

On the Air

A Magazine of Radio

January
1926

15
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In This Issue - **Waking Up Radio's Silent Majority** By ARMSTRONG PERRY

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1926 Catalog of RADIO BARGAINS Save 1/3 to 1/2

**The World's Largest
Exclusive Radio Mail Order
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64 illustrated pages containing thousands of bargains in radio sets, semi-finished sets and radio kits of all styles, sizes and approved circuits. 5-tube sets as low as \$29.50. Beautiful models of the very latest designs and types. Elaborate console models with loud speakers built right in cabinets of genuine mahogany and walnut. All sets guaranteed. Coast to coast receiving range. Also contains everything in radio supplies, including batteries, chargers, loud speakers, transformers, condensers, rheostats and any other parts you may want for improving your set or building a new one. Guaranteed saving to you of 1/3 to 1/2.

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Transportation charges extra. Shipping weight 25 lbs.

This set with all Accessories, including the famous American Bell Loud Speaker with adjustable unit, 2-45 volt "B" batteries, one guaranteed 100 Ampere Hour storage "A" battery, cable for battery connection, 5-201A tubes, Aerial and ground equipment, and everything complete ready to set up and operate. **\$59.75**
Nothing else to buy. Price.....
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AMERICAN RADYNOLA 5 TUBE SET

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Order Direct From This Page! Save 1/3 to 1/2. Sets on this page are typical examples of bargains throughout our catalog. Our guarantee protects you. Money cheerfully refunded if you are not satisfied. Write your order and prices plainly. Send post office money order or bank draft for full amount to insure safety. Refer to any bank or commercial agency regarding our reliability.

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Beautiful Walnut Cabinet in two-toned effect. Two door panels inlaid with highest grade burl walnut. Cabinet is 39 inches high. Top measures 13x37 inches. Equipped with high-grade built-in loud speaker with adjustable unit. Large, roomy interior for holding all batteries, books, etc. The Columbia Grand is a 5-tube tuned radio frequency receiver. Coast to coast receiving range. Tune in stations desired—very selective. Has latest type, low-loss condensers, coils and sockets. Bakelite baseboard, sockets and dial knobs. Dials are beautifully etched in gold on walnut finish bakelite panel. Price for set only, fully built and wired—\$57.95.

Transportation charges extra. Shipped by freight or express. This set with all accessories, which include 2-45 volt "B" batteries, one guaranteed 100 ampere hour storage "A" battery, 5-201A tubes, multi-colored cable for easy battery connection, aerial and ground equipment, instructions for setting up and operating—everything complete, nothing else to buy—**\$84.95**
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Semi-Finished 8-Tube Super-Heterodyne

\$43.75

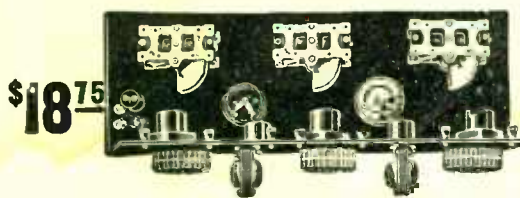


World's Famous 8-tube Super-heterodyne. Fully mounted on panel and baseboard. Comes Completely assembled ready to wire and operate. We have testimonials from thousands of builders of this set. Some have received foreign stations on loop aerial. Unsurpassed in volume and tone quality. Low-loss straight line frequency condensers, vernier dials, finest quality rheostats. Matched Columbia long wave transformers. Requires only three screws for attaching panel and baseboard and set is ready to wire and operate. 7x30 panel. Price of set only **\$43.75**.

Requires following accessories to complete this set: 7x30 cabinet, 8-201A tubes for storage battery operation or No. 199 tubes for dry cell operation, 100 Ampere hour storage battery, 2-45V "B" batteries, loud speaker, center tapped loop aerial. All these items are listed in our catalog, at a tremendous saving.

Our semi-finished sets come with all parts mounted on panel and baseboard ready for wiring. Do not fail to send for our catalog. Remember—we are the largest exclusive radio mail order dealers in the world and carry the best of everything in radio. We save you 1-1 to 1-2 on everything in radio. Detailed descriptions appear in our catalog.

Semi-Finished 5-Tube Radio Frequency Set



\$18.75
This special offer is astounding the radio world. Coast to coast reception on loud speaker. Low-loss condensers and sockets. Highest quality transformers. Bakelite rheostats. All wiring concealed under Bakelite baseboard. 7x18 panel—fits into any standard 7x18 cabinet. Complete instructions for operating. Guaranteed saving to you of \$50.00. Price of set all mounted, **\$18.75**. Cabinet of same model as American Radynola pictured above \$5.65 extra.

Our line is complete, includes all popular sets, such as Superheterodyne, Neutrodyne, Ultradyne, Reimartz, Regenerative, Radio Frequency, Brown-Drake, Super-Heterodyne Reflex and all other latest circuits. Kits, sets and parts by well-known manufacturers such as Frost, Howard, Baldwin, Brandes, Western Electric, Columbia and others.

ULTRADYNE

Complete parts for 8-Tube Ultradyne receiver, without cabinet, complete with blueprint, instructions and diagrams

\$45.85

NEUTRODYNE

Genuine Licensed Neutrodyne kit of parts come fully assembled on the panel and baseboard with complete instructions ready to wire

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ULTRA-AUDION

One-tube Ultra-Audion. Wizard of radio. Fully assembled and ready to wire, with instructions

\$6.35

COCKADAY

3-tube Cockaday kit of parts, fully assembled on panel and baseboard ready to wire

\$15.85

BROWNING DRAKE

4-tube complete low-loss parts

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REMLER 8-TUBE SUPER HETERODYNE

Complete parts for Best 45 Kilocycle Super-Heterodyne Genuine Remler parts

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HARKNESS

2-tube reflex kit of parts, fully assembled on panel and baseboard, ready to wire, complete instructions

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Catalog includes list of broadcasting stations, general radio information and facts about our free service division. Write for it today.

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OUR GUARANTEE
Every article exactly as represented. Every article tested before shipping. Complete satisfaction guaranteed.

A New Radio Principle!

Four essential improvements result

Now a perfected new-type radio offers you the advantages for which you eagerly have waited. We ask that you test it in the privacy of your own home. Let it entertain you for an evening free. Simply send the coupon.

AN extraordinary and striking improvement has been achieved in radio reception.

Materially greater distance is secured because of it. Supreme clarity is obtained. Volume is increased to concert proportions.

And selectivity is so sharp that stations differing only a few meters in wave lengths are separated with surprising ease.

On the new principle that makes these four improvements possible, a new-type radio has been built. Instead of asking you to buy it we want you to test its superior performance under the actual working conditions surrounding your home. *This is the only safe way to select any radio.*

Simply return the coupon at once.

Finally we had it. A vitally improved radio that delighted scientists with its superlative performance.

4 astounding improvements

The heart of this new-type receiver is a new and revolutionary coil—the Erla *Balloon *Circlloid. It is found alone in Erla Circlloid Five receivers. None other,

no matter how costly, can give it to you. Four great advantages result:

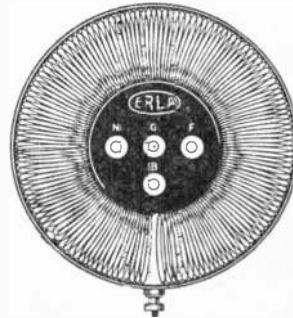
(1) *Greater Distance.* Circlroids offer nation-wide reception in winter. 1000 miles on reasonably clear nights in summer. Because they have no measurable external field to interfere with adjacent coils and wiring circuits, proportionately higher amplification is permitted in each stage. Hence increased sensitivity and range.

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(3) *Increased Volume.* Higher radio

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(4) *Finer Tone.* Ends completely fuzziness and blurred tones. Circlroids' self-enclosed field eliminates stray feedbacks between coils and hence does away with mushing and distortion. Even the highest tones are full and crystal clear, with the finest shades perfectly reproduced.



New Erla Balloon Circlloid Coupler and Transformer

See how little this fine receiver costs

The price of Erla receivers is as surprising as their performance. Read the descriptions under the model pictured here. You can see why we say, "Add \$50 or \$100 to the price of any Erla receiver, then compare it with others."

As radio pioneers we have maintained supreme mechanical excellence.

Merged with the world's largest chest and cabinet manufacturer we save the cabinet maker's profit.

By making 95% of the parts that go into Erla our price includes only one profit instead of three or four.

Now a tremendous demand proves the soundness of low price policy.

Here is the only SAFE way to select a radio

So that there will be no inconvenience with your evening's entertainment, an Erla Circlloid Five is installed for you.

This is a daring way for any manufacturer to display a radio—by letting it demonstrate itself. Few receivers today could stand the test.

But it is the only safe way to select your radio. Test it in the spot where you are going to enjoy it. Then you know beforehand how it is going to perform.

Take the coupon to your nearest dealer or send to us direct. This offer will be withdrawn without notice. So enjoy your evening's entertainment soon.

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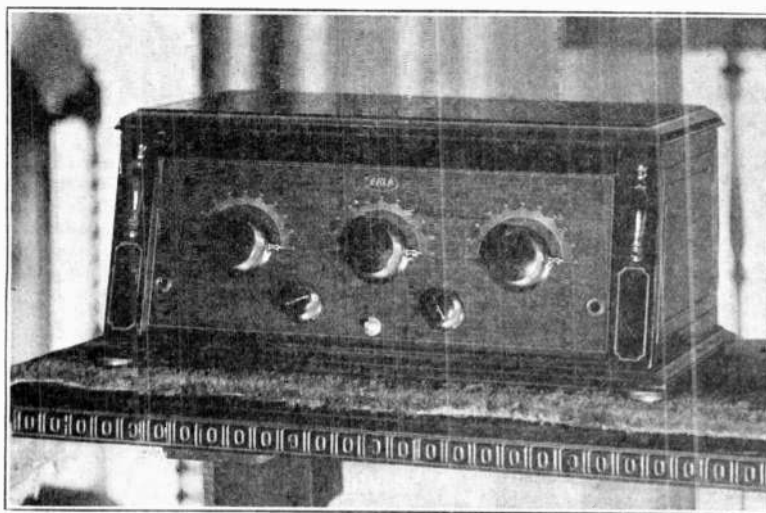
- Please have my local Erla dealer lend me a set for an evening.
- Please send me your interesting radio catalog and handbook.

Name.....

Address.....

City..... County..... State.....

Tell them you saw it advertised in *On the Air*.



Rich, two-tone dark mahogany or walnut finish. 5 tubes, \$69.50. De Luxe Model, in quartered French walnut, \$77.50. Prices on Pacific Coast, \$73 and \$82 respectively.

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



DEALERS — Aggressive individuals or organizations, with or without previous radio experience, may secure exclusive franchises in territories still open by writing or wiring immediately.

On the Air

A Magazine of Radio

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MONTHLY ROUND TABLE WITH THE EDITOR

OUR APPEAL to "On the Air's" 100,000 enthusiastic readers, last month, has met with a gratifying success. We have received letters from all over the country; from the farms, small towns, and big cities, voicing our readers' enthusiastic approval of the bigger and better "On the Air," all of which leads us to believe we are pursuing the right course and will be rewarded if we continue to do so.

The response from readers in answer to our request that they tell us what kind of a magazine they want has been noteworthy. From a representative group of intelligent radio fans, typical of the readers of "On the Air," we have found that what they like is what we are giving them every month; a good group of feature articles about their friends in the best known broadcasting stations; a generous portion of general-interest articles on the various uses to which modern radio is being put; and lastly, but justly important, a series of technical articles on the care and construction of efficient radio apparatus. Such was the plan followed in the last issue of "On the Air" and a careful perusal of this issue will show that the same idea has been kept in mind throughout. And we are sure that the universal appeal of "On the Air" is responsible for the tremendous reader confidence it now enjoys.

OUR promise of "something new" each month, which was fulfilled in the December issue, struck a favorable chord among our readers, who are now sure that "On the Air" will give them something unique and out of the beaten path with each issue. This feature is continued again this month on page 7.

It is surprising to note the large number of fans who have yet to purchase radio sets. Almost daily we receive several personal letters, asking us "What set shall I buy?" The volume of these requests leads us to believe that the sale of radio sets has not yet reached the saturation point, and that untold millions of our citizens are yet to be acquainted with the joys of radio. And "On the Air" stands ready, as always, to offer personal aid to the bewildered fan who knows not which way to turn in choosing the best set to meet his needs. So don't hesitate to call upon our engineers for advice whenever you need it.

ON THE AIR, Monthly. Application made for transfer as second class matter from the Post Office at Chicago, Ill., to the post office at Mount Morris, Ill., under the act of March 3, 1879. Originally entered at the Chicago Post Office April 25, 1925.
ISSUED MONTHLY, 15 cents a copy, \$1.50 a year in the United States and possessions. Elsewhere \$2.00. When remitting, do so by check, money order, or by registered mail if cash is enclosed.

