus therein shall not be transferred in violation of this Act. There shall be no vested property right in the license issued for such station or in the bands of wave length authorized to be used therein, and neither the license nor any right granted thereunder shall be assigned or otherwise transferred in violation of this Act.

b. Such licenses shall contain such other conditions, not inconsistent with this Act, as the Secretary of Commerce may prescribe.

F. Any station license granted by the Secretary of Commerce shall be revocable by him for failure to operate service substantially as proposed in the application and as set forth in the license, for violation of or failure to observe any

of the restrictions and conditions of this Act or of any regulation of the Secretary of Commerce authorized by this Act or by the provisions of any international radio convention ratified or adhered to by the United States or any regulations thereunder or whenever the Secretary of Commerce shall deem such revocation to be in the public interest; provided, that no order of revocation shall take effect until 30 days' notice in writing thereof to the parties known by the Secretary to be interested in such license. Any person interested, aggrieved by said order, may make written application to the Secretary at any time within said 30 days, for a hearing upon such order and upon filing of such written application said order of revocation shall stand suspended until the conclusion of the hearing herein directed. Notice in writing of said hearing shall be given by the Secretary to all the parties known to him to be interested in such license, 30 days prior to the time of said hearing. Said hearing shall be conducted under such rules and in such manner as the Secretary may prescribe. Upon the conclusion thereof, the Secretary may affirm, modify or revoke said orders of revocation.

Section 3. A. The actual operation of apparatus in any radio station for which a station license is required by this Act shall be carried on only by a person holding an operator's license issued thereunder. No person shall operate any apparatus in such station except under and in accordance with an operator's license issued to him by the Secretary of Commerce.

B. The Secretary of Commerce, in his discretion, may grant special temporary operators' licenses to operators of radio apparatus under such regulations, in such form and upon such conditions as he may prescribe whenever an emergency arises requiring prompt employment of such an operator.

C. An operator's license shall be issued by the Secretary of Commerce in response to a written application therefor, addressed to him, which shall set forth:

a. The name, age and address of the applicant;

b. The date and place of birth;

c. The country of which he is a citizen, and if a naturalized citizen of the United States, the date and place of naturalization;

d. The previous experience of the applicant in operating radio apparatus; and

e. Such other facts or information as may be required by the Secretary of Commerce.

Every application shall be signed by the applicant under oath or affirmation.

D. An operator's license shall be issued only to a person who, in the judgment of the Secretary of Commerce, is proficient in the use and operation of radio apparatus and in the transmission and reception of radiograms by telegraphy and telephony. Except in an emergency found by the Secretary of Commerce to exist, an operator's license shall not be granted to any alien, nor shall such a license be granted to a representative of a foreign government.

E. An operator's license shall be in such form as the Secretary of Commerce shall prescribe, and may be suspended by him for a period not exceeding two years upon proof sufficient to satisfy him that the licensee

a. has violated any provision of any act or treaty which the Secretary of Commerce is authorized by this Act to administer, or of any regulation made by the Secretary under any such act or treaty; or

b. has failed to compel compliance therewith by any unlicensed person under his supervision; or

c. has failed to carry out the lawful orders of the master of the vessel on which he is employed; or

d. has wilfully damaged or permitted apparatus to be damaged; or

e. has transmitted superfluous signals, or signals containing profane or obscene words or language.

F. A license may be revoked by the Secretary of Commerce upon proof sufficient to satisfy him that the licensee was at the date his license was granted to him, or is at the time of revocation, ineligible for a license.

Section 4. A. After the approval of this Act the construction of a station for which a license is required by this Act shall not be begun, nor shall the construction of a station already begun be continued, until after a permit for its construction has been granted by the Secretary of Commerce upon written application therefor. This application shall set forth such facts as the Secretary of Commerce by regulation may prescribe as to the citizenship, character and the financial, technical and other ability of the applicant to construct and operate the station, the ownership and location of the proposed station and of the station or stations with which it is proposed to communicate, the wave length or wave lengths desired to be used, the hours of the day or other periods of time during which it is proposed to operate the station, the purpose for which the station is to be used, the type of transmitting apparatus to be used, the power to be used, the date upon which the station is expected to be completed and in operation and such other information as the Secretary of Commerce may require. Such application shall be signed by the applicant under oath or affirmation.

B. Such permit for construction shall show specifically the earliest and latest dates between which the actual operation of such station is expected to begin and shall provide that said permit will be automatically forfeited if the station is not ready for operation within the time specified. The rights granted under any such permit shall not be assigned or otherwise transferred to any other person, persons, company or corporation, without the approval of the Secretary of Commerce; Provided, that a permit for construction shall not be required for Government stations to be used exclusively for communication of official business or for private stations as provided for in Section 4, fifteenth regulation of the Act of August 13, 1912. The granting of this permit to construct a station as herein required shall not be construed to impose any duty or obligation upon the Secretary to issue a license for the operation of such station.

Section 5. An advisory committee is hereby established to whom the Secretary of Commerce shall refer for examination and report such matters as he may deem proper relating to

a. The administration or changes in the laws, regulations, and treaties of the United States relating to radio communication.

b. The study of the scientific problems involved in radio communication with the view of furthering its development.

c. The scientific progress in radio communication and the use of radio communication:

The advisory committee shall consist of twelve members of whom one shall be designated by the Secretary of State, one by the Secretary of War, one by the Secretary of the Navy, one by the Secretary of Agriculture, one by the Postmaster General, and one by the Secretary of Commerce to represent these Departments respectively, and six members of recognized attainment in radio communication not otherwise employed in the Government Service to be designated by the Secretary of Commerce.

The necessary expenses of the members of the committee in going to, returning from, and while attending meetings of the committee, including clerical expenses and supplies, together with a per diem of twenty-five dollars to each of the six members not otherwise employed in the Government Service for attendance at the meetings, shall be paid from the appropriations made to the Department of Commerce for this purpose.

Section 6. Radio telephone stations, the signals of which can interfere with ship communication, are required to keep a licensed radio operator of a class to be determined by the Secretary of Commerce, listening in on the wave length designated for distress signals, during the entire period the transmitter of such station is in operation.

Section 7. Regulation First of Section 4 of said Act of Congress, approved August 13, 1912, is amended by striking out the words, "this wave length shall not exceed 600 meters or it shall exceed 1,600 meters."

Regulation Second of Section 4 of said Act of Congress, approved August 13, 1912 is amended by striking out the words "provided that they do not exceed 600 meters or that they do exceed 1,600 meters."

Regulations Third and Fourth of Section 4 of said Act of Congress, approved August 13, 1912, are hereby repealed.

Regulations Fifteen and Sixteen of Section 4 of said Act of Congress, approved August 13, 1912, are amended by striking out the words "exceeding 200 meters," and substituting in lieu thereof the words "of not less than 150 meters nor more than 275 meters."

Section 8. Any person, company or corporation who shall erect, use or operate any apparatus for radio communication in violation of this act, or knowingly aid or abet another person, company or corporation in so doing, or knowingly make any false oath or affirmation for the purpose of securing a permit or a license, shall incur a penalty not to exceed one thousand dollars which may be mitigated or remitted by the Secretary of Commerce; and the permit or license of any person, company or corporation who shall violate any of the provisions of this Act, or of any of the Regulations of the Secretary of Commerce issued hereunder, or knowingly make any false oath or affirmation for the purpose of securing a permit or license, may be suspended or revoked by the Secretary of Commerce.

Section 9. The Secretary of Commerce is hereby authorized and directed to charge and through the imposition of stamp taxes on aplications, licenses or other documents, or in other appropriate manner, to collect the fees specified in the schedule following. The Secretary shall collect said fees through the Collectors of Customs or other officers designated by him and he may make such regulations as may be necessary to carry out the provisions of this section;

SCHEDULE OF FEES TO BE COLLECTED

	Per annum
For transoceanic radio station license	$300.00
For commercial land station license, other than transoceanic, one kilowatt transmitter input or less	50.00
and for each additional kilowatt or fraction thereof	5.00
For ship station license	25.00
For experiment station license	25.00
For technical and training school station license	15.00
For special amateur station license	10.00
For general and restricted amateur station license	2.50
For commercial extra first-class operator's license	2.50
For commercial first-class operator's license	1.50
For commercial second-class operator's license	1.00
For commercial cargo grade operator's license	.50
For experiment and instruction grade operator's license	1.00
For amateur first grade operator's license	.50
For amateur second grade operator's license	.50
	For each examination
For commercial extra first-class radio operator's examination for license	2.50
For commercial first-class radio operator's examination for license	2.00
For commercial second-class radio operator's examination for license	1.50
For commercial cargo grade radio operator's examination for license	1.00
For experiment and instruction grade radio operator's examination for license	1.00
For amateur first grade radio operator's examination for license	1.00
For amateur second grade radio operator's examination for license	.50

In the event that other classes of station and operator's licenses or other examinations shall hereafter be prescribed in any lawful manner, the Secretary of Commerce is hereby authorized and directed to charge and collect in the same manner as herein provided, fees for such new classes of licenses and of examination which fees shall be substantially of the amount herein specified for the license and examination nearest in character and purpose of the new license or examination so prescribed.

For failure to pay at the time and in the manner specified by the Secretary of Commerce any of the above fees, the Secretary of Commerce is authorized to refuse to issue such licenses or if issued to suspend or revoke the same as he may deem proper.

Section 10. Wherever the words "Naval and Military" stations appear in the Act to regulate Radio Communication, approved August 13, 1912, said words "Naval and Military" shall be stricken out and the word "Government" substituted in place thereof.

Section 11. All Acts or parts of Acts in conflict with this Act are hereby repealed.

The Monthly Service Bulletin of the

NATIONAL AMATEUR WIRELESS ASSOCIATION

Guglielmo Marconi, *President* — J. Andrew White, *Acting President* — H. L. Welker, *Secretary*

Founded to promote the best interest of radio communication among wireless amateurs in America

THE regular bi-monthly meeting of the New Haven Radio Association at the club rooms in Fraternal Hall in Elm Street on May 18, was one of the largest attended and most enthusiastic held this year. The main feature of the evening's program was the award of prizes in the construction of a receiving set and the membership drive.

Clarence E. Palmer, of 66 Marne Street, Hamden, who brought in a beautiful cabinet tube regenerative set, was declared the winner of the tube regenerative set competition. The prize was a year's supporting membership in the association, valued at $6. Wilbur Sheld, of 220 Dwight Street, was accorded honorable mention in this contest.

F. Donato of 882 Howard avenue, who brought in a small crystal set accompanied by a diagram of its wiring, received the prize for the school-boy's class which also was a year's supporting membership in the club.

The membership contest in which 14 took part was won by Frederick Brill of 242 Davenport avenue, who received a detector tube.

The club now has a membership of about 150 and is growing stronger at each meeting.

W. A. Rida, vice-president of the association, resigned last night because of other pressing duties. He will be succeeded by Stallo Martino, who has already given much of his time in the interests of the club.

Following the business session of the meeting, Seabury B. Waring of Yale University, a true radio comedian, delighted the club with his imitations of an amateur operator.

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THE city government of Newark, N. J., will regulate wireless installations if a measure introduced recently by Director of Public Safety Brennan is adopted by the City Commissioners.

Mr. Brennan's measure provides that persons desiring to put up wireless sets must first obtain permits and then use specified safety devices. It also provides for inspectors to examine the apparatus after it is set up.

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A SURVEY of all radio transmitting stations licensed by the department of commerce shows that on May 31 there were 19,067 stations. Of this number 15,495 are amateur stations, 348 experimental American ships, and the balance, 439, commercial stations.

Of this last number, there are today 274 broadcasting stations, known as limited commercial stations, twenty of which were licensed this week. They comprise universities, municipalities, newspapers, electrical manufacturers and retail stores, sending entertainment or information on weather, crops and market reports.

The growth of this class of radio stations has been remarkable; it jumped from sixty-seven stations a little more than two months ago to 274 to date. Applications are filed on an average of about three or four a day.

Transmitting Stations

Transoceanic	11
General public or "ship to shore"	31
Point to point	124
Broadcasting	274
American ships	2,783
Experimental	225
Technical and training schools	123
Amateur	15,294
Special amateur	201
Total	19,067

Amateur Stations by Districts

1. Boston	2,490
2. New York	2,313
3. Baltimore	1,831
4. Baltimore (Savannah)	319
5. New Orleans	699
6. San Francisco	1,616
7. Seattle	726
8. Detroit	2,393
9. Chicago	2,907
Total	15,294

△ △

A PUBLIC meeting of the Detroit Radio Association was held in The Detroit News conference room recently. "How to Construct an Aerial," "How to Build Simple Receiving Sets," and "Explanation of Wave Lengths" were discussed.

During the general meeting questions on radio matters were answered by members of the association, and the subject of forming a new radio club to be known as the Detroit Amateur Radio Club was discussed.

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INCORPORATION papers have been taken out by the American Radio Association, organized by Chicagoans, with headquarters in the Loop building, Clark, near Madison street. The object of the association, according to incorporation articles filed with the Secretary of State, is to "further scientific, commercial and social interests of radio by combining into a harmonious and active organization."

The association also announces its intention to co-operate with the department of commerce and other governmental, municipal and official authorities in "regulating and enforcing ether rights." Protection of buyers from fraudulent dealers also is planned.

The organization will maintain an engineering staff for the benefit of its members. Plans are being made to make the organization national.

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AMATEUR radio transmitting stations operating on 200 meters are at liberty to use the ether at all times, except between 7:30 and 9 o'clock at night, according to a decision made by Major M. J. Dillon, United States radio inspector for the 6th Radio District.

If the owners of receiving sets will make a thorough examination of their machines, Major Dillon says, he believes that the "listening in" fans will find that their trouble rests with improper tuning, and not from the interference of amateurs.

Amateur operators must of necessity be allowed their scheduled time on the air, he said. And just so long as they continue operating on 200 meters, he said, there wasn't anything his office could do by way of checking their activity.

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THOMAS FINNEGAN, thirty-seven years old, of No. 890 Tinton avenue, the Bronx, New York City, lost the thumb of his left hand and received lacerations of his right hand, when a large calibre cartridge he was filing exploded. He was taken to Lincoln Hospital. Finnegan, who is a radio man, recently found the cartridge and decided to use the brass tube in connection with his receiving set. He was filing off the head of the cartridge when he struck the percussion cap.

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IN the first contest of its kind, the University of Minnesota defeated the University of Wisconsin in a game of chess by radio on May 5. Three men were to have played on each side in three games, but two of the Wisconsin contestants failed to appear at the broadcasting rooms in Madison and only one game was played. Joseph M. Jran, who played that game from the radio rooms at the University of Minnesota, won in 19 moves.

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THE National Board of Fire Underwriters has formulated a set of rules governing the installation of wireless receiving sets that are connected with outdoor antennae.

These rules aid to minimize to a great extent the lightning danger and fire hazard generally believed to be associated with outdoor attennae.

The rules in detail follow:

"(a) Antennae outside of buildings shall not cross over or under electric light or

power wires of any circuit carrying current of more than 600 volts, or railway trolley or feeder wires, nor shall it be so located that a failure of either antenna or of the above mentioned electric light or power wires can result in a contact between the antenna and such electric light or power wires.

"Antenna shall be constructed and installed in a strong and durable manner and shall be so located as to prevent accidental contact with light and power wires by sagging or swinging.

"Splices and joints in the antenna span, unless made with approved clamps or splicing devices, shall be soldered.

"Antenna installed inside the building are not covered by the above specifications.

"(b) Lead-in wires shall be of copper, approved copper-clad steel or other approved metal which will not corrode excessively, and in no case shall they be smaller than No. 14 B. & S. gauge except that approved copper-clad steel not less than No. 17 B. & S. gauge may be used.

"Lead-in wires on the outside of buildings shall not come nearer than four (4) inches to electric light and power wires unless separated therefrom by a continuous and firmly fixed non-conductor that will maintain permanent separation. The non-conductor shall be in addition to any insulation on the wire.

"Lead-in wires shall enter building through a non-combustible, non-absorptive insulating bushing.

"(c) Each lead-in wire shall be provided with an approved protective device properly connected and located (inside or outside the building) as near as practicable to the point where the wire enters the building. The protector shall not be placed in the immediate vicinity of easily ignitable stuff, or where exposed to inflammable gases or dust or flyings of combustible materials.

"The use of an antenna grounding approved lightning arrester which will operate at a potential of 500 volts or less.

"The use of antenna grounding switch is desirable, but does not obviate the necessity for the approved protective device required in this section. The antenna grounding switch, if installed, shall, in its closed position, form a shunt around the protective device.

"(d) The ground wire may be bare or insulated and shall be of copper or approved copper-clad steel. If of copper the ground wire shall be not smaller than No. 14 B. & S. gauge, and if approved copper-clad steel it shall not be smaller than No. 17 B. & S. gauge. The ground wire shall be run in as straight a line as possible to a good permanent ground. Preference shall be given to water piping. Gas piping shall not be used for grounding protective devices. Other permissible grounds are grounded steel frames of buildings or other grounded metallic work in the building and artificial grounds such as driven pipes, plates, cones, etc.

"The ground wire shall be protected against mechanical injury. An approved ground clamp shall be used wherever the ground wire is connected to pipes or piping.

"(e) Wires inside buildings shall be securely fastened in a workmanlike manner and shall not come nearer than two (2) inches to any electric light or power wire unless separated therefrom by some continuous and firmly fixed non-conductor making a permanent separation. This non-conductor shall be in addition to any regular insulation on the wire. Porcelain tubing may be used or incasing wires to comply with this rule.

"(f) The ground conductor may be run inside or outside of building. When receiving equipment ground wire is run in full compliance with rules for protective ground wire, in Section d, it may be used as the ground conductor for the protective device."

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THE elimination of the short-wave "mush" of several high-power naval arc stations by means of a new method, has brought joy to the hearts of many thousands of amateur operators.

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A LECTURE under the auspices of the Program Committee of the Milwaukee Amateurs' Radio Club, "Straight C.W., Radio Regeneration and Amplification" by Mr. L. S. Hansen, A.M.I.R.E., Howard Radio Company, Chicago, Ill., was given on Monday, May 22, 1922, in the Trustees' Room of the Milwaukee Public Museum.

Kadel & Herbert

Prof. J. A. Fleming, F.R.S., lecturing on radio telephony before an audience of children

HARRY CONRAD, sixteen years old, of No. 2096 Amsterdam avenue and Paul John, eighteen years old, of No. 230 West One Hundred and Seventh street, two high school boys charged with burglary after forcing an entrance into the De Forest Radio Telephone and Telegraph Company plant at No. 1391 Sedgewick avenue, the Bronx, were discharged by Magistrate Sweetzer in Morrisania Court at the request of Richard Keaton, manager of the plant. Mr. Keaton said that in view of the fact that nothing had been taken from the place he did not wish to hurt the boys' careers and that he believed their act was more the result of a boyish prank than an intent to commit a crime.

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AT the annual meeting of the Tech Radio Club, of the Brooklyn Polytechnic Institute, held recently, the following new officers were elected for the ensuing year: Ole Engstrom, president; F. Andre, secretary and treasurer, and Brainard Foote, as third member of the board of directors.

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ANNOUNCEMENT was made by Judges J. Andrew White, H. Gernsback, L. Cockaday and Miller Reese Hutchison, of the awards made in the amateur radio receiving set contest held at the Radio Show at the 71st Regiment Armory; the awards were as follows: 1st Prize, $100, Rudolph Knopp, Cedar Grove, N. J.; 2nd Prize, $75, A. Faske, 1515 Eastern Parkway, Brooklyn; 3rd Prize, $50, F. B. & Walter Ostman, 180 Broad street, Ridgewood, N. J.; 4th Prize, $25, William A. Irvin, 319 Monroe St., Brooklyn. The following were each awarded a ten-dollar prize for their sets: Adam Dashiell, Albert W. Beiler, Gilbert H. Meyer, Peter Till, Jerome R. Childs, Allan Edwards, Edward Pina, Henry Farkough, and W. A. Robins. Five-dollar prizes were allotted to the following: Charles Ballette, Arthur Schoy, Jos. E. Knipper, Victor Kern, William H. Ruf (who had eight diminutive sets entered, and who refused an offer of $1,000 from Jeanne Eagles for his patented finger ring radio set) and Henry Farkough, who in addition to winning a ten-dollar prize, won two five-dollar prizes with two very ingenious tiny sets.