CHANGE OF ADDRESS. Instructions for change of address should be sent to the publisher at least two weeks before the date they are to go into effect.

ADVERTISING FORMS close on the 15th of the month preceding date of issue. That is, forms for the February issue close January 15. Issued on the 25th.

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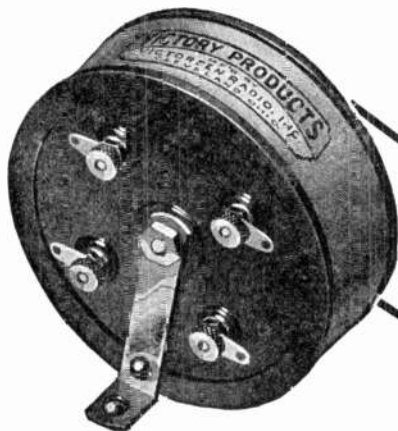
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Distance, Selectivity, Clarity

With a

VICTOREEN SUPER-HETERODYNE

Complete parts to build the "Victoreen" can be purchased from your dealer for between \$50.00 and \$75.00—depending on quality of material selected.



Photographs of a completed Victoreen set built by George W. Walker, A. M. I. R. E., appear on page 44 of this magazine. Note the beautiful appearance and the simplicity of assembly and wiring.

The Heart of the Circuit consists of

4 No. 170 Victoreen R. F. Transformers (illustrated above) at \$7.00 each.

1 No. 150 Victor Oscillator Coil at \$5.50.

Should use of aerial be preferred to loop, the Victoreen No. 160 antenna coupler is required at \$3.50 extra.

Victoreen Air Coil Transformers are not "merely matched," but are actually tuned to a guaranteed precision of 1/3 of 1 per cent—a Victoreen feature.

There are no oscillations, howls or squeals on the Victoreen. For full range, clarity, volume, selectivity and ease of operation, you will find a Victoreen Super-Heterodyne can not be excelled.

Ask your dealer for a free folder and hook-up of the Victoreen set or write directly to us. Your dealer can supply you with all necessary parts.

- Additional Parts Required To Build a Victoreen Super-Heterodyne.**
- 2 .0005 Variable Condensers
 - 8 Vacuum Tube Sockets
 - 2 .00025 Grid Condensers with mounting
 - 2-2 MEG Grid Leaks
 - 1 400 OHM Potentiometer
 - 2 30 OHM Rheostats
 - 2 6 OHM Rheostats
 - 2 Double Circuit Jacks
 - 1 Single Circuit Filament Jack
 - 1 Filament Switch
 - 2 Audio Transformers
 - 1 1 MFD. Bypass Condenser
 - 1 4 1/2 Volt "C" Battery
 - 1 7x24 in. Panel
 - Base Board 8 3/4 x 23 x 3/8
 - Binding Post, Screws, Bus Bar and Solder Lugs
- Your Dealer can furnish you with all these parts.*

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Tell them you saw it advertised in *On the Air*.

EDITORIALS



AS the 1925-26 radio season approaches its zenith, there does not seem to be a noticeable decline either in radio interest or in the sale of sets and parts. Inquiries among prominent manufacturers in the Middle West, which is usually considered a national business barometer, disclose the interesting fact that more sets are being sold over the counter today than production can handle; likewise, contrary to previous predictions, the parts business is holding its own, particularly in the super-het field.

What is the cause of all this? Why has not the heralded slump that put such a crimp in radio last year made its appearance so far? The answer is obvious; radio fans are learning that conditions are only as they make them, and not as they are made by so-called experts and statisticians who infest every industry, and who in this case attempt periodically to delegate radio to its good season, its bad season, and its "fair" season. The radio public is waking up to the fact that reception is good nearly all year round, and not four or five months out of twelve; and that the sets being built today are capable of reaching out and getting the best there is in the air, at a cost much lower than was possible a few years ago.

All this speaks well for the rapidly stabilizing radio industry. It looks as if this season will end in a grand and glorious display of sales and enthusiasm, leaving the Summer months for the necessary adjustment that will determine the status of radio manufacturing during the season beginning in September, 1926. It will mean that the inevitable adjustment will be made in a sane manner, and not hurriedly and dangerously, which would be the case if the bottom fell out of the market in midseason. What could be a better New Year's greeting to the infant industry?

ROXY AND HIS GANG ARE BACK! The inimitable showman who put WEA F on the map a few years ago with his highly original radio programs, is back to the fold and is entertaining millions of fans weekly through a large chain of stations extending from the Atlantic to the Mississippi. And radio fandom can again settle back to that contented pose that characterized the long reign of Samuel Rothafel, the man who does things on a big scale.

Fandom was given more or less of an incurable shock some months back when "Roxy" left the Capitol theater all of a sudden—for reasons best known to himself—and hied himself off to Europe. WEA F'S popularity dropped by several points, and listeners weren't so apt to turn their dials to this strong station,

all because WEA F's chief attraction had "flown the coop." WEA F has a large gathering of distinguished entertainers, but the good-natured fun that Roxy sent out over the ether was their one big feature, and without it WEA F was a ship without a rudder.

But good times always return. Roxy came back from Europe and announced he was to manage a brand new "Roxy" Theater to be built in New York, the most pretentious movie palace in the world. WEA F capitalized on the revived enthusiasm over Roxy, and now he's on the air again, this time for good, we hope.

Radio needs such personalities as Roxy. Everyone knows there are few enough entertainers in this radio game who really amount to something. They can be counted on your ten fingers, and even then you might have a few fingers to spare. Roxy stands for the virile, the pep and the youth in radio. He personifies care-free happiness, tho sometimes bordering on the silly. But he is a welcome surcease from tiresome classics and educational discourses. Roxy is back! Long live the king of mirth!

PRESIDENT COOLIDGE recently announced that he was opposed to direct broadcasting by the chief executive of the nation. He pointed out that of the entire time he has been a resident of the White House, he has broadcast to his constituents but once with the express purpose of "talking over the radio." At other times, and there have been many, his voice has been broadcast and his speeches relayed by many stations so that millions of citizens could listen in; but on those occasions the broadcasting was an "incident" in connection with a dinner or other gathering at which the President was guest of honor before an assemblage of visible listeners.

We can appreciate the President's view in this respect. Direct broadcasting by a President is apt to be mechanical, to be misconstrued as mere propaganda for political purposes. On the other hand, in addressing a meeting that is being broadcast, the President knows he must impress his visible audience; he can see their reactions, their pleasures or displeasures, of his views.

However, in time of national crisis the importance of direct radio appeals by the President cannot be overestimated. Within a few hours' notice, a chain of stations can be formulated whereby the chief executive may address every American who cares to hear him. Radio as a national defence thus assumes a vital importance. It is one of the strongest links in our national integrity, and we believe our President realizes this fact conscientiously.

Free!

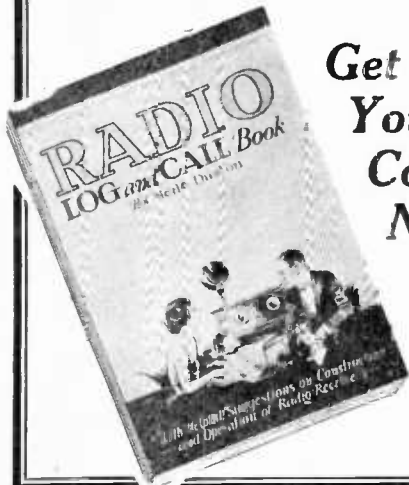
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- Class "B" stations by wavelength.
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- Radio station log.
- Helpful suggestions on construction and operation of radio receivers.

HERE is the most complete Radio Log and Call Book ever issued! It is a complete book of radio information, containing valuable technical information essential to the proper operation of a receiver, batteries, tubes, etc., as well as interesting, up-to-date items of importance. Profusely illustrated with maps, pictures, etc.

NO other book is printed like this one! Handy pocket size. It is useful to every owner of a receiver. You need it, and we'll be pleased to mail it to you free of charge with a year's subscription to ON THE AIR, at \$1.50, postpaid. Send in your order at once, for the edition is limited, and we want all our friends to get a copy of this unusual book. Just clip the coupon today.



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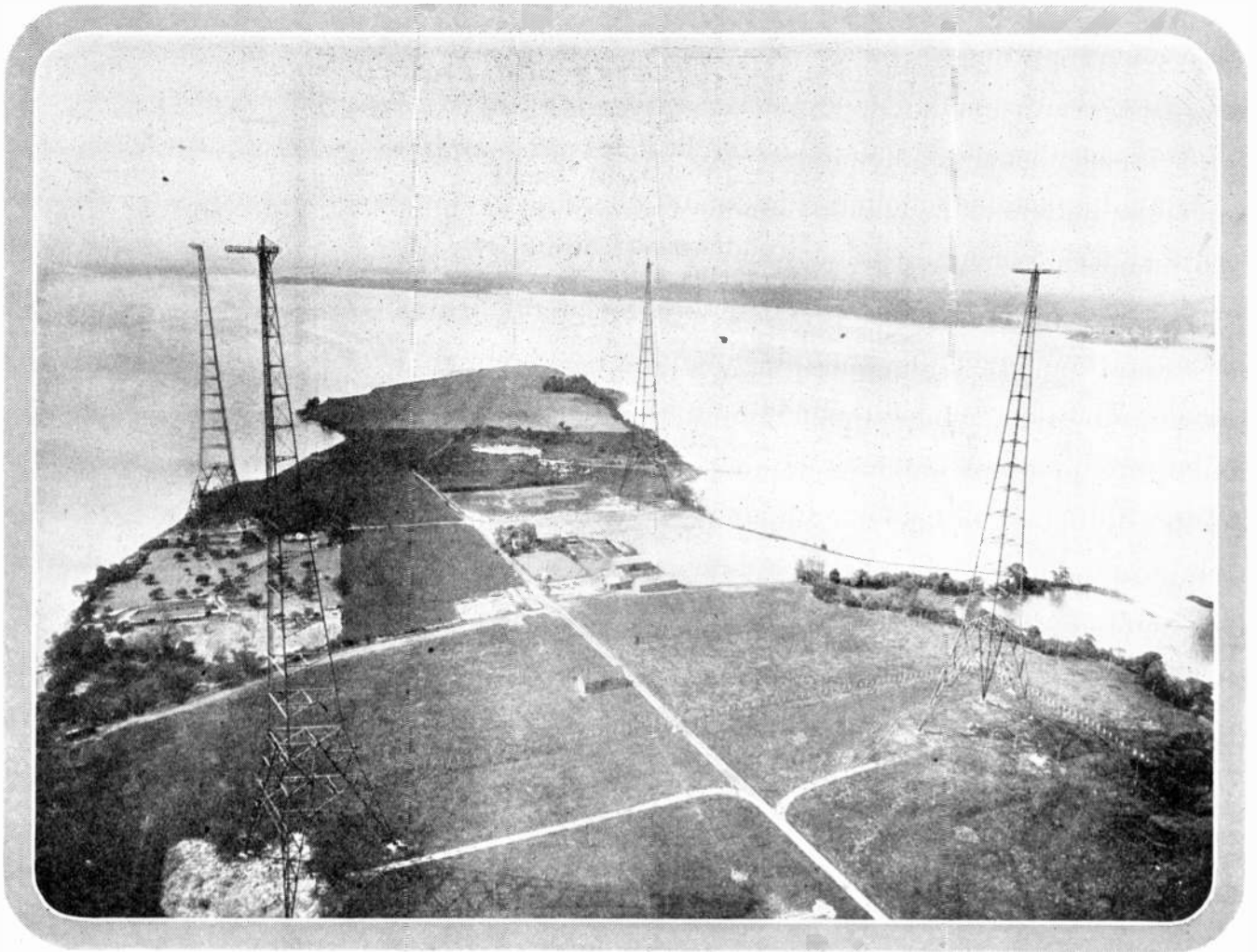
Enclosed find \$1.50 (cash, money order or certified check) for which you may send me ON THE AIR for one year, beginning with the current issue, and the new edition of the Radio Log and Call Book FREE.

Name

Address

(1-26)

The Mighty Towers of NSS



The mighty towers of the Navy station at Annapolis, Md., which operates under the call of NSS, a call that has been heard at the farthest corners of the earth. Located on Greenbury Point, it is one of the most picturesque radio installations in the world.

On the Air

A Magazine of Radio

VOLUME 2

NUMBER 5

JANUARY, 1926

The Medical Profession Adopts Radio

Humanity is Being Benefited in Many Ways by Recent Radio Discoveries; Now the Deaf Can Hear by Means of Radio

By WALLACE LINDSAY

WHEN radio is mentioned one usually pictures a device for entertainment, or perhaps one gets the commercial point of view, or the more dramatic effect of signals from a ship in distress, calling for aid. But radio is going much farther than that.

Day by day, new uses are discovered for radio; humanity is being benefited in numerous different ways by this wonderful science, through its various adaptations to almost every field, and to the medical science in particular.

Much has been written about its different uses and benefits to date, and much is being done every day that does not get to print. Scientists and engineers are constantly finding new and valuable use for radio.