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"RADIO DAY" is the name given by the Radio Engineering Society of Pittsburgh to a day set aside each year for an outing of the radio fans of Pittsburgh and vicinity. The idea originated with the above society when it held the first "Radio Day" in Pittsburgh on August 17th, 1919, attended by a small group of radio enthusiasts. The annual radio outing of the Society has since been a regular event each year and has met with widespread popular approval. From a small group of "Old Timers" in the amateur fraternity of this locality who attended the first modest gathering, the attendance at these annual outings of the Radio Engineering Society each succeeding year has grown to such proportions that it was deemed necessary by the Society to arrange for the exclusive use of a large amusement park this season to accommodate the crowds it is confidently expected will turn out for the occasion.

The Committee in charge of the affair is composed of the following officers and members of the Radio Engineering Society: W. K. Thomas, Chairman; C. E. Urban, Secretary; M. Hirsch, Treasurer; Dr. Omar T. Cruikshank, Guy Davis, W. E. Menges, John B. Coleman, C. C. Young, John Schaming and Thomas McLean.

Pittsburgh's "Radio Day" will be held August 24, 1922, at Westview Park, which is ideally situated and adapted for the purpose. A program of events is being planned that is full of novelty, pep and entertainment. Many new and interesting radio contests are being scheduled with prizes for the winners that will cause a scramble of applicants to participate. The prizes will be donated by the various local radio dealers and manufacturers who will stage an exhibition of the latest developments in radio appliances covering three hundred square feet of space in two large Exhibition Halls on the grounds. Some of the dealers have started a movement to have all radio stores in the Pittsburgh district close on the day of the outing, and will insert placards in their windows bearing the inscription:

"This Store Will Close August 24th
"RADIO DAY"
Meet Us in Westview Park

The park is but a short ride from the city and has many amusement features such as a roller-coaster, dip-the-dips, lake rowing, pony riding, merry-go-round, curiosity house, moving picture theatre and other attractions. Dancing will take place afternoon and evening at a large dancing pavilion. While a

first-class dance orchestra will be provided, it is also planned to dance certain numbers to radiophone music transmitted by local broadcasting stations and received on apparatus equipped with multi-stage amplifiers and loud-speakers.

Meals will be provided, table d'hote or a la carte, at popular prices, in the park dining room which is spacious and well equipped. There is also a picnic grove for those desiring to bring basket lunches.

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THE station of the First Wing, Air Service, U. S. A. at Kelly Field, San Antonio, Texas, calls letters 5XI, is equipped with a 1 kw. spark set which works on 340 meters. The cage type antenna, 60 feet high, 120 feet long is used.

The official call of this station is DM4 and works with other Government stations using voice and I.C.W. on 840 meters and 1,200 meters. Continuous wave communication is also carried on, on 1,200 and 1,700 meters. Lt. Max F. Schneider the Wing Communications radio officer is in charge of the station.

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THE United States Civil Service Commission announces open competitive examinations for junior engineer on July 5 and August 23, 1922 to fill vacancies in the Bureau of Standards, Department of Commerce, Washington, D. C. or elsewhere, at $1,200 and $1,500 a year, with a possible additional allowance of $20.00 a month.

Applicants may apply to the Civil Service Commission, Washington, D. C. for application blanks and for further information in connection with these examinations.

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THE Argentine Republic, in South America, has authorized transmission by amateurs. Permission for transmitting is easily obtained from the Government. As the regulations stand at present, amateurs are allowed a wavelength not in excess of 300 meters and the power is limited to 50 watts.

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AN examination for the position of Radio Inspector is to be held July 19 by the U. S. Civil Service Commission, in order to fill vacancies in the Bureau of Navigation, Department of Commerce, at $1,800 to $2,200 a year. Other vacancies may be filled from the ranks of successful candidates, including positions as Assistant Radio Inspector. Candidates are required to be operators, have either a college or a high school education, and at least two years' experience in special radio work.

The U. S. Civil Service Commission is to hold in the near future an examination for the position of Assistant Radio Engineer in the office of the Chief of Air Service, Washington, D. C., at $2,400 a year. Applications are being received up until July 11. Applicants must have had considerable experience in radio design, installation, operation and research, and are required to submit a thesis or an original publication.

An examination for the position of Radio Operator is to be held by the U. S. Civil Service Commission on some date after July 18, when applications close. The examination is for the purpose of filling vacancies at $960 a year in the Lighthouse Service at various points on both coasts and in Honolulu. Applicants must have had a common school education and at least two year's experience as a commercial operator.

- CORRESPONDENCE -

Amateur Radio Operation in England

37 Bishop's Road,
Highgate, London, N. C., May 14, 1922

The Editor of THE WIRELESS AGE, N. Y.

Dear Sir:

I was extremely interested in Mr. Godley's article, in your last number, on British Radio. However there are one or two points I should like to mention. With reference to our societies which Mr. Godley visited. Altho' the Wireless Society of London is theoretically an amateur society it is really an "experts" club. The real amateur clubs are to be found round in the suburbs of London and in the provinces. Here Mr. Godley would find youth and keen interest to compare with any American Association. There are very few true amateurs in the Wireless Society of London or, for that, in the Royal Society Arts. It was a great pity Mr. Godley could not visit some of these clubs from both sides.

With reference to our receivers, a man over here who buys a complete set, is as a general rule, classed as a fool with plenty of money. Whereas in the States a man buys his Paragon or Grebe set, the true "DX" man over here makes his own, with the result that our receiving ranges are greater than those in U. S. A. despite our tiny aerials. I am not going to reopen the question of the Trans-Atlantics and aerials, but I should like to mention a few of our ranges here. First, as for wavelengths, we used 1,000 meters, rather than 180 meters, as we found that greater ranges were obtained in practice and more reliable communication established. All the time we knew a wave of say 300-400 meters would be better, but we could not have it. Now we have 150 to 200 meters and 440 meters allowed us. However, there are stations working on 350 meters and a few ranges we get may make some people sit up and take notice. We are able to carry on regular C.W. traffic over 470 miles with 10 watts input on 350 meters, and usually voice communication is possible, too. This reception is accomplished with no H.F. amplification. On several occasions this distance has been covered by I.C.W. with 90 milliamperes in the aerial circuit, i.e., about a couple of watts. Conversations over 100 miles in daylight often take place on 1,000 meters, and our latest record is speech over 84 miles with 28 watts input, 280 milliwatts! Over here an amateur transmitter is not much to notice unless it has a regular range of 100 miles speech and 200 miles C.W. in daylight at 10 watts input. To give an example of what every one does over here, there is the concert weekly, on Sunday afternoon, from PCGG at The Hague, Holland, 250 miles from London, on 1,050 meters, 200 watts. Almost every one gets this O.K. on one valve and some even get it on a crystal. It is quite easy, too, to get it on two valves with no aerial, on a decent British amateur set. There is food for thought here for some American hams who seem to want about umpteen kilowatts. Another point is this. During the last eighteen months I have logged about 110 amateur stations. Of these four used spark and two of them usually use phone or C.W. Over here, saying that a man has a transmitter means that he has a 'phone—spark has gone forever.

Yours truly,
FREDERIC L. HOGG,
Radio 2SH

STATIONS WORKED AND HEARD

Stations worked should be enclosed in brackets. All monthly lists of distant stations worked and heard which are received by the 10th of each month will be published in the next month's issue. For example, lists received by November 10th will be published in the December issue. Spark and C. W. stations should be arranged in separate groups.

6ZF, W. W. LINDSAY, Jr., Los Angeles, Cal. (March)

CW—4bq, 4ft, 4gl, 4zc, 4cb Can., (5za), (7qe), (7xf), (7xg), (cl8), 8jl, 8vy, 8wi, 8xv, 8zg, 8agz, 8axk, 8brl, 9fm, 9pi, 9ps, (9wd), (9wu), (9xi), 9xm. 9bd Can,, 9aav, 9arq, 9aja, 9ayu, 9bji, 9dng, 9dth, 9dtm, (9dva), 9egm, 9xaq, 9zac, (9zaf).

Spark—5ak, 5er, 5if, (5xd), 5yq,. (7bk), 7ck, (7ge), (7gj), (7il), 7jd 425 meters, (7ke), (7ik), (7ly), (7mf), (7mp), 7nw, (7oh), (7ot), (7oz), (7po), (7vo), (7wg), 7xb, 7ya, (7yl), (7zj), (7zm), (7zp), (7zt), (ci8), 9zj.

8HJ, Joel J. Young, Elmira, N. Y. (April and May) (Detector only.)

Spark—(1ayz), (1bbw), (1bes), 1bqk, (1bwj), (1chj), (1cik), 1cja, (1csa), 1jt, (1pm). (1pr), (1vq), 1yb, 1xz; (2aeq), 2agc, 2aif, (2ayv), (2bbx), (2beh), (2bem), 2bfx, (2bfz), (2bgi), (2bnd), (2bqd), (2brc), 2bua, (2fz), (2hw), 2lh, (2rd), (2wt), 2cen, 2cft, 2cjn; 3any, (3bij), (3bnu), (3buv), 3fm, (3fp), (3fr), (3gh), (3il), (3iw), (3nh), (3qv), (3zo); 4gh, 4gx, 4iv; 6cu, 6ka, 6xad; (9aiy,), (9amo), 9amt, (9ane), (9aog), 9arz, 9awm, (9axf), 9bed, (9bfg), (9blc), 9bhd, 9bsg, 9bya, (9bzo), (9dax), (9ddz), (9dgq), 9dio, 9dky, 9dqq, (9dsw), 9dzq, 9ei, (9ii), (9qf), (9uc), 9uu, (9wq), 9wu, Canadians, C.W.—3dq, (3cz), (3ji).