"Radio Knife" the Latest

ONE of the more recent applications is the "Radio knife," which was successfully used to perform a bloodless operation in a Chicago hospital. This knife makes use of a very high frequency current, produced by an oscillating vacuum tube, or tubes. One side of this high frequency current is applied to the body of the patient and the other side is connected to the knife or cutting instrument. By using this arrangement the high frequency current scars the tissues as it cuts, thus closing the veins and preventing the blood from flowing out at the incision, making possible minor operations upon ænemic persons whose life would be endangered by even so small a loss of blood.

Great strides have been made toward numerous other medical adaptations of human benefit, but none so important or so widely successful as in aiding the deaf, or partially deaf, to hear not only radio programs but ordinary speech as well. One of the latest findings has been a means of more accurately testing the sensitivity of the human ear, and the exploration of this complicated organ, by Dr. F. W. Kranz and his associates in a laboratory near Geneva, Illinois.

Dr. Kranz and his associates, who are experts in physics, have spent several years attempting to determine just what the ear consists of and how it operates. They have just completed a set of testing equipment for measuring the degree of sensitivity of the organ, which is similar to a miniature broadcasting set, except that it produces and transmits various tones over a range of frequencies heretofore impossible to obtain, instead of an intermittent signal or the reproduction of music or voice. In making a test with this apparatus, the patient is supplied with a head-piece, similar to the ear-phones such as were commonly used on your own radio set a year or so ago. The transmitter is put into operation and various tone or pitches are produced at the will of the operator. The volume or loudness of the tone is controlled by the patient to fit his degree of hearing and the resultant test will show just how alert his hearing organs are.

The Wonders of the Ear

BY MAKING possible such a wide band of frequencies or sound waves, this apparatus has shown that the average human ear is so alert and sensitive as to be able to pick up and distinguish over 250,000 different sounds or tones. In fact, practically any degree of test can successfully be made upon the ear with such equipment, as it is possible to generate frequencies from one cycle per second to several million per second at almost any volume required.

Further research, or we should say "popular opinion" among the profession, has concluded that the ear is composed of three sections; namely, the outer ear, the middle ear, and the inner ear, of which the ear drum or diaphragm constitutes the outer ear, three small bones or armatures constitute the middle ear and thousands of minute cells or strands constitute the inner ear.

When a tone or sound is

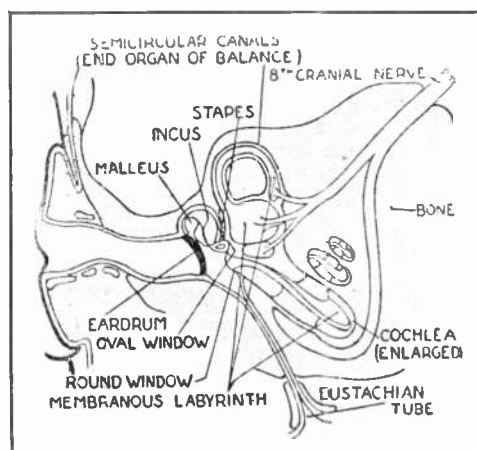


Fig. 1. Above is a diagram showing the human ear and the mechanism of its composition. Scientists, after making a thorough study of the ear's intricacies, have now arrived at a method to bring hearing to the deaf.

produced, it is caused by the vibration of air at various frequencies or vibrations per second. These sound waves, upon entering the outer ear, act upon the ear drum or diaphragm similar to the action of the diaphragm in an ordinary telephone transmitter, causing it to vibrate in resonance with the sound wave. These vibrations are picked up in the middle ear by the three small bones which, by the way, are the smallest in the human body and known as Malleus, Incus and Stapes, which in turn transpose the vibrations similar to the little carbon granules of the telephone transmitter and pass them on to the inner ear or the thousands of little cells or strands which in turn transmit them to the brain, where they are recorded much the same as the telephone line transmits and reproduces the sound at the receiving station.

Now, sometimes this ear drum or diaphragm is affected, causing it to stiffen; or the pressure is too great on one side or the other. This makes it impossible for the average sound waves or vibrations to be picked up and reproduced so that they can be transposed by the inner ear, then the person suffers partial or even complete deafness, as the organ can not get into resonance with the sound wave applied. This trouble is more easily overcome as it is in the outer ear, which is better known and can be treated medically. Affection or infection beyond this outer ear, however, can be treated medically, but where there is some response radio has been of great benefit and has affected a cure in no small number of instances.

An Important Discovery

ONE of the most recent discoveries has shown that an ear drum, or other parts of the organ, while not sensitive to audible sound waves, can be put into action by the application of a suitable frequency outside of the audible band, which action can be compared to a tuning fork in that it does not respond to any other frequency than that of its period of vibration, but readily responds in resonance with a tone whose frequency matches its own point.

With the aid of the vacuum tube oscillator, a frequency can be generated to fit the vibrating period of that particular organ, causing it to get into action or become sensitive to a slight change in vibration, once it has been set into action. For example, it is found that the ear-drum will respond to a frequency of say 50,000 cycles per second, which would be above audibility. This frequency or sound vibration is set up, causing the organ to become sensitive once it is vibrating in resonance with the frequency. Any other sound waves super-imposed upon it would cause a corresponding change in the action or vibrations, which, being in the audible band of frequencies, would be transmitted and recorded as in a normal organ.

Should this method or discovery become perfected to the degree that it could be used by the patient outside of a laboratory, a great many people now considered incurable would be able to hear as well, or to a close degree as well, as a person whose hearing was

normal without disturbing or inconveniencing those conversing, as it would cause no sound or require a speaking tube or other pick-up device.

It has also been found with the aid of radio apparatus that the bones of the human body will transmit sound vibrations to the middle or inner ear when sufficiently amplified and applied. Whether this method would be practical or not is yet to be seen. However, it will enable the detection of active parts of the organ, which will aid in various other treatments by showing that there is still activity.

Some deaf persons have been made to hear and distinguish different tones or pitch by applying them to the skull or bones of the head with an instrument made similar to an ordinary telephone receiver. This instrument has a bar fastened to its diaphragm on which is fitted a small pad or plate as in Figure 2. This pad

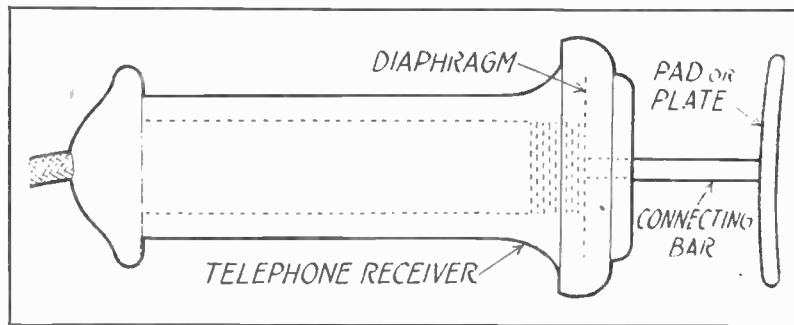


Fig. 2. Above is an artist's conception of the instrument used to apply sound vibrations to the bones of the head. Note the similarity in construction and principle to the ordinary telephone receiver.

or plate is pressed to the head and the vibrations produced by the tone or pitch which would normally act upon the ear-drum are transmitted to the bones of the head.

This vibration is probably picked up by the middle or inner ear and transmitted to the brain the same as would normally take place in an ear

which was properly functioning. To enumerate all of the uses that radio has been put to in this field would fill a good size book, and new ones are coming up almost daily, such as in the following extract from a daily newspaper which came to our attention while writing this article; to wit:—

Deaf Man Catches Hearing on Radio

Credit radio static with a miracle! Joseph Clyde Tennyson, 74, tobacco grower of Clement, Md., so deaf for almost thirty years that he could hear only shouts, declares he has completely recovered his hearing and that static in radio turned the trick. While visiting his son, J. Clyde Tennyson, at Brooklyn, Md., Tennyson was listening to a radio concert with ear receivers. Suddenly there was a tremendous roar of static. When Tennyson removed his head receivers, his son shouted: "Well, Dad, how did you like the program?" His father exclaimed: "Don't shout. I can hear!"

In some government hospitals patients whose hearing organs are paralyzed or partially deadened have a session at the head-phones every day prescribed as regular treatment. This has been found to exercise the muscles of the organ and gradually bring them back, so that the patient can hear.

Vocational training schools have been able to teach deaf persons to be telegraph operators, reading the code signals by touch instead of sound, and future development may even make possible the recording of sound visually. In this era of science, nothing seems impossible and with the vast army of scientists and engineers working day and night, great things will be accomplished to the benefit of all humanity.

Former Means Attempted

In the past, mechanical means of producing sound waves at various frequencies were resorted to,

This required elaborate equipment and limited the field to the small range of frequencies obtainable. In addition, volume was not controlled, or could not be controlled satisfactorily.

With the comparatively simple operation required in controlling frequency and volume of sound, and the great variation of frequencies, ranging far above the audible band, which is about up to 5,000 cycles per second, the vacuum tube oscillator and amplifier have proven of untold value.

SOMETIMES, it so happens that the air pressure between the outer and inner ear becomes higher, or lower than that of the atmosphere, causing a pressure to be exerted upon one side of the ear-drum. This trouble causes a sort of damping effect upon the ear drum, or diaphragm, and the person so affected, becomes hard of hearing because weak or normal sound waves will not cause the ear-drum, or diaphragm, to get into resonant vibration. Perhaps you have noticed this condition yourself, while afflicted with a bad cold.

The air chamber between the outer and inner ear is regulated by a channel which has its outlet in the roof of the mouth. These channels act as valves, raising or lowering the air pressure to equal that of the outside air. During a bad cold, these channels have a tendency to become clogged and the pressure upon the inside of the ear drum, or diaphragm, is lowered or kept too high, so that the damping effect takes place and the consequent impaired hearing.

THE action in the human ear would be similar to that which takes place in a regular broadcasting transmitter. That is, an oscillator tube is used to generate a frequency equivalent to its wavelength and called the carrier frequency. Another vacuum tube is used to superimpose other frequencies upon this carrier frequency, called a modulator tube.

While this modulator tube generates frequencies corresponding to the sound waves received by the transmitter, they would not carry sufficient energy to be received over any distance; therefore, a carrier frequency must be generated to carry these sound waves and produce sufficient energy to sensitize the receiver. This carrier frequency, by the way, is also too high to be audible so it does not cause any annoyance.

WITH the advent of the photo electric cell, which changes light rays into electrical pulsations, or frequencies corresponding to the intensity of the light, it may even be possible to aid the blind to visualize

things to a limited extent. While this assumption is rather far fetched, it may be tried and at some future time be put to use as many other strange things have been perfected to a limited extent, as the organs of sight are explored and their operation put upon a mechanical basis. Radio may play an important part and even make possible things which are even now unbelievable.

What the Public Must Do for Radio

RADIO manufacturers throughout the country have been negligent in educating the public, generally speaking, on the proper care and operation of a radio receiver, regardless of whose set it is, according to Clarence E. Ogden, president of the Kodak Radio Corporation, operating Station WKRC, Cincinnati.

A radio receiver with "A," "B" and "C" batteries, tubes, the proper hook-up of the batteries, ground and antenna, plus the proper method of tuning, and other details, require some patience and some effort on the part of the operator of the set in order that the best results may be obtained.

When a motor car runs out of gas, or the bearings burn out because of lack of oil, or tires become rim-cut because the owner fails to have the proper air pressure the motor car is not blamed, and the owner realizes his own responsibility. He realizes that it is not the fault of the automobile and does not blame the automobile dealer or the manufacturer. On the other hand, Mr. Ogden points out, anything that may

happen with radio reception is blamed onto the set because the owner only knows that he has a set that is supposed to get certain stations and regardless of bootleg tubes, batteries and other equipment—the radio receiver bears the brunt and the manufacturer is blamed.

Mr. Ogden who holds thirty-two basic patents in radio, including patents covering battery chargers and radio receivers pointed out that manufacturers and dealers who sell receivers to the public, giving the impression that all there is to do is set the receiver down, attach the batteries, insert the tubes and get everything in the country

and part of Europe, are doing an injustice to their own business. Automobile dealers expect buyers to know something about fuses, gasoline and oil; the necessity for relining brakes and tightening bolts and ignition wires.

In turn, people should expect to spend a little time in learning to operate their receiver properly in order that the receiver may do full justice to any program.