SAUX—G. Z. Jackson, Cleveland, Ohio (May)

Cleveland, Ohio (May)—1aj, 1aw, 1rh, 1xz, 1adc, 1adl. (1arb), 1ary, (1boq), 1bua, 2bm, 2el, (2fp), (2om), 2rm, 2wb, 2acd, 2ahu, 2ahw, 2aje, (2arb), 2beh, 2cdz, 3ac, 3ba, 3bp, 3cc, 3ez, 3fp, 3gx, (3uc), 3zo, 3zy, 3arb, 3ajd, 3aln, 3aov, (3bij), 3bsh, (3bfu), 3blf, (4cx), 4ea, (4fd), 4gl, 4gn, 5da, (5hk), 5py, 5xa, 8bo, 8dy, (8eb), (8eo), (8ew), (8ft), 8fv, 8ky, (8lb), (8lf), (8mz), (8no), 8oc, (8rt), (8sp), 8ty, 8ue, (8uo), (8vq), 8vy, (8uc), (8wd), (8yn), 8ze, (8zo), (8afd), 8afe, (8ahq), (8ajw), 8ago, (8ajx), (8akq), (8amz), (8ano), 8aoi, 8aqo, (8ars), 8asl, 8awu, 8ayc. 8aym, 8azf, 8bcf, (8bbu), (8cgz), 8ceb, (9cp), 9fp, (9ki), 9kx, (9lf), 9mc, 9ox, (9pd), 9rc, 9sn, (9uh), (9uu), (9vl), (9yb), (9yj), 9zc, 9zn, 9aau, (9aaw), 9acb, 9afk, (9agr), 9aiu. 9air, 9ark, 9avv, 9awz, (9aze), (azf), 9bhd, 9biq, (9dcx), 9den, (9dfx), (9dlx), (9dkk), (9drr), (9dzy).

9CCW, C. W. Scott and Stewart M. Scott, 6026-A Washington Ave., St. Louis, Mo., (April)

CW—1ru, lafv, lary, lcak, 2fd, 2ft, 2zl, 2zz, 3iw, 3mo, 4bq, 4ss, 4zc, 4ft, 5ho, 5la, 5rz, 5xb, 8bk, 8ci, 8ge, 8hm, 8hp, 8wr, 8xe, 8abv, 8aeg, 8aio, 8alc, 8aqf, 8aot, 8awp, 8bci, 8bfx, 8bow, 8box, 8zae, 9el, 9io, 9kp, 9lq, 9wt, 9yb, 9bed, 9dcr, 9aw, Can. 3bp.

Spark—1aw, 1sn, 1awz, 3el, 3ms, 4gn, 4jb, 5aa, 5by, 5eg, 5ek, 5is, 5ms, 5py, 5uu, 5zab, 5zak, 8bp, 8cp, 8dw, 8ew, 8fn, 8go, 8jj, 8lh, 8lj, 8mr, 8po, 8qq, 8ru, 8tk, 8tt, 8yn, 8zp, 8acf, 8acr. 8acn, 8afb, 8afd, 8aff, 8afk, 8ago, 8ahh, 8aib, 8ajx, 8amo, 8amz, 8ano, 8ard, 8ars, 8atu, 8awp, 8ayn, 8bbu. 8bep, 8bna, 8brl, 8bun, 8dbo, 8zaa, 9ap. 9au, 9be, 9bf, 9bp, 9ca, 9cp, 9cs, 9ee, 9el, 9et, 9fk, 9fs, (9ko), 9ky, 9lf, 9lw, 9me, 9ms, 9nq, 9ox, 9ps, 9rc, 9ll, 9uh, 9uu, 9vm, 9vw, 9xi, 9yb, 9yc, 9yo, 9aau, 9aap, 9aey, 9aff, 9auh, 9bbu, 9bcx, 9bdf, 9bij, 9blg, (9cee), 9dcu, 9ded, 9dzu, 9tty, 9wt, 9yak.

Radio Ramblings

The melancholy days have come
The saddest of the year
So sang our friend the poet once
But now he's wrong I fear.

The summer static's over and
The air is clear and bright
There's always something doing tho'
I listen every night.

On Saturdays a football game
Will find me full of pep
Tho' far away from scenes of strife
It seems but just a step.

When winter comes and piles of snow
Are heaped about my door
On Sunday morn why freeze my toes?
I'll venture out no more.

For in my humble cottage is
A simple wireless set
I'll hear the choir singing and
Perhaps a sermonette.

It has one great advantage if
The sermon fails to suit
I'll cut the preacher off real short
And practice on my flute.

Now after all is said and done
There's just this much about it
Take my advice and get a set
No home's complete without it.

—Peter Deets.

✦ ✦ ✦

A Problem Solved

BY STATIC SAM

Every time I have a radio problem, some smart fellow comes along and solves it for me and takes some of my money.

I had one connection on my set for phones. Had two pair hooked up in series. That was OK when I wanted 'em both in operation. When I didn't, had to un-hook a pair. Lots of trouble. Then along comes the Multijack (Pacent). I bit!

Now I can have one pair or two or three in operation. Hot dog—no more trouble. What's next?

Queries Answered

Answers will be given in this department to questions of subscribers, covering the full range of wireless subjects, but only those which relate to the technical phases of the art and which are of general interest to readers will be published here. The subscriber's name and address must be given in all letters and only one side of the paper written on; where diagrams are necessary they must be on a separate sheet and drawn with India ink. Not more than five questions of one reader can be answered in the same issue. To receive attention these rules must be rigidly observed.

Positively no questions answered by mail.

C. L. B., Vermont, Ill.

Q. 1. Which is the more efficient; a three coil regenerative set using duo-lateral wound coils, or a regenerative set using a vario-coupler and two variometers?

Ans. 1. We recommend the honeycomb coil for long waves above 600 or 1,000 meters but prefer the vario-coupler and variometers for waves below 600 meters.

H. N. P., Lyndhurst, N. J.

Q. 1. In the March issue of THE WIRELESS AGE on page 39, article entitled "The Case Against the Storage Battery" (Second prize) J. Greenfield. Can you inform me the kind of transformer used to eliminate the hum. This transformer is used between the set and head phones.

Ans. 1. This is a telephone transformer and is employed so that low resistance phones can be used. You should be able to purchase this from some telephone dealer.

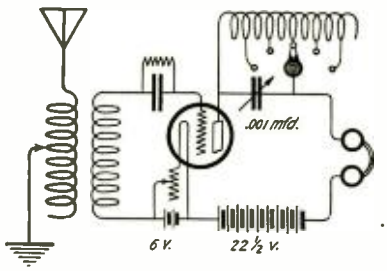
F. D. W., Oakland, Cal.

Q. 1. Would like to obtain more information concerning a solution given in March issue of this year, concerning "Filament and Plate Current Direct from A.C. Supply" on page 38. 440 Turns of No. 3 D.C.C. wire are specified. Why is such a large size wire used? Will No. 14 D.C.C. do?

Ans. 1. This was an error and should have read No. 32 D.C.C.

C. L. S., West Corinth, Vt.

Q. 1. I have a Navy type receiving transformer for wave lengths running up to probably 4,000 by using a loading coil. Can a coil be placed in inductive relation to secondary in plate circuit of detector tube to make a regenerative hook-up. I have four steps of amplification, but would like same results with less expense if possible. It it can be accomplished, please give diagram and description in your paper.



Ans. 1. Suggest that you employ the tuned plate circuit as shown. Wind a tube 10 inches in length by 3 inches wide with about eight inches of No. 24 D.C.C. taking a tap off every inch. Connect as shown.

Q. 2. I have a receiving station with four amplifying units. Is there any practical way to utilize the 32-volt farm lighting plant power for the plate voltage. I also have a Magnavox Loud Speaker and you will note it takes quite a volume of voltage for the entire outfit ranging from 16 to 22½ on detector to slightly over 100 on last step to get volume for horn. Kindly reply through your paper.

Ans. 2. The only way to use your 32 volts lighting circuit is to use it on the filaments and connect a suitable resistance in series to reduce the voltage to the proper value. I think you will have to contine using dry cell "B" batteries for best results.

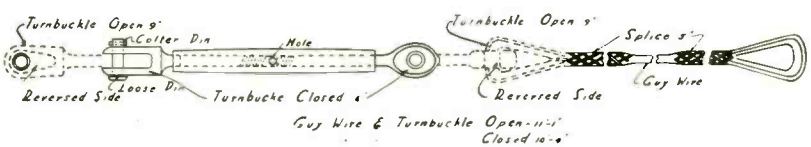
Condensite

INSULATION is rarely subjected to more trying conditions than in radio. The high potentials used in sending, the varying climatic conditions, from the cold of the arctic to the heat of the equator, from the dryness of the desert to the saturated air of the tropics; the rough usage encountered at the hands of the unskilled, the remoteness from means of repair and replacement; all these and numberless other trying conditions make it imperative that for radio work the best insulation should always be used.

Condensite is the name of the insulation which will withstand these conditions, and which possesses all the properties essential to radio insulation.

Upon request we will send the list of radio manufacturers who make their equipment of Condensite.

Condensite Company *of* America
Bloomfield, N. J.



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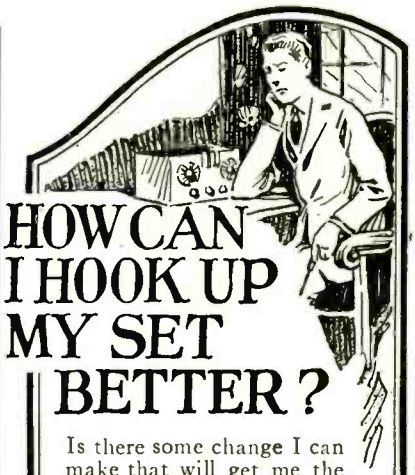

HOW CAN I HOOK UP MY SET BETTER?

Is there some change I can make that will get me the distances others are getting? How can I get sharper tuning with my present outfit? Is there some source of information about the newest hookups, the latest developments, improved types of aerial, that is really dependable and *never grows old?* Yes

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The Radio Shop of Newark

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Transmitting Parts To Be Sold Below Cost—Three essential parts of excellent Transmitting Set, in perfect condition and excellent working order, to be sold as a whole or separately. Motor Generator Set with synchronous disc discharge—$80.00; Switch Board—$25.00; Transformer, 2KW 240 cycle—$20.00. Only one of each item. Write at once for details if interested. Doubleday-Hill Electric Co., 719 Liberty Ave., Pittsburgh, Pa.