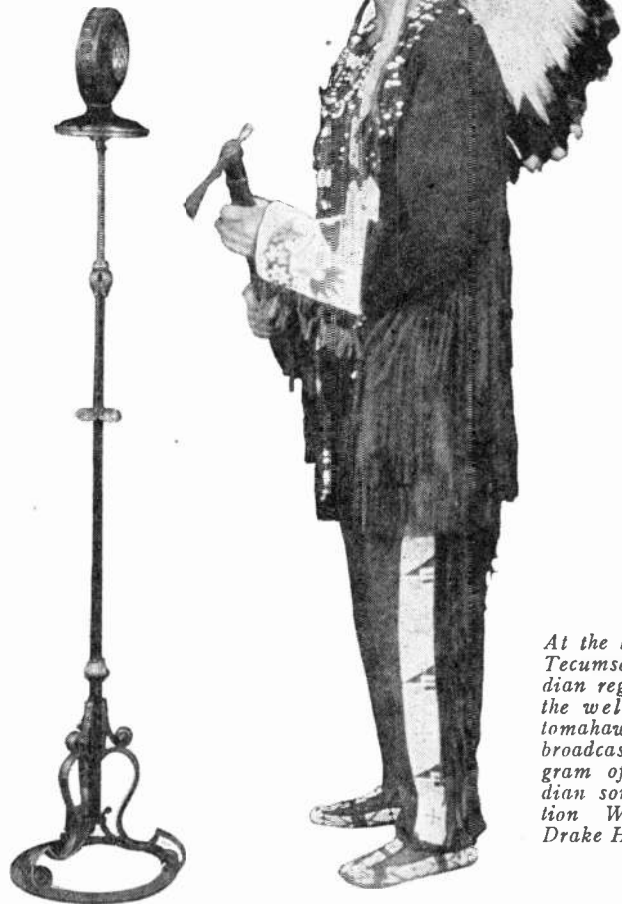
Persons who had given themselves up as permanently deaf have had their hearing restored successfully, after scientists had applied radio methods to the mechanism of the afflicted ears. Now these persons may hear radio concerts as well as speech and other auditory impulses.

Radio's "One and Only" Indian Tenor

Kiutus Tecumseh Wanted to Show the Public that an Indian Possesses an Inherent Ability to do Things; Now He's Known as the Country's Only Indian Singer, and He's Working His Way to Be More Famous Than Ever.



By
MARVIN
PLOTKE



At the left is Kiutus Tecumseh, in full Indian regalia, down to the well-sharpened tomahawk, as he is broadcasting a program of spirited Indian songs from Station WGN, on the Drake Hotel, Chicago.

WHAT a rare treat it is to hear an Indian musician! Yes, indeed, America's only Indian tenor is working his way through musical college to be an accomplished artist. Work, study, practice—depriving himself of all amusements and working during spare hours, comprise the daily routine of Kiutus Tecumseh, great-grandson of the famous old Chief Tecumseh.

As Kiutus said, "The American public think the Indian boy has no talent. I wanted to show them. One night I had a dream. I was to be famous—a great singer; so I went to my folks and told them. They laughed, but this made me more determined. Now, when things are slow and money gets tight, I always remember my dream—and fight all the harder."

So folks, with this in mind, we find Kiutus Tecumseh now finishing his last year at The Chicago Musical College and working his way through by being employed at a downtown hotel.

How It All Started

NO doubt, you ask, who is this Indian? Where does he come from? What has he done in radio, or what is the idea of telling Indian stories in a radio magazine? Well, we'll take one thing at a time, begin at the beginning, and proceed up to the present time.

Tecumseh is of the Yakima tribe in Yakima, Washington, known out west as "The Valley" or "The Land of Sunshine and Apples." His mother is Yakima and his father a Cherokee, which, by the way, brings in the relationship to the old Chief Tecumseh, from the paternal side. When a mere lad his voice was so shrill that the Indians called him, "The Coyote," or "Kiutus," the coyotes having the highest pitched voice of any wild animal. However, as he grew older and matured, his voice changed into a wonderful tenor and he became known as "The Songbird Of The Yakimas."

As he approached eighteen years of age, he obtained a job

as a cowpuncher in Washington and worked during the hot Summer days, "punching cows." When the sun settled and twilight came on, the tired cowboys rode homeward. Then, after supper, the boys pushed the well scratched music box (commonly known as a piano), out on the veranda, and there, by the light of the stars and the softness of the moon-beams, Kiutus sang to them. He sang folk songs of his home, his people and their heroes.

Soon, from miles around, they came to hear this much discussed Indian. They marveled at his voice and whenever there were celebrations in the town—Kiutus was sure to sing.

Then came the World War. Like the full blooded American that he is, he joined Uncle Sam's navy. Just like as in the days out west, he sang to the sailors each night. He made many friends and the officers begged him to train his voice, as some day this voice was to become great and famous—because in his dream The Great Spirit told him so, as well as his white brothers. So, after the war he prepared for his career.

Onward to Chicago

HE came to Chicago and entered The Chicago Musical College. After two years study, he ventured up to Station WDAP on the Drake Hotel to meet Jack Nelson. Nelson realized the quality and talent in Tecumseh, and Kiutus Tecumseh became a feature over WDAP. Since then he has sung from nearly every principal radio station in the country.

Tecumseh believes the big event in his life, was his introduction to President Coolidge on August 7, 1924, when he talked to the President for ten full minutes. He sang for Mr. and Mrs. Coolidge as well as for the wounded soldiers at the Walter Reed government hospital, and at radio stations WCAP and WRC in Washington. Then, escorted by Charles H. Burke, commissioner of Indian affairs, Tecumseh visited

(Continued on page 52)



Cave explorers conducting radio tests in Virginia. The aerial is being lowered into the cave by the "bug" at the extreme right, preparatory to underground transmission tests.

What About the SILENT Majority?

We Absorb Programs Like Auditory Sponges,
Yet Remain Quiet as Clams; The Silent Ma-
jority Cannot Rule by Being Silent Forever

BACK in the days when there were bashful children, callers used to ask them: "Has the

By *ARMSTRONG PERRY*

cat got your tongue?" There ought to be something like that to draw the silent majority of radio listeners out of their shells. We absorb broadcast programs like auditory sponges, yet remain as inarticulate as a colony of Little Neck clams.

Silent folks have their likes and dislikes, as well as those who express themselves. The broadcasters try to guess what we want. Sometimes they hit it right and often they miss. They are guided by the letters they receive, but listeners who write letters represent types of mind that may not be found in equal proportions in the much larger audience that does not express itself. Those who talk and write most freely may think less deeply than those who do nothing but think.

It is a common mistake to assume that "everybody's doing it," when a considerable number express an interest in one type of radio program. The crowds

in front of the loud speakers during the World Series made it appear that baseball was the ruling passion of the American public, but many a useful American passed these crowds daily who could not tell what the World Series was if he met it in an intelligence test. Many radio fans gasped in astonishment when they tuned in WEAJ, on the Sunday afternoon when one of the crucial games was played, and heard Dr. Cadman, the Brooklyn preacher, giving his usual talk.

"Why a sermon when the public wanted a ball game?" they asked. Thousands, on the other hand, listened to Dr. Cadman, as usual, who would have been highly incensed if they had heard the baseball game on the air at an hour regularly reserved for something of greater spiritual value. In spite of surface indications, there is still a goodly percentage of Americans who take life seriously and spend some time in self-cultivation. Radio would give them much more assistance if they expressed their desires to the broadcasters instead of leaving the direction of the programs so largely to the more effervescent masses whose brains, located below the waist line, demand the stimulation of jazz orchestras rather than of musical or other programs addressed to audiences whose will power controls their lives.

Hearing that the development of radio has hurt the sale of phonographs, some have concluded that the majority of radio



Radio engineers testing a radio receiver at the mouth of a Pennsylvania cave, with the antenna in the bowels of the earth. This region is reputed to be the best in the country for radio experimentation. The results thus obtained are better than the most exhaustive laboratory tests.

users purchase their receivers, as the public presumably purchased phonographs, merely to pass pleasantly the idle hours. It may be that amusement is the big idea with a large number of listeners, yet in visiting average homes in many localities here are some of the interests I discovered:

Exceptions To The Rule

IN IOWA a boy was specializing in short-wave apparatus. Nothing over 40 meters interested him for the time. He picked up the short wave broadcasts, not for what they contained, but to test the receivers that he built. While the Mac-Millan expedition was in the Arctic, he maintained two-way communication with it for twenty-two days while the older experts failed in their attempts.

In a Y. M. C. A. dormitory in Chicago a number of the men worked night after night on super-heterodyne receivers. They were trying to solve the problem of cutting through the interference between the numerous near-by broadcasting stations, reach out in spite of the absorption of energy by the steel structures that surrounded them, and get rid of the noisy effects of thousands of electrical devices such as flashing signs, street car motors and violet-ray machines. This was purely amateur work with no commercial motive.

In another home an old lady, living on a widow's pension, found in radio a double economy. From a savings bank she had secured a home radio bank. A crystal detector set contained in the upper part of this bank brought her the music that she loved—"Wher You and I Were Young, Maggie," and other songs of that vintage. As she listened, she thriftily stowed away such nickels and dimes as she could spare through the slot in the side.

A Pennsylvania minister built a receiver during long nights when a sick child required medicine every half hour. It gave such astonishingly good results that he continued to build sets, and placed them with families in his neighborhood who needed the inspiration of broader contacts.

The Chief Scout Executive of the Boy Scouts of America, always alert for the latest ideas to use in his great work, has three receiving outfits of the latest types in his home in New Rochelle, New York. Four exceedingly active children, as well as father and mother, keep their ears on the ether and nothing of real importance escapes them.

In Chester, Pennsylvania, the



Entertainment and savings are combined by means of the unique savings-bank-radio shown in the photo above. And with economy come the familiar strains of such old-time favorites as "When You and I Were Young, Maggie."



A Washington patent attorney is shown above preparing to find out how broadcast programs are received underground. Much interest has been manifested lately in underground work. While extremely laborious as compared to above-the-surface work, subterranean transmission and reception promises to be one of the big developments of the future.

local executive of the same organization installed a receiving set for general purposes. His wife is a musician and likes to hear the great broadcasting artists. The executive himself is usually thinking in terms of work with boys. While listening in he devised a plan for teaching the International Morse code, which every Scout is expected to learn. Each letter of the code is composed of dots, dashes or combinations of the two. Often several months are required for learning it. Having some artistic ability, he drew pictures representing the various letters so vividly that they stick in the memory. He broadcast the code, describing these pictures in such a way that they were readily sketched by the boys who listened. He found that many boys learned the code in half an hour by this means, well enough so that they could send and receive messages at slow speed. After that, all they needed was practice to increase their speed.

Laboratory versus Home

IN A small eastern city the inventor of the filkostat and other radio devices has equipped several houses with receivers. He knows that his laboratory experiments should be supplemented by the every-day radio experiences of average folks who have no special interest in radio science. Just how valuable such experience is will be appreciated by all who have purchased radio equipment on the strength of advertising based only on laboratory tests. Home conditions differ from those in a laboratory and results often fall short of those claimed by manufacturers and dealers.

In Mammoth Cave I found a grotto equipped with radio for the entertainment of visitors.

In Washington a physicist listens to all sorts of radio programs, though he is not interested in what the programs contain. He has specialized in accoustics for the better part of his life and he wants to give the world a loud speaker that will faithfully reproduce the voice or the sound of the musical instrument. He gives the broadcasters credit for having approached very nearly to perfection at the transmitting end but he knows even better than the average listener just how bad much of the reception is. He is conscious of overtones and harmonics unknown to most ears but which are very important. The disc type of loud speaker is his contribution to radio, but he expects to produce one that will be immeasurably better than anything in use today.

(Continued on page 54)

The Radio Inspector Will Get You IF YOU DON'T WATCH OUT

By S. R. WINTERS

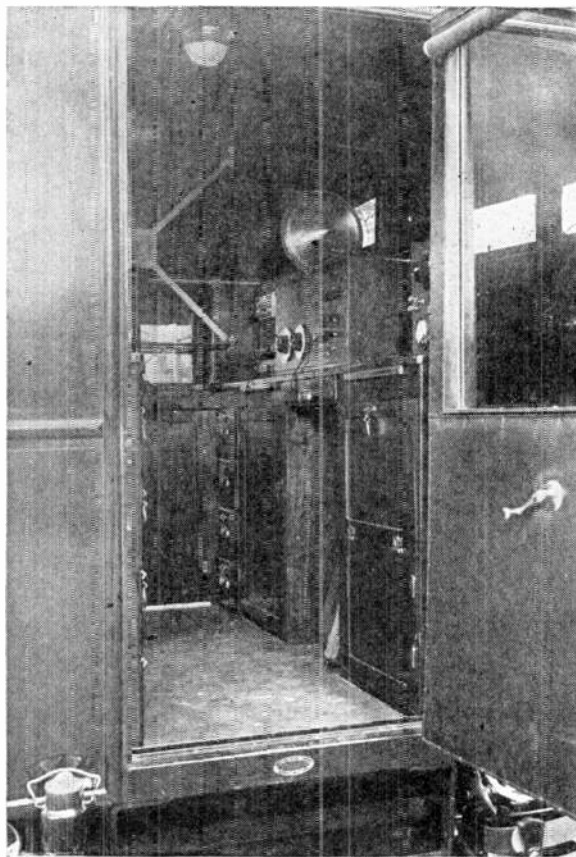
☞ Meanders Here and There with a Complete Radio Station

A RADIO supervisor's office and laboratory on wheels is a phrase descriptive of a car equipped by S. W. Edwards of Detroit, Michigan, for use in the performance of his duties as radio supervisor of the eighth district comprising parts of New York, Ohio, Pennsylvania, West Virginia, and Michigan. The serviceable purpose of such a mobile unit is at once obvious when we are told that any of the manifold requirements imposed upon a radio supervisor can be performed by the facilities of this radio test car—ranging from the role of detective to the determining of qualifications and issuing of licenses to radio operators.