Amateur Radio Stations of the United States

Supplementary List brought up-to-date from June WIRELESS AGE

First District

1 GD Gardner, Bryant H., 57 Day Ave....Westfield Mass.
1 HH Gordon, Fred W., West Road..Belgrade Lakes, Maine
1 LH Tabbut, A. Ralph, 6 First South St., Bar Harbor, Maine
1 LI Wilson, Vernon K., 5 West St.....Portland, Maine
1 LO Guillemette, Joseph D., 70 Magill St., Pawtucket, R. I.
1 NX Novak, Nathan,3719 No. Main St., Bridgeport Conn.
1 PS Meriden Radio Club, 35 Colony St.....Meriden, Conn.
1 QC Keyes, Ernest R., 311 Nahatan St...Norwood, Mass.
1 QE Van Allen, Edward J., 26 Park Row..Stamford, Conn.
1 QW Eckert, Clendenin, Strawberry Hill..Stamford, Conn.
1 RG Bowman, Everett L., 96 Water St....Clinton, Mass.
1 RR Cavallini, Ello, G., 305 Court St....Plymouth, Mass.
1 RS Klein, William G., 20 Fairfield St., Springfield, Mass.
1 SA Stagg, Charles H., 1739 Dixwell Ave., New Haven, Conn.
1 SG Woodward, Dudley B., 35 Pond St...Greenfield, Mass.
1 SO Dinsmore, Rodney L., 37 Shawmut St., So. Portland, Maine
1 SM Sloan Edgar T., 154 Oxford St.....Hartford, Conn.
1 ST Lemieux, Gustave, 657 Main St.....Berlin, N. H.
1 TA Gallagher, Raymond, 19 Chautauqua Ave., Nashua, N. H.
1 TC Gregory, Horace E., 3 Lewis St.....Norwalk, Conn.
1 TD Arey, Charles K., 217 Preble St., So. Portland, Maine
1 TE Bessette, Raymond P. Sulford St., So. Bellingham, Mass.
1 TM Gibbs, Arthur B., Spring St., Vineyard Haven, Mass.
1 TO McDermott, William J., 31 Pleasant St..Bristol, Conn.
1 TQ Ferris, Paul F., 316 Lynnfield St.....Lynn, Mass.
1 TT Tepper, Donald T., 58 East Haverhill St., Lawrence, Mass,
1 TX McIntyre, John I., 10 Violet St.....Lynn Mass.
1 TV Fay, Marshall H., 36 Park Ave....Winchester, Mass.
1 UA Pierce, John A., 100 Main St.....Orono, Maine
1 UE Bosse, Armand J., 239 Blake St....Lewiston, Maine
1 UL Shepard, Ernest L., 76 Pine St.....Bath, Maine
1 UT Moody, Norman B., 6 Noyes Place....Augusta, Maine
1 UU Waite, Gordon D., 18 Ware St.....Lewiston Maine
1 UV Cameron, Ralph W. E., 145 Galen St., Watertown, Mass.
1 UW Elder, Thomas P., 68 Williams St., New London, Conn.
1 UX East Bridgewater High School, East Bridgewater, Mass.
1 VA Palmer, Clarence E., 66 Marne St..New Haven, Conn.
1 VB Foley, Francis 559 Washington St..Denham, Mass.
1 VD Allen, John, 53 Garfield St....Springfield, Mass.
1 VE Petersen, R. Lee, 11 Lunt St..Norfolk Downs, Mass.
1 VG Cormier, Ernest J., 26 Locke St., No. Cambridge, Mass.
1 VH Macdonald, Herbert C., 109 Stow St..Waltham, Mass.
1 VK Simmons, Norman R., 45 Oakland St..Bristol Conn.
1 VN Potts, Leslie T., 11 Allyn St.....Holyoke, Mass.
1 VO Stacker, Robert J., 48 Mountain Ave...Winsted, Conn.
1 VS Halapian, John H., 73 Wellington St., Worcester, Mass.
1 WA Bigelow, Henry M. L., 1 Fennway Road, West Hartford, Conn.
1 WC Hartmann Mfg. Co., 308 Pearl St....Hartford, Conn.
1 WE Northrop, Robert L.....Weatogue, Conn.
1 WI Hanson, Kermit F., 126 Brown St., So. Portland, Maine
1 WL Morin, Hobart L., Berry Ave..West Yarmouth, Mass.
1 WM Frueh, Frederick G., 20 Arcadia Park, Dorchester, Mass.
1 WN Duffy, Charles E., 55 Bloomfield St., Dorchester, Mass.
1 WV Sawyer, Arthur W., 33 High St....Yarmouth, Maine
1 WX Sauer, Charles R., Old Field Road...Fairfield, Conn.
1 AAH Kunz, Clifford A., 9 Harris Ave., Jamaica Plain, Mass.
1 AAL Donahue, Leonard M.....Richmond, Vt.
1 AAN Hatch, Harold P., 150 School St.....Everett, Mass.
1 AAT Carder, Robert W., 23 Chardon Road, W. Medford, Mass.
1 ABD Ballou, Everett T., 35 West Main St...Ware, Mass.
1 ACF Donato, Frank, 882 Howard Ave....New Haven, Conn.
1 AJU Cole, George E., 350 Piedmont St., Waterbury, Conn.
1 BJZ Hotchkiss, Alan W., Pond Point Beach, Milford, Conn.
1 BZL Grundy, Leslie W., Main St.....Phillips, Maine
CHANGE OF ADDRESS
1 TL Wilmott, Roy E., 108 Anderson Ave., West Haven, Conn.
1 ARX Boynton, A. S., 13 Griswold St.....Meriden, Conn.
1 ASY Goss, Horace, Box 1.....Essex, Conn.
1 CJX Stetson, Thurston L., 51 West St....Elmwood. Mass.

Seventh District

7 AE Edgar, Thornton, R. F. D. No. 3, Walla Walla, Wash.

Eighth District

RE-ASSIGNED CALLS

8 BE Orrie Baumgardner, 4409 Lorain Ave..Cleveland, Ohio
8 DJ Donald C. Meyer, 9714 Lamont Ave..Cleveland, Ohio
8 GC W. G. Chandler, Blank St.....Sylvania, Ohio
8 HZ Donald L. Ross, 122 Midwood Ave.....Toledo, Ohio
8 HI Howard C. Barton, 18 Myrtle St.....LeRoy, N. Y.
8 JL L. Miller Andrus, 505 E. Higham St..St. Johns, Mich.
8 JK Russell L. Schwing, 15 University Ave..Buffalo, N. Y.
8 KH Carl G. Gutman, 3584 E. 130th St., Cleveland, Ohio
8 KN Melvin A. Leach, Lansing High Shool, Seymour & Shiawassee, Lansing, Mich.
8 LZ Sherman B. Landman, 134 S. Oakley Ave., Columbus, Ohio
8 MI L. Russell York, 4555 Harding Ave...Detroit, Mich.
8 MU Myron H. Premus, 53 McKinley Ave., Kenmore, N. Y.
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8 XB Precision Equipment Co., 2437 Gilbert Ave., Cincinnati, Ohio
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8 LN H. Terry, 601 Pasadena Ave. .....Detroit, Mich.
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8 LW H. L. Saire, 636 Maplewood Ave. .....Ambridge, Pa.
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8 LZ G. Stybr, R.F.D. No. 1, Box 316. .....Bellevue, Pa.

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8 MB A. R. Miller, Illinois St. .....McDonald, O.
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8 MM O. E. Swanson, 184 Bath St. .....Elyria, O.
8 MN A. E. Alger, 214 Arizona Ave. .....Lorain, O.
8 MO F. A. Ploetz, 754 Grand River Ave. .....Detroit, Mich.
8 MP E. Hopponen, 1632 Euclid Ave. .....Detroit, Mich.
8 MQ W. P. Doty, 75 Steel St. .....Auburn, N. Y.
8 MR V. D. Wellington, 511 Gibbs Ave. .....Wapakoneta, O.
8 MS D. Booth, 1524 Collingwood Ave. .....Toledo, O.
8 MT R. M. Sincock, 120 Lenox St. .....Uniontown, Pa.
8 MU W. G. Gallup, 147 Friedley Ave. .....Bellevue, O.
8 MV V. J. Coughenour .....Plattsburg, O.
8 MW G. E. Lyman, 217 Morgan St. .....Oberlin, O.
8 MX A. H. Hantman, 1485 Fairlawn Ave., Dormont, Pittshurg, Pa.
8 MY D. G. Carter, Rathbone Pl. .....Grosse Pointe. Mich.
8 MZ H. F. Wannemacher, 17 W. Main St...Lancaster, N. Y.

8 NA E. Michel, 1053 Market St. .....Meadville, Pa.
8 NB M. H. Nelson, 525 Benton St. .....Rochester, N. Y.
8 NC A. Kollmar, 20 Portage St. .....Buffalo, N. Y.
8 ND C. E. Miller, 71 Aurora St. .....Lancaster, N. Y.
8 NE A. J. Gogel, 411 Palmwood Ave. .....Toledo, O.
8 NF H. M. DeGowin, 110 N. Huron St. ...Cheboygan, Mich.
8 NG J. Gafilli, 506 Southfield Ave. .....Birmingham, Mich.
8 NH A. P. Vandergrift, 1019 Manhattan St..Pittsburgh, Pa.

8 NI J. L. Eddy, Jr., The Knoll .....Ithaca, N. Y.
8 NJ W. G. Broughton, 201 DeWitt Ave. .....Ithaca, N. Y.
8 NK W. P. Van Behren, 2149 Scottwood Ave. .....Toledo, O.
8 NL J. J. Dunn, 2445 Townsend Ave. .....Detroit, Mich.
8 NM D. R. Girardin, 625 Woodward Ave. .....Detroit, Mich.
8 NN W. E. Brindley, 568 Coal St. .....Wilkinsburg, Pa.
8 NO P. Muscari, 812 E. Pike St. .....Clarksburg, W. Va.
8 NP L. Chambers, 1521 E. 82nd St. .....Cleveland, O.
8 NQ C. H. Kreighbaum, 1256 E. 125th St. ....Cleveland, O.
8 NR C. S. Bacon, 533½ Prouty St. .....Toledo, O.
8 NS E. Hess, 4129 Carter Ave. .....Norwood, O.
8 NT E. W. Richards, 27 Roosevelt Ave. ..Binghamton, N. Y.
8 NU J. H. Ferris, R. F. D. No. 1. .....Elberta, Mich.
8 NV J. A. Barlock, 1026 Talbot Ave. .....Braddock, Pa.
8 NW J. F. Eckel, 933 Bank St. .....Cincinnati, O.
8 NX G. E. Francis, Jr., 117 Magee Ave. ...Rochester, N. Y.
8 NY M. J. McConnell, 134 Benham St. ....Penn Yan, N. Y.
8 NZ E. E. House, 272 N. Michigan Ave. .Battle Creek, Mich.

8 OA F. V. Hunt, 421 N. Chester St. .....Barnesville, O.
8 OB H. F. Kelso, Euclid & 4th Sts. .....Dravosburg, Pa.
8 OC H. J. Lohman, 427 Olive St. .....McKeesport, Pa.
8 OD P. L. Pennock, Lincoln Way. .....Minerva, O.
8 OE F. J. Kahn, 8126 Linwood Ave. .....Cleveland, O.
8 OF M. L. Ruhl, 160 Martin Ave. .....Columbus, O.
8 OG L. C. Brothers, N. Main St. .....Wellington, O.
8 OH N. F. Anger, 1029 Ferdinand Ave. .....Detroit, Mich.
8 OI A. B. Sparks, 159 Erie St. .....Elyria, O.
8 OJ N. Schlaack, 405 Knox St. .....Birmingham, Mich.
8 OK G.L.Stevenson, 205 Davidson Ave. .Highland Park, Mich.
8 OL T. Schmarzreddt, 9110 Fort St. W. .....Detroit, Mich.
8 OM J. R. Pell, Jr., 910 16th St. .....Parkersburg, W. Va
8 ON G. W. Finegan, 2 Fenwick St. .....Rochester, N. Y.
8 OO D. S. Perry, 514 Edgewood Pl. .....Ithaca, N. Y.
8 OP R. J. Lampe, 715 Leeson Ave. .....Van Wert, O.
8 OQ P. D. Murphy, 162 Jefferson Ave. .....Columbus, O.
8 OR E. Gillam, 91 Calvert Ave. .....Detroit, Mich.
8 OS N. E. Colegrove, 1899 Knowles St. ..East Cleveland, O.
8 OT W. J. Wiseman, 436 Cherry Ave. N. E. ....Canton, O.
8 OU M. Meister, 2303 St. Clair St. .....Cleveland, O.
8 OV C. E. Heffelman, 3124 Tuscara St. W. .....Canton, O.
8 OW A. Mag, 4212 Penn Ave. .....Pittsburgh, Pa.
8 OX C. H. Bogart, 112 W. Dewey St. .....Youngstown, O.
8 OY W. H. Bullock, 1207 Taylor Ave. .....Ithaca, N. Y.
8 OZ R. C. Leacock, 9200 Gratiot Ave. .....Detroit, Mich.

8 PA J. F. McFarren, 1214 Chislett St. .....Pittsburgh, Pa.
8 PB A. J. Hessinger, 135 Albany St. .....Buffalo, N. Y.
8 PC E. Haringx, 97 Aberdeen St. .....Rochester, N. Y.
8 PD T. A. March, 331 Shaw St. .....New Castle, Pa.
8 PE D. D. Emery, 1832 Harvey Pl. S. E. .....Canton, O.
8 PF C. G. Crowley, 76 Florida St. .....Buffalo, N. Y
8 PG W. J. Vallely, 166 Sterling Ave. .....Buffalo, N. Y.
8 PH R. C. Husselman, 134 Seneca St. .....Youngstown, O.
8 PI J. F. Barton, Main St. .....Espy, Pa.
8 PJ C. S. Taylor, 598 Masten St. .....Buffalo, N. Y.
8 PK J. J. McNevin, 958 College Ave. .....Elmira, N. Y.
8 PL J. Conner, 450 Wellington Ave. .....Rochester, N. Y.
8 PM A. M. Martin, 5959 Vermont Ave. .....Detroit, Mich.
8 PN E. C. Epsey, 176 Franklin Ave. .....Vandergrift, Pa.
8 PO M. Winglemire, 107 Saginaw St. .....Holly, Mich.
8 PP A. Kaeppner, Jr., 236 Sycamore St. .....Coluubus, O.
8 PQ H. Breitenbach, 39 Vine St. .....Danville, Pa.
8 PR C. F. Bramley, 207 Holley St. .....Brockport, N. Y.
8 PS R. Barringer, 418 N. Wood St. .....Fremont, O.
8 PT R. Boundy, 56 State St. .....Grove City, Pa.
8 PU H. C. Gitzgerald, Peach & Cherry Sts. .....Erie, Pa.
8 PV R. J. Glass, R.F.D. No. 4. .....Wellsburg, W. Va.
8 PW P. J. Wallace, Smith Stop. .....Spears, Pa.
8 PX G. M. Barker, 2901 W. Liberty Ave. .....Dormont, Pa.
8 PY R. Palmer, 6050 Northfield Ave. .....Detroit, Mich.
8 PZ J.A.Sullebarger, 1503 Woodbourne Ave..Pittsburgh, Pa.

8 QA H. L. Lape, 129 Springfield Ave. .....Wyoming, O.
8 QB A. A. Lentz, 203 Moselle St. .....Buffalo, N. Y.
8 QC R. C. Emery, 3166 Poplar St. .....Grove City, Pa.
8 QD F. W. Servais, Taylor Ave. .....Falls Creek, Pa.
8 QE A. D. Slavin, 2001 St. Paul St. .....Rochester, N. Y.
8 QF R. P. Murphy, 186 Granville St. .....Newark, O.
8 QG G. H. Smith, 401 5th St. .....Charlerol, Pa.
8 QH F. A. Hamel, 200 W. Martin Ave. .....Amherst, O.
8 QI A. A. Scheppner, 2514 Peach St. .....Erie, Pa.
8 QJ T. H. Mains, 6450 Vinewood Ave. .....Detroit, Mich.
8 QK D. E. Schellenbach, 204 Elm St. .....Wyoming, O.
8 QL W. T. Smith, 803 Clay St. .....Sharpsburg, Pa.
8 QM L. O. Adams, 756 E. Market St. .....Elmira, N. Y.
8 QN F. Collins, 150 Puritan St. .....Highland Park, Mich.
8 QO T. R. Parker, 619 Dawson Ave. .....Bellevue, Pa.
8 QP W. F. Ebrick, 218 W. Lucas St. .....Bucyrus. O.
8 QQ R. F. Sadler, 400 Strathmore Rd. .....Lansing, Mich.
8 QR T. Peterson, 1001 Madison St. .....Ludington, Mich.
8 QS E. L. Ferguson, 1222 W. Ottawa St. ...Lansing, Mich.
8 QT E. H. Mitchell, 217 E. Main St. .....Findlay, O.
8 QU J. W. Anderson, Lincoln St., Box No. 155, East Towas, Mich.
8 QV E. A. Smith, 8819 Hough Ave. .....Cleveland, O.
8 QW C. C. Richardson, 268 Main St. .....Greenville, Pa.
8 QX R. R. Schaffner, 149 S. Union St. .....Akron, O.
8 QY R. L. Osborne, 547 McClellan Ave. .....Detroit, Mich.
8 QZ F. H. Garrahan, 393 Northampton St. ....Kingston, Pa.

8 RA M. G. Limb, 151 Beall Ave. .....Wooster, O.
8 RB A. E. Miller, 6811 Clark Ave. .....Cleveland, O.
8 RC M. W. Wetzel, 143 Willowbank Ave. ....Bellefonte, Pa.
8 RD W. H. Smallenberger, 15 William St. ...Meadville, Pa.
8 RE R. S. Baker, 41 Steele Ave. .....Gloversville, N. Y.
8 RF E. F. Roberts, Overlook Blvd. .....Rochester, Mich.
8 RG H. L. Bear, Box No. 59, 3rd St. .....Freport, Pa.
8 RH G. C. Ornstine, 631 Prescott Ave. .....Scranton, Pa.
8 RI Reserved.
8 RJ N. C. Lewis, 2921 Urwiler Ave. .....Cincinnati, O.
8 RK C. J. Emmons, 405 Ohio Ave. .....Sidney, O.
8 RL R. A. Gerhard, 478 N. 1st St. .....Leighton, Pa.
8 RM E. L. Keller, 308 Oakland Ave. .....Pittsburgh, Pa.
8 RN C. F. Lohner, 62 Glendale Ave. .....Bedford, O.
8 RO H. A. Johnston, 3617 Butler St. .....Pittsburgh, Pa.
8 RP H.E.Brennan, 2 St. John Pl., 36th St. & Liberty Ave., Pittsburgh, Pa.

8 BQ R. M. Carson, 150 Wood St.....Wilkinsburg, Pa.
8 BR T. J. Donohue, 841 Franklin Ave.....Columbus, O.
8 BS E. A. Volzer, 1441 Market Ave S.....Canton, O.
8 BT H. W. Whitby, 21 Walnut St.....Crafton, Pa.
8 BU C. C. Rankin, 2929 Glenmore Ave.....Pittsburgh, Pa.
8 BV W. S. Herbster, 622 Industry St.....Pittsburgh, Pa.
8 BW H. Pendieberry, 802 N. Main St.....Niles, O.
8 BX E. A. McDonough, 1232 Braddock Ave...Braddock, Pa.
8 BY J. H. McQuaide, 298 45th St.....Pittsburgh, Pa.
8ZBZ K. S. Forsbee, R.F.D. No. 1.....Savannah, N. Y.