It is not only a complete transmitting and receiving station, but equipment is available for studying the directional characteristics of electro-magnetic waves, for measuring the field intensity or strength of signals from the various broadcasting stations, for the inspection and keeping of records of transmitting stations, and for measuring the assigned frequencies or wave lengths (and determining the variations therefrom) of the respective broadcasting stations. The regard for details in completely equipping this radio laboratory and office on wheels was so carefully planned as to include such office equipment as typewriter and stationery. This means that wherever this test car happens to be—whether located in a remote rural section of West Virginia or in the congested centers of New York or Pennsylvania—applicants for licenses to become radio operators may be subjected to examinations and their qualifications determined. The dimensions of the body of this motor truck are 18 feet long and 12 feet wide.

The Radio Equipment

THE radio facilities on this test car were designed and in-



A LABORATORY ON WHEELS

This is an interior view of the motor vehicle used by S. W. Edwards, radio supervisor of the Eighth district. A two foot loop is used as the antenna, and both transmission and reception are carried on. The set in the center foreground is a specially designed 50 to 3500 meter super-heterodyne.

☞ He Finds Outlaw Stations on air and Checks Waves En Route

stalled by S. W. Edwards, Radio Supervisor, and J. E. Brown, Radio Inspector, with the exception of the unit used in measuring the field intensity or strength of radio signals. The latter apparatus was designed and built at the Radio Laboratory of the National Bureau of Standards, and one of its very recent applications was that of measuring the strength of the 50,000-watt signals from WGY. Two radio receiving sets—a super-heterodyne, with a wavelength range from 50 to 3,500 meters and a short wave receiver, operating on the band of wavelengths from 40 to 175 meters—are included on board this mobile transmitting and receiving station. These two types of radio receivers, embracing such a wide band of frequencies, enable the radio supervisor to check any possible interference having its source either with amateur transmitting stations

or popular broadcasting stations. For instance, the 8-tube super-heterodyne was designed with the provision that it should not yield harmonics so that the beat note of frequencies may be checked in measuring the wave lengths of transmitting stations.

The vacuum-tube transmitting set, which serves the needs for an oscillating unit in the work of a radio supervisor, has a rating of 50 watts power. The range of wavelengths of this oscillator or transmitting set corresponds to that of the super-heterodyne radio receiver—from 50 to 3,500 meters. The beat note from this oscillating unit is employed as a means of checking the frequencies of the approximately 200 broadcasting stations in this particular district.

Toroidal coils are used in the construction of this radio equipment, thus restricting the magnetic field and thereby avoiding a flooding of the radio receiving sets. Storage batteries, motor generator and other necessary power units, as

☞ How the Radio Supervisor of the Eighth District Keeps Tab on His Domain's Activities

well as a rectifier and battery charger, are included in the equipment, and it is possible to charge the batteries while the motorized vehicle is in motion.

In addition to the super-heterodyne and short-wave receiver, there is an inductance receiving set or a unit that you might expect to find in the home of a broadcast listener. It is of the transformer-coupled* type, employing three 201A type electron tubes. A cone type of loud speaking unit further contributes to the completeness of this radio supervisor's office on wheels. At present use is being made of a loop antenna, 2 feet square and consisting of about ten turns of wire, but this is soon to be displaced by a radio compass coil and with the inclusion of a radio compass this will probably be the most complete mobile radio outfit in either Government or commercial service.

Hoover Pleased With Design

Secretary of Commerce, Herbert Hoover, is interested in this novel and efficiently designed radio test car. In company with W. D. Terrell, Chief of Radio Supervisors, he examined the interior of the radio equipped vehicle. The Secretary of Commerce asked a number of questions relating to the use of the car and he inquired into the necessity for providing all of the radio supervisors with such apparatus. This inquiry, it would seem to suggest, foreshadows a time in the near future when the nine radio supervisors of the United States will be conducting their duties afield in this highly desirable manner, provided funds can be had for this purpose.

Radio supervisors, by the very nature of their activities, do not lead sedentary lives—instead they are busy bodies whose duties keep them afield for the major portion of the time. These assignments in the open spaces should not be interrupted constantly by the necessity of returning to their offices or headquarters for equipment and facilities that could be transported readily. The radio equipped automobile, which has been described, should serve as a model for duplication in at least nine instances—one each for every radio supervisor in the country.

Secretary Hoover Gets Busy

WHEN the United States Department of Commerce is temporarily withholding the broadcasting privilege to approximately 200 applicants for licenses because of the exhaustion of available wave lengths, Secretary of Commerce Herbert Hoover may find additional justification for this course of action in results of a comprehensive study of the relative causes of interference. An analysis of 8,500 observations in

determining the obstacles to radio reception discloses that other broadcasting stations cause 25.7 per cent of all interference experienced by broadcast listeners.

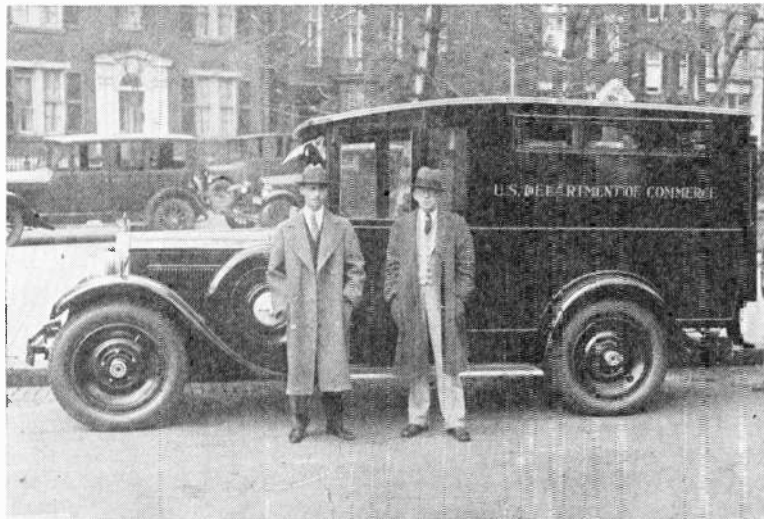
Static and the fading or fluctuation of radio signals, ordinarily regarded as the chief disturbing factors in reception, produce relatively less interference than that condition which has forced the crowding of approximately 600 broadcasting stations in the band

of wave lengths between 200 and 560 meters. In fact, interference from other broadcasting stations is almost as great as the combined obstacles from both atmospheric disturbances and fading—27.9 per cent compared with 25.7 per cent from other broadcasting stations. Static is held accountable for 15.7 per cent of the obstacles to reception and fading is blamed for 12.2 per cent of the national pastime, "Keep the dials turning."

Radiation from receiving sets, interference from amateur transmitting stations, dis-

turbances from leaking power lines, X-ray machines, trolley cars, and other minor sources of interference were classified under the general designation "other obstacles." Contrary to a prevailing belief, these obstacles are of a minor magnitude—in fact, all of these sources of interference contribute only 14 per cent of the disturbing factors experienced in radio reception. However, a special analysis of interference caused by radiating receivers was made and, as strange as it may seem, this, not unlike static, is a seasonal disturbance. That is to say, the variation of interference from other receiving sets ranged from zero in July to 6.1 per cent in April. Other months in which this type of interference was appreciable included March, August and September.

The statistical survey of the conditions affecting the distance range over which broadcast listeners may reasonably expect to receive signals was fostered by the Radio Laboratory of the Bureau of Standards. Fortunately, it extended for beyond laboratory walls, and the survey was singularly comprehensive and truly representative of actual conditions, since 101 voluntary observers participated. This formidable organization of field observers contributed a total of 8,500 observations, the records embracing a period of one year. These observing radio amateurs were located at varying distances from the transmitting stations—some of the observers living within the shadow of the antenna of the broadcasting station while others were removed hundreds of miles from the source of the transmitted signals. KDKA of the Westinghouse Electric & Manufacturing Company and WLB of the University of Minnesota, located at Minneapolis.



THE WAGON OF THE LAW

Even though you do get in the back of this automobile, and even though it is representative of law and order, this is not the picture of a city patrol wagon. It is a dignified radio laboratory and the gentlemen in the photo are S. W. Edwards, radio supervisor Eighth district, and his assistant, J. E. Brown. They use this truck in their inspection work.



These jovial faces belong to the Mark Strand Male Quartette, which broadcasts regularly through WEAf, New York, as a part of the Plunketteers' famous entertainment organization now delighting radiodom.

The PLUNKETTEERS

Bid for Radio FAME

and Become Radio's Original "Bohemians"

FEW things on the nightly radio menu are quite so palatable as the combination vocal and instrumental salads

submitted by the great metropolitan movie and variety houses. One of the best of these is the Monday evening feature syndicated through WEAf and WOO from the Mark Strand Theatre on Broadway at Forty-Eighth Street, New York City—the Plunketteers, I mean—the name being derived from that of their widely known and popular managing director, Joseph Plunkett.

The Plunketteer's symphony orchestra, Mr. Plunkett himself, with his pointed announcements, Kitty McLaughlin, Redferne Hollinshead, the Strand Male Quartette, Estelle Carey, Madeleine MacGuigan and her eloquent violin, are, of course, familiar spirits from the depths of the loud speakers in millions of American homes. I took a snappy tour of their offices, their New York apartments, their back-stage dressing rooms; and there found them to be as interesting a group personally as I knew them to be musically.

In a cozy suite a block or two off Broadway's White Light district, dwells Miss Madeleine MacGuigan. Some creature of the crasser sex has said, "Beauty and brains grow not together." Plainly the ignorant fellow had never met this attractive young Plunketteer, who is both unusually intelligent and unusually attractive.

By J. EDDY

"I am still nervous every time I play before the microphone," exclaims Miss MacGuigan, over a cup of tea, "but I discovered a secret for overcoming it. I play for some particular person that I like and that I know to be listening in. Often I send a telegram to make sure that I am being listened to, then I put my whole soul into my 'fiddle,' and so forget the surroundings."

Concerts in Aeolian Hall, tours through the West, are not new to this young lady. Before the assembled thousands at the Open Air Stadium in New York she has "fiddled," bringing down on her bobbed head the approbation of the said thousands, and of the austere music critics, even of Cecil Burleigh himself. When she played Mr. Burleigh's Second Concerto the composer wrote her, calling her work "a masterly performance . . . a splendid success."

Perhaps it is just as well that Miss Madeleine does not take all of her fan letters too seriously. One fan, a man you may be sure, had seen her picture in the paper. From distant New Orleans a letter came—two long pages, too long to quote, but here is one sentence:

"You are a perfect example of enchanting, alluring, bewitching, graceful, seraphic, exquisite, delightful, captivating and magnificent womanhood."

One week not so long ago the

Now We Have A "Greenwich Village" of the Ether, and the Plunketeers are The Peppiest Bunch of All

It was Madeleine MacGuigan whom the writer of this article took to tea one day to learn the dreadful secret of her feelings when appearing before the Mike. The secret is told in the article, and after reading it you probably will wish you were one of Madeleine's best friends. Read on! She is a violinist and singer by trade.



Mark Strand Theatre put on, by way of divertissement, a Dixie negro cabin scene. Four male voices and one female sang that old spiritual, "Deep River."

About seven-thirty of an evening the enterprising interviewer called at the stage door and asked to see Miss Kitty McLaughlin, "the New England Nightingale."

A Unique Visitor

COMING from the door to the wings was an old negro mammy that reminded one of a certain ubiquitous pancake advertisement. Miss McLaughlin is by profession a concert singer and by avocation a radio broadcaster; but she is by no means a tyro in the ungentle art of theatrical make-up!

"This awful costume!" she moaned, trying to scare off the interviewer,—"and I've been crying all afternoon."

"No!"

"My mamma and poppa just returned to Boston!"

Of course, it was rather horrible, having anyone return to Boston.

"But they can listen to your singing over the radio, even from Boston," I hazarded.

Miss McLaughlin smiled, a very nice smile she has, and "Yes indeed," she admitted. "I've had letters from hundreds of old friends down east who have heard me. Radio is a wonderful medium for friendship. Broadcasting has made *more* friends for me . . ."

"Why, I love radio," she insisted. "Before broadcasting I was like so many other struggling musicians—I was practically unknown. Radio gave me the opportunity to show what I could do, and now people who before would have merely stared had you mentioned my name can place me at once. In other words, radio has brought me publicity, I suppose, and that's something every artist must have. Radio has made me 'somebody,' instead of 'just another soprano.'"