8 SA G. G. Moyer, 1417 Cordova Ave.....Lakewood, O.
8 SB W. D. Sanford, 1144 4th Ave.....Huntington, W. Va.
8 SC S. H. Graham, 615 W. Washington St.....Ionia, Mich.
8 SD L. Williams, 248 Tireman Ave.....Detroit, Mich.
8 SE Boy Scouts .....Hamilton, O.
8 SF H. L. Wohlers, 1025 S. Milwaukee St..Jackson, Mich.
8 SG M. F. McDowell, 612 Mithoff St.....Columbus, O.
8 SH L. A. Taylor, 101 Lyceum St.....Geneva, N. Y.
8 SI C. H. Gebauer, 160 Johnson St.....Buffalo, N. Y.
8 SJ M. F. Bruning, 2842 Mt. Pleasant Ave....Hamilton, O.
8 SK C. L. Kesecker .....Sleepy Creek, W. Va.
8 SL W. H. Clark, 43 Grove Ave.....Highland Park, Mich.
8 SM C. G. Kaufman, 517 Prescott Ave.....Scranton, Pa.
8 SN R. M. Edmonds, R.F.D. No. 9.....Penn Yan, N. Y.
8 SO K. R. Ling, 413 3rd St.....Cresson, Pa.
8 SP A. Kisner, 809 Coleman Ave.....Fairmont, W. Va.
8 SQ C. D. Morris, 195 N. Liberty St.....Delaware, O.
8 SR L. McCanne, 225 Barrington St.....Rochester, N. Y.
8 SS T. McMahon, Jr., 2944 W. Liberty St..Pittsburgh, Pa.
8 ST E. C. Wright, 402 Pavey Ave.....Columbus, O.
8 SU R. Hagerty, 5584 Ivanhoe Ave.....Detroit, Mich.
8 SV G. N. Hoyt .....Perry, O.
8 SW K. Taylor, 91 W. 2nd Ave.....Columbus, O.
8 SX C. Carlson, 5814 Stanton Ave.....Pittsburgh, Pa.
8 SY N. Balibach, 3230 Concord Ave.....Detroit, Mich.
8 SZ W. A. Murphy, 86 Mithoff St.....Columbus, O.

8 TA C. A. Schmidle, Box No. 61, B, Union Rd., Ebeneezer, N. Y.
8 TB C. E. Gardiner, 23 N. Perry St.....Johnstown, N. Y.
8 TC H. E. Batterson, 13 Richard St.....Rochester, N. Y.
8 TD R. W. Pitt, 343 Birr St. .....Rochester, N. Y.
8 TE C. A. Crawford, 1885 E. 90th St.....Cleveland, O.
8 TF W. Atwater, 463 E. 123rd St.....Cleveland, O.
8 TG H. S. Gould, 8520 Brush St.....Detroit, Mich.
8 TH W. B. Jameson, 1019 Rex Ave, N. E.....Canton, O.
8 TI C. Eckel, 153 Delaware Ave.....Detroit, Mich.
8 TJ J. G. Martin, 12 Innis St.....Columbus, O.
8 TK D. H. Brown, S. Lynn St.....Convoy, O.
8 TL H. C. Loeffler, 2150 St. Paul St.....Rochester, N. Y.
8 TM R. M. Brown, 81 Maple St.....Dorranceton, Pa.
8 TN N. Emmons, 3d, 909 Grand Ave.....Dayton, O.
8 TO H. R. Young, 309 Eldon Ave.....Columbus, O.
8 TP C. B. Marvin, 951 Euclid Ave.....Detroit, Mich.
8 TQ B. A. Norris, 1267 Parkwood Drive.....Cleveland, O.
8 TR D. E. Jenkins, 218 Hyde Park Ave. S...Scranton, Pa.
8 TS W. B. Lacock .....Bethany, W. Va.
8 TT J. D. Bay, 640 W. Jackson St.....Painesville, O.
8 TU N. A. Otto, 427 6th St.....Niagara Falls, N. Y.
A. B. Rudenauer, 1646 Elmwood Ave.....Lakewood, O.
G. Brockman, 522 Riddle Rd.....Cincinnati, O.
A. R. Royle, 221 Glenwood Ave.....Rochester, N. Y.
R. Bissell, 506 Pendergast Ave.....Jamestown, N. Y.
F. May, 684 E. Utica St.....Buffalo, N. Y.

Y. M. C. A. Ass'n, 2231 Carnegie Ave...Cleveland, O.
B. Harter, 200 W. Main St.....Frankfort, N. Y.
Graeter, 967 McMillan St.....Cincinnati, O.
Krager .....Cattaragus, N. Y.
D. Seckel, 922 E. Main St.....Columbus, O.
H. Ellis, 292 Jewett Ave.....Buffalo, N. Y.
Quincey, 452 Davison Ave. W.....Detroit, Mich.
C. Robinson, 1751 Northfield Ave....Cleveland, O.
Stoum, Waverly St.....Cattaragus, N. Y.
R. Witte, 1182 Leverenz Ave.....Detroit, Mich.
H. Poad, 1509 E. 123rd St.....Cleveland, O.
Park, 523 S. Albany St.....Ithaca, N. Y.
McFarland, 802 Woodlawn St.....Scranton, Pa.
Moerschfelder, Dormitory 6, Carnegie Inst. of Technology, Pittsburgh, Pa.
Weir, 5590 Pocusset St., Squirrel Hill Station, Pittsburgh, Pa.
French, 1675 Pilgrim Pl.....Akron, O.
athrop, 11 White St.....Blissfield, Mich.

omers, 151 E. Main St.....Bradford, Pa.
mith, 41 Seward Ave.....Detroit, Mich.
urick, 559 W. 4th St.....Mansfield, O.
bbins, 307 1st St.....Jackson, Mich.
rman, 50 S. Balch St.....Akron, O.
ke, 242 Forest St.....Oberlin, O.
le, 51 Baltimore St.....Dayton, O.

r, 1105 Green St.....Marietta, O.
ws, Main St.....Marlett, Mich.
456 Trumbull Ave.....Detroit, Mich.
, 2217 24th St.....Detroit, Mich.
elt .....Lancaster, Pa.
217 Whitney St.....Conneaut, O.
1323 Douglass Ave.....Youngstown, O.
251 E. 8th St.....Erie, Pa.
Jr., 1437 Woodward Ave., Lakewood, O.
535 W. Lima St.....Findlay, O.
9 N. Broadway St.....Shelby, O.
2122 W. 53rd St.....Cleveland, O.
1223 Robbins Ave.....Niles, O.
1418 W. 45th St.....Cleveland, O.
5 E. State St.....Gloversville, N. Y.
12 Tuxill Sq.....Auburn, N. Y.
nklin St.....Freeport, Pa.
114 McClurg St. S. S...Pittsburgh, Pa.
750 Leighton Rd.....Cleveland, O.
9 Helen St., Mt. Auburn, Cincinnati, O.
h, 37 Gaylord St....Binghamton, N. Y.
Ford Ave.....Ogdensburg, N. Y.
184 College Ave.....Elmira, N. Y.

8 VX E. R. Lappe, 7125 Agnew St.....Pittsburgh, Pa.
8 VY F. M. Louwaert, 1227 N. Burdick St..Kalamazoo, Mich.
8 VZ E. A. Greene, 15 S. High St.....Greenville, Pa.

8 WA A. B. Allen, 1549 Temple St.....Detroit, Mich.
8 WB G. C. Kostelecky, 11802 Union Ave.....Cleveland, O.
8 WC W. L. Snyder, 402 Ridge St.....Curwensville, Pa.
8 WD H. S. Morris, 1025 Mary St.....Parkersburg, W. Va.
8 WE L. W. Reimsnyder, 310 Woodlawn Ave..Elmira, N. Y.
8 WF T. R. Wayne, R.F.D. No. 6, Box 14..Bellefontaine, O.
8 WG E.M.Wilson, Hotel Sherwood,Canisteo St., Hornell, N. Y.
8 WH C. C. Peugeot .....Stryker, O.
8 WI S. Lohmann, 307 W. Main St.....Greenville, O.
8 WJ C. E. Lloyd, 229 E. 5th St.....Salem, O.
8 WK E. A. Wendler, 5939 Canton Ave.....Detroit, Mich.
8 WL H. Webb, 803 W. Riverview St.....Dayton, O.
8 WM G. F. Shuck, 203 W. Pitt St.....Bedford, Pa.
8 WN C. Luebs, 231 Grand Ave., W....Highland Park, Mich.
8 WO H. Brainard, 836 Richmond Ave.....Buffalo, N. Y.
8 WP R. N. Stoddard, 2134 E. 100th St.....Cleveland, O.
8 WQ A. A. Blasb, 409 Davis St.....Elmira, N. Y.
8 WR C. M. Chorpening, 115 W. Church St..Conellsville, Pa.
8 WS P. Louis, 600 California Ave.....Oakmont, Pa.
8 WT A. J. Sands, 3 William St.....Amsterdam, N. Y.
8 WU E. L. Martz .....West Cairo, O.
8 WV H. B. Hammond, E. Brook Rd.....Pittsford, N. Y.
8 WW J. Fobara, 1506 E., Congress St.....Detroit, Mich.
8 WX N. Ball, 1237 Varland Ave.....Toledo, O.
8 WY D. M. Lord, 531 Beach Ave ....Cambridge Springs, O.
8 WZ H. E. Sticker, 420 Woodlawn Ave.....Bucyrus, O.

8 AAB H. Eck, 113 Front St.....Jamestown, N. Y.
8 AAC H. M. Ryder, Braddock Rd.....Wilkinsburg, Pa.
8 AAD J. C. Arns, 801 Wyoming Ave.....Lockland, O.
8 AAE E. W. Zinsmaster, Jr., 5439 Baywood St.,Pittsburgh, Pa.
8 AAF D. N. Wallace, 1523 Oneida St.....Utica, N. Y.
8 AAG C. A. Long, 516 5th St.....Oaknont, Pa.
8 AAH J. Braschowitz, 6516 Clark Ave.....Cleveland, O.
8 AA1 G. W. Davis, 403 N. Main St.....Coudersport, Pa.
8 AAJ C. B. Miller, 257 45th St.....Pittsburgh, Pa.
8 AAK F. W. Benskin, 1410 Fulton Rd. N. W.....Canton, O.
8 AAL J. M. Holshoy, 1427 Homer St. N. W.....Canton, O.
8 AAM R. H. Koehler, 424 Stokes Ave.....Braddock, Pa.
8 AAN E. Brownell, 321 Cooper St.....Utica, N. Y.
8 AAO L. H. Svoboda, 3622 E. 135th St.....Cleveland, O.
8 AAP T. Glynn, 3315 Broadway Rd.....Cleveland, O.
8 AAQ E. A. Estabrook, 4248 W. 35th St.....Cleveland, O.
8 AAR C. C. Miller, 3589 Beechwood Blvd....Pittsburgh, Pa.
8 AAS H. Fluke, 370 N. Genesee St.....Utica, N. Y.
8 AAT R. F. Morris, 165 N. Portage Path.....Akron, O.
8 AAU O. J. Cravatt, R.F.D. No. 46, S. Main St.,
8 AAV L. E. Clark, Bentley Ave.....Hubbard, O.
8 AAW W. Burston .....Farwell, Mich.
8 AAX C. B. Mullett, 89 Eastwood Pl.....Buffalo, N. Y.
8 AAY H. Heidloff, 5310 McBride Ave.....Cleveland, O.
8 AAZ V. L. Miller, 209 Clarendon Ave.....Canton, O.