"How does it happen you have made this tremendous hit as a broadcaster?" I wanted to hear. "There are hundreds of others doing it, you know, and we don't hear so much about them."

"It's because I can use my voice at much lower volume than on the concert stage and the microphone is sensitive enough to pick it up at full strength.

linshead, "that I don't know where to turn. In my selections I try to please the greatest number, and at the same time maintain a certain standard for myself. It's no easy job."

Estelle Carey—did any of you New Yorkers see her in that act, all dressed up in a bouquet of roses?—allowed herself to be chatted with in the broadcasting studio itself. Mr. Plunkett had pointed her out. I observed a soft, round face, a smile, much grease paint (she had come to the studio directly from the stage), one of those coiffures that might be and then again might not, and a bushel of vivacious charm.

"How long have you been radiating, Estelle?"

"Me? Ever since the Plunketteers started. Oh I'm a veteran! You know, I opened WNYC down on the Municipal Building. Mayor Hylan made a little speech, then I opened the station with a song. First time WNYC got on the air."

When Miss Carey had coolly trolled a song to Mike, I asked, "Isn't this all hokum, this talk about everyone being scared to death every

(Continued on page 52)

I can sing without effort and get good tonal quality. Our tenor, Mr. Hollinshead, has had the same experience."

Redferne Hollinshead, who lives with his wife (yeh!) in a Morningside Drive apartment, is a big man, with imposing stage presence. He has stacks of letters and telegrams from every state east of the Mississippi and some beyond. Many tell him that his is the finest voice on the radio today.

He's Quite Perplexed

THERE are so many different sorts of music requested of a broadcaster," complained Mr. Hol-



Alma Real has travelled all over the country singing Spanish songs, and finally she's landed in New York, where she performs on Plunketteer Programs from WEA F.

Travelling the Pace That Thrills!

—with our
Old Friend,
Lindsay
McPhail



Carrie Jacobs Bond, the famous composer of "End of a Perfect Day," who appears often in recitals from KFWB, Hollywood.

YES, this is station KFWB," said Miss Florence Israel as I stepped into the reception room of that station.

"Anybody special you wish to see?"

For the first time since I had been in the state of California I found somebody who didn't say "RADIO KFWB," so knew I could find out a lot about what I was in search of. When I

explained that I was representing a radio publication, and wished to find all I could about it, Miss Israel politely ushered me to a seat inside the broadcasting studio proper where there was nothing but atmosphere present, as well as a beautiful Steinway Grand piano, on which I amused myself until:

"Lookin' for me?" came a short snappy voice, a voice one would imagine on a youngster of six years, but instead it was Pa Dillon, a very young old man, who, I learned was the publicity man for Warner Bros. Radio Station. From Pa Dillon, in five minutes, I learned what it would take most people a half day to show and explain in connection with anything as important as this radio station.

"For an instance," Mr. Dillon went on, "of a remarkable achievement, take this fact into consideration. KFWB was in operation thirty-six hours after the erection of the towers, due to the remarkable work of Frank N. Murphy, who for the past eight years has been the Warner Bros. Electrical Engineer and is quite a genius in his line of work." (Two months is the time generally required to accomplish a similar undertaking—) "Yes, yes," said I, fast becoming gripped by the dynamic personality of Pa Dillon. "Now KFWB is as perfect a station of its kind as human skill can make it, and is operated on a 252 meter wavelength. Its two imposing one hundred fifty feet towers directly in front of Warner Bros. Picture Studio are the chief landmarks of Hollywood and are brilliantly illuminated at night with most

California Radio is Setting a Fast Pace for the Rest of the Country, Our Correspondent Finds; A Visit to KFWB, in Hollywood, Where the Famous People of the West Come and Go Every Day, and Where "Artists" Have Given Way to "Paid Talent"

beautiful effect." All this from Mr. Dillon in one breath.

A Voice From the Past

IS'POSE you're becoming quite bored with this technical talk and would like to meet

somebody else in connection with the station to talk to," Mr. Dillon guessed, "So let's see if we can find our announcer, Charlie Wellman"—and just then came "Hello, Dillon, howaryu?"

Speak of the Devil and he's sure to appear! When I first heard the name I knew it sounded familiar, and when Wellman popped in, we both looked at each other with a gasp and a "Well, I'll be ———!" "What in Sam Hill are you doing out here, McPhail?" queried Chuck. I raised him five and shouted, "When in Sam Hill did you land out here?" Just a word to state here that Charley Wellman is the boy who used to knock 'em cold in Chicago with Harry Geise, another famous radio star of the Windy City. Right now he is a big hit as the announcer-director of KFWB, with his famous "Don't go 'way, folks" expression, known to thousands of air fans all over the country.

"Got any new song-hits for me to sing?" asked Charley.

"Now listen, friend," says I, "I'm writing this station up for publication, and if there's going to be any music between us two it will be after this article is jotted down!"

"Say, boy, you're crazy!" piped up Chuck; "if you want any more dope about this station, don't ask me! Come around here for a couple of nights between 9 and 11 p. m., Pacific Standard Time—I suppose you haven't even changed your watch from Chicago time!—and when you're here, listen to our programs. They'll surprise you!" (Turn the page)

"In the first place, Mac, KFWB has the advantage over any studio on the Pacific Coast in the way of entertainment because it is the only one in the world owned and operated by a moving picture concern, this enabling it to draw from the Warner Brothers screen stars and directors for the nightly programs which are remarkable not only for excellence but variety as well. Our programs on week days begin at 6:00 p. m.—on Sundays at 9:00 p. m. and last until 11:00 p. m. The last hour is devoted to what is known as Warner Brothers' Frolic. Among those who appear as guest announcers during the Frolic are: Irene Rich, Marie Prevost (pronounced Pree-Vo) Louise Fazenda, Dorothy Devore, June Marlowe, Patsy Ruth Miller, Dolores and Helene Costello, Alice Calhoun, Myrna Loy, Monte Blue, Syd Chaplin, Lowell Sherman, Huntley Gordon, Charles 'Chuck' Reisner, director, and J. Stuart Blackton. Besides, several groups of professional entertainers and orchestras are on our pay roll."

"Pay roll?" said I, in surprise. "You pay your talent, Charley?" "Sure do, and we get talent, not 'artists,' as the 'hams' insist upon being introduced over the Mike," he continued, emphatically. "Say, boy, one of the things I swore would happen all over the country has happened here at KFVB already, and will have to happen back in Chicago if you're going to have passable radio programs every night," mused Wellman. It didn't take me long to see this argument, and I left Charley at this point of the story, with a promise to be back that night and hear the program, also to play a tune or so over his station if he desired.

"Meestah Wellman save good seat for you," said the little Hawaiian doorman who ushers the listeners to their seats, and I was ushered in to the very first row of chairs, row A, inside the studio, at exactly 9 p. m. There are half a dozen full rows of chairs for the audience inside the studio, and the same number of rows, outside the studio, in an adjoining room, just separated from the studio by plate glass, through which the outside listeners see the artists directly but hear the program only through the loud speaker.

A Typical Program

DON'T go 'way, folks!" came Wellman's familiar cry over the Mike, as he announced that a few late news bulletins of the day would be read from the operating room, at which time he switches off in the studio for a brief rest.



One of the many "Guest Announcers" from KFVB is the youngster pictured above before the mike. He just wandered in without giving his name, spoke a few youthful witticisms for the radio audience, and remained only long enough to be snapped by the studio photographer.

After a few seconds of news, which only the "loud speaker" seats and their holders take in, the studio program is on again. "Here we are, folks, back in the studio of KFVB, Warner Bros. Motion Picture Studio, Hollywood, California," continues Charley. "The next number in the studio will be a vocal solo by Charles Beauchamp, Tenor, who will sing 'I Hear You Calling Me,' and this number will be in honor of 'Chuck' Reisner, our good friend-director, who is listening in, the man who directed the 'Man on the Box' and co-directed the sensational 'Gold-Rush' for Charlie Chaplin. Mr. Beauchamp singing, Miss Billie Dunn at the Steinway."

After listening to Mr. Beauchamp's silver-toned voice, his wonderful diction, style and all, the meaning of the "paid talent" argument of Wellman's was stealing over me. I resolved to listen to every "paid" artist to see if it held good all the way through.

"Aha, I see Lindsay McPhail in the studio!" hit my ears next like a bullet would a soldier in battle. "Lindsay's from WMBB, Chic—aw—go," he raved on, in Jerry Sullivan style, "and we're going to ask him to play his latest song-hit, 'My Sweetie's Eyes,' you know, the one his wife's picture is on? Maybe he'll play his 'San' for us too, and if he'll play the new one he wrote with Jack Nelson of WJJD, *Headin' South*, I'll sing it with him! Come on, Lindsay, make your bow!"

Had I known at the time that I was in the presence of two famous movie stars whom I shall mention later, I should have felt all out of place, but ignorance is bliss and our attempt went over the air, my first broadcast in the state of California. What an occasion of importance this was for me I can only explain by saying that lovely June Marlowe happened to be the guest announcer that night, and announced my second solo number over the air; *Go West, Young Man, Go West*, and become famous!

Two more "paid" artists then did a duet, Bill Hatch at the Steinway, and the violinist, Ray Kellogg, as Wellman jokingly announced him, "at the *Stradivarius!*" Their style of entertainment from this station is the "meanest kind of blues," and they just naturally outdid themselves on this occasion, just for me, I felt, as they swayed the entire audience of listeners, like a stiff breeze would the branches of a tree. Surely, this was the finest kind of a radio show I had ever attended, and it was just an

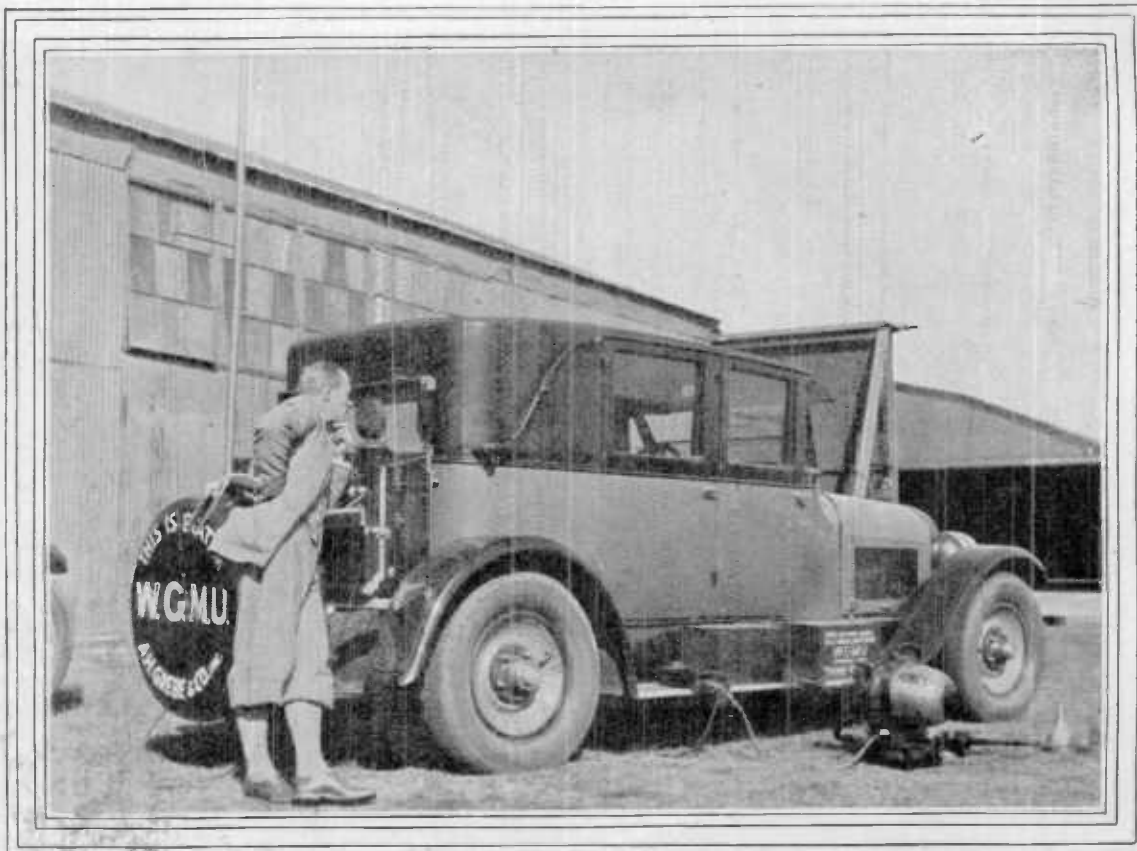
(Continued on page 58)



In California, unlike Chicago, and other "remote" radio centers, the performers at radio stations are called "Paid talent" instead of "artists." Charles Beauchamp, shown above, is one of KFVB's most distinguished tenors.

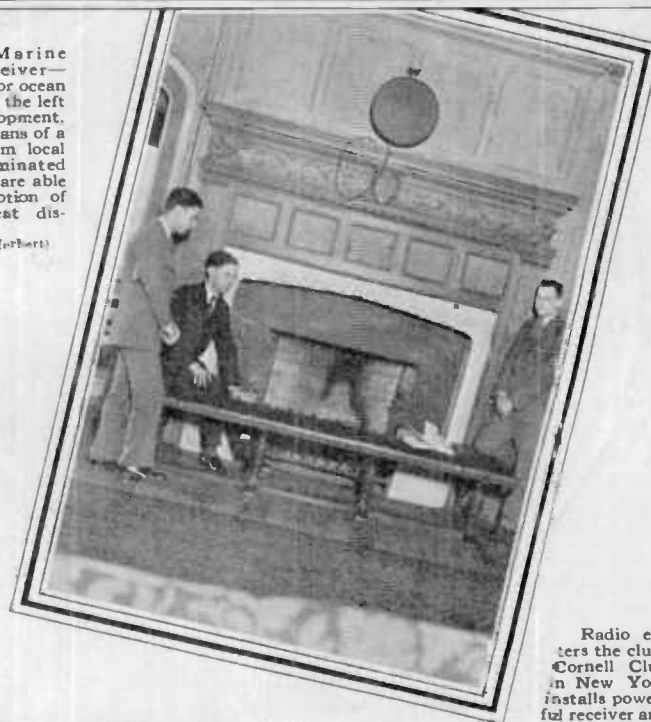
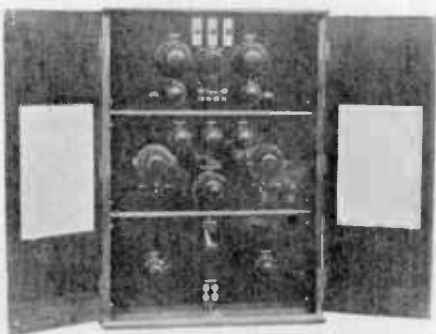
Broadcasting the air races at Mitchell Field. Airplane enthusiasts who could not get out to Mitchell Field, N. Y., to watch the great air derby during October, found a splendid substitute in Dick Wagner's radio broadcasting direct from the field from Portable Station WGMU, mounted in a high powered motor.

(Photo by U and I)



Marconi V-4 Marine Broadcasting Receiver—especially designed for ocean reception. Photo at the left shows the new development, a 4 tube set. By means of a special tuning system local interference is eliminated and ship passengers are able to enjoy clear reception of programs over great distances.

(Kadel and Herbert)



Radio enters the club; Cornell Club in New York installs powerful receiver and public address

system. With the installation of elaborate receiving and amplifying systems, (shown at the right), the Cornell Club takes the lead in introducing radio into club life. The addition of an amplifier to a super-het sends the programs to the loud speakers on panelled walls of various rooms of the clubhouse.

(Kadel and Herbert)

World's Largest and costliest chimes go on the air as regular broadcast feature. Photo at the left shows Anton Brees, carillonneur from Antwerp, Belgium, adjusting the microphone on the belfry of Park Av., Baptist Church, New York City, preparatory to the broadcasting of the famous chimes, the gift of John D. Rockefeller to the church. The chimes are heard through WJZ, New York.

(Kadel and Herbert)



Huge variometer is wound with copper tubing. This monster inductance differs from the small instrument of its type in its construction as well as size. This one is wound with copper tubing, which, of course, makes it expensive but far more efficient. This inductance (shown at left) is installed on one of the latest type 2-KW radio transmitters.



Radio carries message of stork's visit to Proud Papa — Captain Hartley of the S. S. Leviathan, the largest liner afloat, receives the news of his dignity via radio while his ship is on a record-breaking trip to New York. The captain is shown above at the dials of his set, by which he was notified of the stork's activity.



Hero of gridiron speaks to an audience numbering millions, in his first appearance before the "Mike." Red Grange, former Illinois U. star and more recently graduated from the ice-delivering ranks to the professional football field, thrilled 70,000 fans at the Polo Grounds in New York recently and then thrilled his unseen audience from WEA, New York, under the auspices of the Near East Relief.

No, this man is not playing a game of chess, as would be surmised from viewing the photo at the right. He is second operator Sven Schoug of the S. S. "Gripsholm," a Swedish motorship. This ship created a sensation on its maiden voyage recently because of its highly efficient broadcast equipment. The radio outfit is the very latest, with a one-KW transmitter for either code or phone work. All of the apparatus was made in Sweden.

(All photos by Kadel & Herber.)





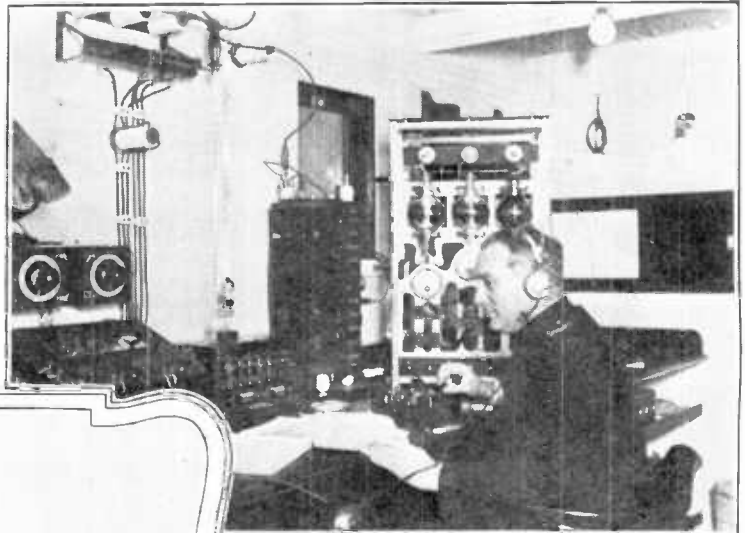
(Kadel and Herbert)

The first "Radio Tourist" Bureau has been inaugurated by Station WBBM, Chicago. Miss Nina Baker, shown above, is in charge of this unique department, and she is kept quite busy answering the queries of fans who get the travel itch about this time of the year.

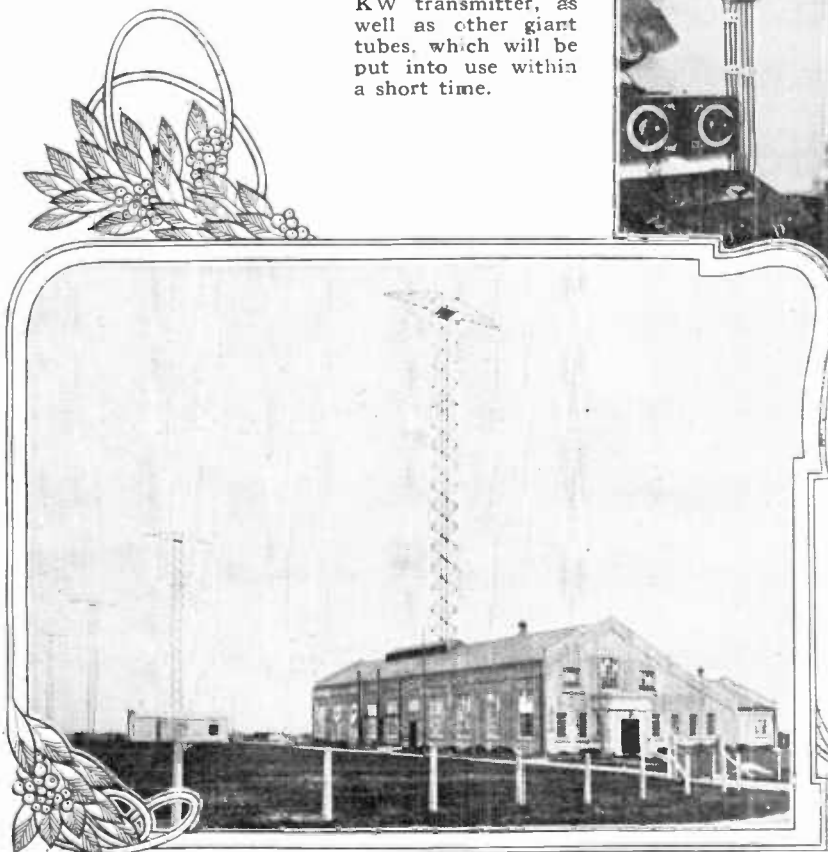


(Kadel and Herbert)

At last—a perfect broadcasting station. WHAP, of Brooklyn, N. Y., has decided to send no jazz or advertising out on the air. The wavelength is 240 meters, and the policy adopted is unique in broadcasting annals. No advertising, direct or indirect will be allowed to trickle into the microphone, and the taboo has been placed on jazz. Five hundred watts will be used to start. Photo shows a close-up of the huge 2 1-2 KW transmitter, as well as other giant tubes, which will be put into use within a short time.



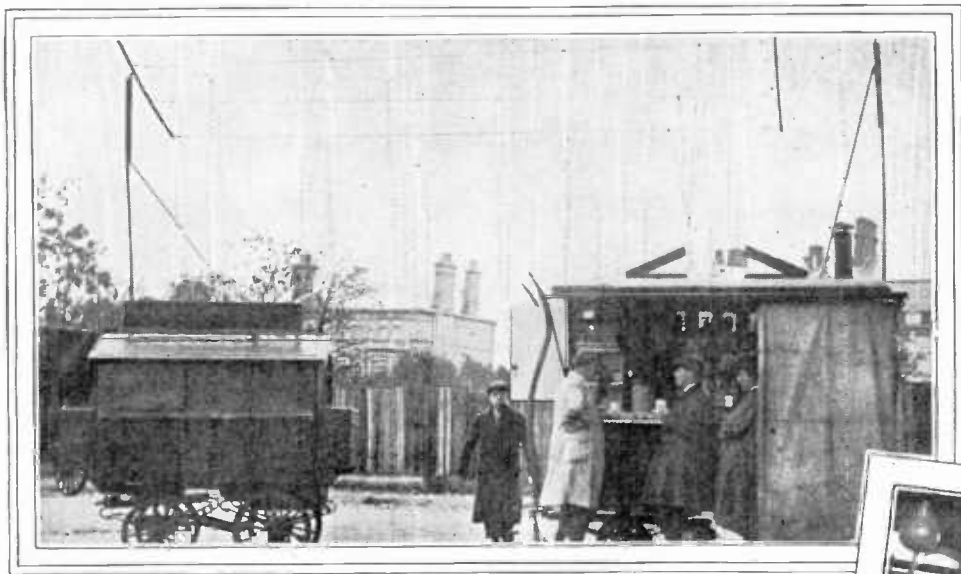
(Kadel and Herbert)



(Kadel and Herbert)

New Italian liner "Conte Biancamano" has one of the finest radio installations in the world. The photo above shows the radio operator of this ship in the radio room, where the complete equipment may be seen. Note the huge coil, for antenna inductance, on the left of the transmitter. The range is said to be remarkable.

Beam wireless station at Dorchester, England, is completed. This giant transmitting system will be used for the Trans-Atlantic tests in January. The photo at the left shows the station itself and some of the antenna masts. It is an invention of the famous Marconi.



Wayside coffee stall offers dinner music to its patrons by means of radio. Although he doesn't do it, the owner of this English coffee shop could advertise that he supplies music by the Hotel Savoy orchestra of London to his patrons. With a powerful radio set and an elaborate antenna system, he furnishes real music with his food, and his enterprise has brought him an increased volume of trade.

(Kadel and Herbert)



The youngest radio announcer on the air is Dick Dumont, 15, shown above at the left, with his dad, Paul Dumont, announcer for Station WM-CA, New York. Although young Dick towers over his dad, and his voice reaches just as far, according to the multitude of listeners who have grown to like his pleasant manner over the ether.

(Kadel and Herbert)



(Kadel and Herbert)

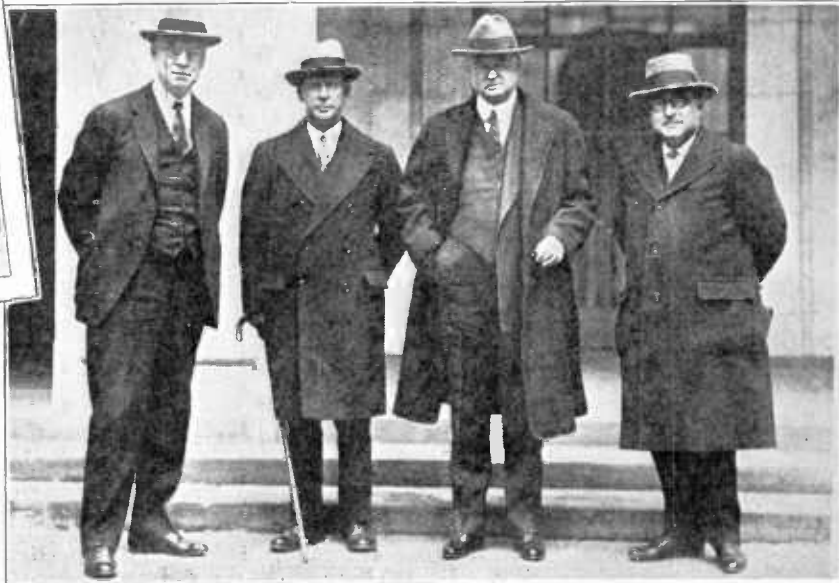
Another view of the world famous chimes which are being broadcast from the belfry of the Park Av. Baptist Church, New York, through station WJZ of the Radio Corporation of America. The photo shows Herbert Glover, of WJZ, holding one of the microphones in place.