8 ABA C. Gerbracht, 223 Sassafras St.....Erie, Pa.
8 ABB E. S. Heck, 31 Lincoln Ave.....Salem, O.
8 ABC O. S. Finch, 1 Stuart St.....Binghamton, N. Y.
8 ABD O. S. Barnes, 215 Main St.....Binghamton, N. Y.
8 ABE R. L. Boyer, R.F.D. No. 11.....Sidney, O.
8 ABF R. Rolfe .....Marlett, Mich.
8 ABG H. A. Wheat, Jr., 584 S. Main St.....Geneva, N. Y.
8 ABH E. V. Barton, 781 Hazelwood Ave.....Pittsburgh, Pa.
8 ABI H. R. Daniels, Jr., 424 W. 1st St.....Dayton, O.
8 ABJ C. M. Sorenson .....Dearborn, Mich.
8 ABK A. E. Johnson, 115 Owen Ave.....Detroit, Mich.
8 ABL T. Whalen, Jr., 119 Amabelle St.....Pittsburgh, Pa.
8 ABM H. L. Spencer, 160 Conklin Ave.....Binghamton, N. Y.
8 ABN J. F. Hamilton, 1132 Jefferson Ave.....Buffalo, N. Y.
8 ABO M. A. Neff, 300 Maple Ave.....Birmingham, Mich.
8 ABP G. M. Bunting, 722 Haven Ave.....Ann Harbor, Mich.
8 ABQ R. A. Eccles, 201 Genesse St.....Auburn, N. Y.
8 ABR G. Rouston, 527 Chalmers Ave.....Detroit, Mich.
8 ABS G. E. Wilcox, 24 Ravine St.....Hornell, N. Y.
8 ABT T. R. Carter, 1722 Whitney Ave..Niagara Falls, N. Y.
8 ABU H. H. Bradley, R.F.D. No. 5.....South Haven, Mich.
8 ABV R. E. Stowe, 623 Grand Ave.....Dayton, O.
8 ABW M. Vanderweken, 2206 Washington Ave..Scranton, Pa.
8 ABX P. Coville, 514 E. Buffalo St.....Ithaca, N. Y.
8 ABY C. H. Wagner, 129 Willowbank St.....Bellefonte, Pa.
8 ABZ J. G. Russell, 906 Charles St.....Parkersburg, W. Va.

8 ACA E. L. Green, Booth St.....Ashtabula, O.
8 ACB N. G. Wintermantel, 3028 Stickney St.....Toledo, O.
8 ACC I. E. Beasley, 1874 E. 6th St.....Cleveland, O.
8 ACD H. J. Cooper, R.F.D. No. 5, Box 113, Slippery Rock, Pa.
8 ACE W. G. Greavy, 938 Monroe Ave.....Scranton, Pa.
8 ACF T. W. MacNary, 27 Highland Ave.....Washington, Pa.
8 ACG G. H. Hammer, 507 Washington St.....Oakmont, Pa.
8 ACH J. A. Victoreen, 11302 Euclid Ave.....Cleveland, O.
8 ACI F. E. Foster, 226 W. Union St.....Athens, O.
8 ACJ J. Harmon, 714 Literary Rd.....Cleveland, O.
8 ACK N. Arnold, 134 High St.....New London, O.
8 ACL W. L. Parker, 3 Pine St.....Binghamton, N. Y.
8 ACM W. E. Bostwick, 206 Willard Bay.....Ithaca, N. Y.
8 ACN H. E. Wilkinson, 1446 Michigan Ave....Buffalo, N. Y.
8 ACO P. Robiscung, 1211 N. Edward St....Kalamazoo, Mich.
8 ACP Hilltop Y. M. C. A., Knoxville Boro, 300 Zara St., Pittsburgh, Pa.
8 ACQ W. B. Louis, 1252 Summit Ave.....Lakewood, O.
8 ACR A. G. Spiller, 14405 Strathmore Ave..E. Cleveland, O.
8 ACS D. G. Shotton, 1641 Sanderson Ave.....Scranton, Pa.
8 ACT B. L. Davis, 1435 Velvidere Ave.....Detroit, Mich.
8 ACU H. E. Shultz, 319 Young St.....Cheboygan, Mich.
8 ACV C. Davidson, 332 National St.....Detroit, Mich.
8 ACW R. A. Stephens, 181 Seneca St.....Hornell, N. Y.
8 ACX Wilkinsburg High School, 14859 Wallace Ave., Wilkinsburg, Pa.
8 ACY R. C. Wolfe, 912 Blackhoof St.....Wapakoneta, O.
8 ACZ E. W. Brown, 128 Ohio St.....Elyria, O.

8 ADA A. Fischer, 339 Rawson Ave.....Freemont, O.
8 ADB R. Woller, 322 Bird Ave .....Buffalo, N. Y.
8 ADC Raphael Elec. Co., 507 Washington St..Oakmont, Pa.

8 ADD G. J. Boyle, 72 E. Carey St.....Plains, Pa.
8 ADE E. Beach, 434 S. Grant St.....Troy, O.
8 ADF R. J. McConnell, 931 Beckford Ave.....Newcastle, Pa.
8 ADG C. H. Schrader, 1412 Dudley Ave.....Utica, N. Y.
8 ADH R. K. Strong, 24 Paige St.....Owego, N. Y.
8 ADI M. N. Rohrback, 583 Allegheny Ave.....Oakmont, Pa.
8 ADJ F. J. Brewster, 2159 E. 69th St.....Cleveland, O.
8 ADK C. A. Hultberg, 5432 23rd St.....Detroit, Mich.
8 ADL T. M. Peters, 233 Union St.....Bellevue, O.
8 ADM W. L. Rust, 703 E. State St.....Ithaca, N. Y.
8 ADN J. R. Dean, 86 Vermont St.....Rochester, N. Y.
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8 AEF G. L. Williamson, 391 Arnett Blvd...Rochester, N. Y.
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8 AEO D. A. Gunn, 19 16th St.....Buffalo, N. Y.
8 AEP R. N. Stoddard, 10013 Lamont Ave.....Cleveland, O.
8 AEQ J. D. Anderson, & J. H. Patterson, 1608 E. 66th St., Cleveland, O.
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8 AEX R. L. Doty, 45 South St.....Genesee, N. Y.
8 AEY M. T. McColm, 448 E. Sliver St.....Lebanon, O.
8 AEZ F. J. Hooven, 140 Lexington Ave.....Dayton, O.

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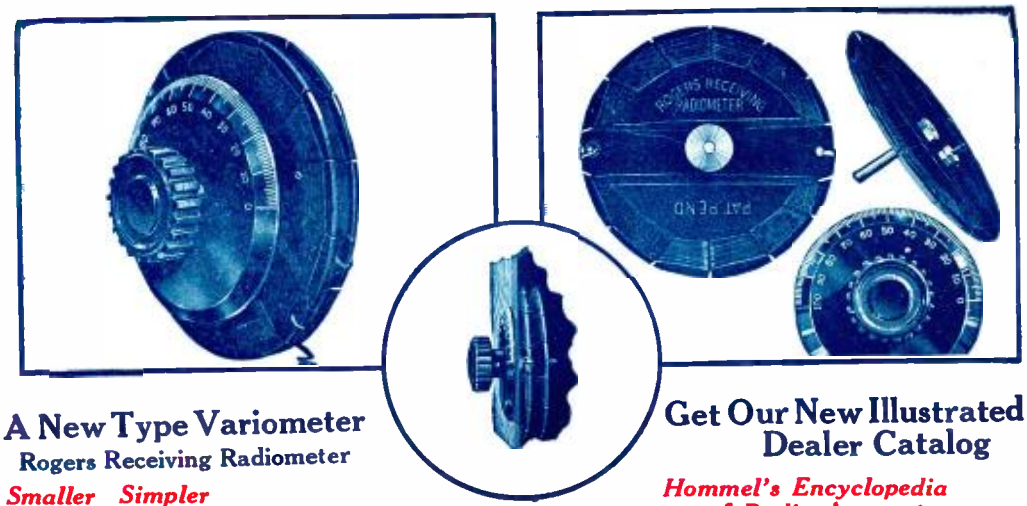

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The tuning efficiency and sharpness is greatly improved because the dielectric material is reduced to the absolute minimum—no wood, paraffine, shellac, or varnish is used.

The Rogers Receiving Radiometer takes up but a fraction of the space required for ordinary variometers—it measures but 4″ in diameter by 1″ in depth.

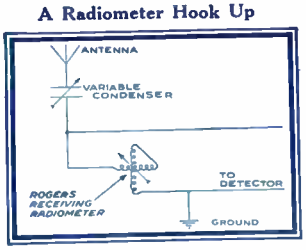
Only one supporting bushing is used for the entire assembly; this bushing is also used for the electrical contact between the two inductors.

For long distance, short wave sets, two Rogers Receiving Radiometers will give as good as, if not better results than any other type of installation.

Can be used in any part of the circuit in which the ordinary ball type variometer can be used.

Price $4.00 each, without dial and knob—about ½ the cost of ordinary variometers.

A Radiometer Hook Up



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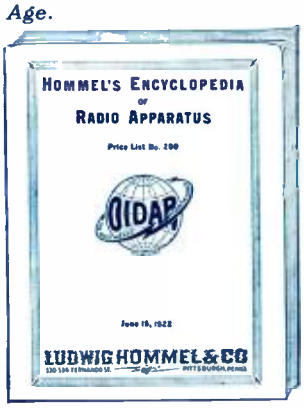

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