Radio music enlivens winter sports at Chateau Frontenac, Quebec. Above, Jeannette Beaubien, a French-Canadian flapper, is shown halting her fun in winter sports to "listen in" a bit.

(Photos by Intl. and Kadel and Herbert)

At the right are W. E. Harkness, Atwater Kent, Sec'y, Herbert Hoover and Congressman Arthur Free, the "Big Four" of the Fourth Annual Radio Conference held recently in Washington.





"Behind the Mike"

with Jack Nelson

I WAS indeed glad to receive several serious replies to some of my previous questions about announcing. One of the best came from C. E. D., of Chattanooga, Tenn. I was glad because I was a bit afraid that with all the half way serious material that has been printed, readers might get an impression that we were not serious in offering help on various questions or admitting serious subjects to this page. That is what we want. The more questions we get the better we like it.

C. E. D. of Chattanooga wrote: "An announcer must have a versatile personality,—few, if any, can qualify as having such. Some announcers just naturally are serious minded and get the inflection out of their voices. And others just as naturally are comically inclined and cannot help voicing funny thoughts and sayings. But please name the ones who can alter their moods to suit the occasion. This is the most important qualification of an announcer. It certainly does seem out of place to hear funny little 'wit-spasms' during a serious play or music. And equally out of place to hear a funeralistic voice announcing a football game or other irrelevant subjects."

Now there's a job for some of the rest of our readers. There must surely be some announcers who qualify under C. E. D.'s requirements. Who are they? Or is C. E. D. right or wrong in your opinion? To us "behind the mike" these things are most interesting, and I know listeners who think at all about things radio are just as much interested.

In last month's issue, when talking about Johnny Johnstone of WEA, I mentioned something about "personality" on the air and that I had an interesting story about this very thing. It does not have to do, however, with any announcer, although it most certainly has a lot to do with personality through the ether, and in a little different way than most of us think of it.

Many of you perhaps have heard at some time Mr. Ambrose Wyrick, the "Silver Toned Tenor" who has done considerable concert and radio work in Chicago. He has appeared at a number of stations and, as Director of one of them, I think I can speak for the rest in saying that he is always welcome to the Program Directors because he is so well liked by the "fans."

I have delayed in writing this for this page because I wanted to make sure that it was authentic. I talked with Mr. Wyrick about it and he assured me that it was absolutely bona fide as reported to me, and he also mentioned

that it would have been printed in newspapers from coast to coast except for the fact that editors, while impressed with its unusualness, were afraid to print it because it was so unusual that it might not be true.

The facts are simply that Wyrick arranged a program broadcast from our good friend Jerry Sullivan's station WQJ, and arrangements were made with Carl Bohnen, a Chicago artist and character analyst, to take the letters following Wyrick's program and

analyze each letter picking from them the various things about Wyrick's singing which appealed to the different listeners. These things then were to be interpreted as various characteristics possessed by Wyrick. From these characteristics Bohnen made a sketch of Wyrick, whom he had never met or seen, and the amazing likeness to a photograph of Wyrick is truly startling. I have an account from Bohnen in which he gives his reasons for portraying in the face of his Wyrick the characteristics which were noticed by the listeners who wrote to the station. It is most interesting reading, but space does not permit my quoting it.

Wyrick told me that he really expected that the sketch Carl Bohnen would make would be unlike him and that he would have great fun in showing this "composite" of the listeners' impressions of his personality on the air, but he was the most surprised man in the world when he saw Bohnen's sketch. I, too, questioned the authenticity of it when I first saw it and heard the story, but Wyrick assured me it was all O. K.

What do you think of that?

Got a letter from Henry Field out there in Shenandoah, Iowa, the other day. He, as you know, is President of the Seed Company which bears his name and which owns station KFNF, and he does most of the announcing himself. And is there anyone who, having heard him once, doesn't like him? He has a way "Behind The Mike" that is all his own, and I have never heard of anybody who does not like him,—and that really is going pretty far, I think. The only thing I didn't like about your letter, "Henry," was that you were too businesslike. Can't you write me a better one and tell me a good story from or about the country "where the tall corn grows?" I have it, this WILL get a "rise" out of him,—I don't believe that Iowa grows taller corn than Illinois.

And talking about Iowa reminds me of a letter I received from my good friend "Tomy" of Detroit. Now, how in the world could Iowa remind me of Detroit? Just because the letter said, "Born in Fairfield, Iowa. Not dead yet (I'll say ya ain't, Tomy). Failed to get an education at Northwestern University. Have earned a precarious living as a newspaper reporter in New York, Chicago and Detroit,—another way of saying that I'm broke." Chief, you're too modest. C. D. Tomy is his real name, and when I mention that he was the Chief of the Red Apple Club

(Continued on page 58)

How Ambrose Wyrick Really Looks—



How the Fans Thought He Looked—





Above is a latest photo of Leo Fitzpatrick, formerly "Merry Old Chief" of the Nighthawks at Kansas City, and more recently announcer at WJR, the Jewett Station.

LEO FITZPATRICK, "The Merry Old Chief," of WJR, the Jewett Radio and Phonograph Company, is one of the unique personalities of radio. He is a pioneer broadcaster, having been in charge of the Kansas City Star's station for four years. Previous to that he was a feature writer on The Kansas City Star.

Mr. Fitzpatrick is a graduate of the Kansas University, where he was active in athletics and soloist on the University Glee Club. He became a newspaperman more than ten years ago, working on the Wichita, Kans. Eagle; The Colorado Springs Telegraph; Butte, Mont. Miner and other western papers. He was publicity man for several theatrical productions before joining the staff of the Kansas City Star in 1917. He is a war veteran and past commander of the American Legion.

When the Star decided to install a broadcasting station in the early days of radio, Mr. Fitzpatrick was selected to take charge of the station and was made radio editor.

His rise to radio fame came after he organized the Nighthawks, one of the most famous radio organizations in the country. Since its inception, more than 250,000 members have been taken into the midnight organization. He recently was selected president of the Central States Announcers, Association by the announcers of the various broadcasting stations of the middlewest.

The popularity of the Nighthawks is due to the faculty that Fitzpatrick has for broadcasting the atmosphere of good fellowship and informality that prevails at the nightly meetings.

"The Merry Old Chief's" description of himself follows:

That's Who I Am!

EARLY in life I became a broadcaster. My mother claims the distinction of being the first Nighthawk that I kept awake until dawn with my howling.

Who's Who in Radio at WJR

By
MILTON LIEBERMAN

"I survived the first eighteen years and decided that I should write the great American novel or try for the O. Henry prize. So I took up journalism by enrolling in the engineering school of the Kansas University. Finally I landed on The Star. When I started, the Star had a circulation of 200,000. It has now more than 250,000, in spite of my being here all the time.

"My ambition is to get eight hours sleep all at one time. Aversions—alarm clocks and hook-up fanatics. Description—five feet eight and one-half inches perpendicular; thirty-six inches circular thirty years old; do not wear non-skid glasses, bow ties, spats or fur-collared overcoats; will eat anything. Nationality—Fitzpatrick."

My Life Story

By C. W. Kirby

IT IS generally said that a man never knows himself, and for the purposes of the story of my adventures perhaps it is just as well that I do not know a great deal about what I am supposed to write about. If I knew all I could not tell it, and if I did tell all of it, what of it? You would be none the wiser, and I might even lose some of my friends.

Like a great many other men, I was shoved into radio. I was wandering about a newspaper office in Detroit, running a radio section. The program director and announcer decided to leave radio for the publishing business, and I was nominated to fill the vacancy, job or position.

Now I have consumed two paragraphs (providing the copy reader will let them go through) and I have failed to explain one funniest thing about me—the name Corley W. Kirby. There has been no complaint on my last name. There are lots of Kirbys in many parts of the world, but the first name—who ever heard of that before? It is always necessary to put the "Mr." before it, because without it the uninformed person usually tries to tack on a "Miss."

As is almost always the case with us, excepting, of course, actors and a few others, I knew nothing about the name when it was given to me during the last decade of the nineteenth century,



One of the pioneers in the radio game is Corley W. Kirby, shown above seriously contemplating the "Mike." Mr. Kirby got his start at the old WWJ, and is now on the announcing staff of WJR.

in a little town in Illinois, but I have carried it around with me too long now to give up and try to take on another after due process of law. In all my experience I have never met another person burdened with such a name, and what is more, I shall never take advantage of a child to the extent of passing the name on to him.

I was supposed to tell something about radio or my experience while in Europe a few years ago with the Army and the Associated Press of America. That seems so long ago now that I would have to refer to some history of the world war or look through a newspaper file.

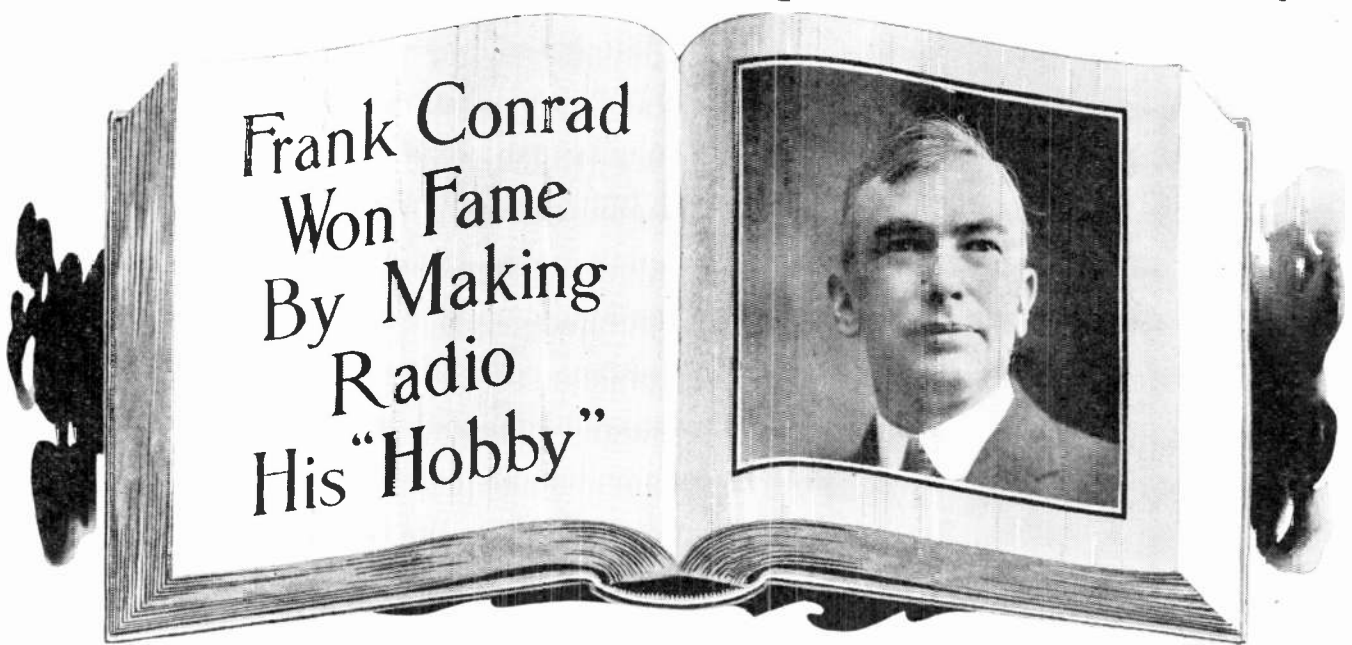
In radio I have several aims. The paramount aim is to help make WJR, the Jewett Radio and Phonograph Co. station, the best in the United States and the world. This is a big job, yet the entire staff of the station is working to that end, and perhaps will be fortunate enough to attain the goal. I have supreme confidence in the future of radio. It is not a fad. It is not competitive to a single form of entertainment we had before its advent. It is competitive to nothing, but supplementary to everything.

A Good Customer

Finkelstein was a good customer of Abe and Mawruss, manufacturers of radio sets. He was, however, getting lax about his payment of invoices, and Abe suggested that Mawruss write him a strong but diplomatic letter calling his attention to this laxity.

Mawruss worked for several hours over the letter, then showed it to Abe for his approval. After reading it over carefully, Abe said: "By golly, dot's a wonderful letter. Strong and to der point, aber not personal or insulting. But you got a couple mistakes in it, Mawruss. 'Dirty' you should spell mit only von 'r' and 'cockroach' begins mit a 'c'."

Men Who are Making Radio History



When the pages of radio history are printed and sealed, the name of Frank Conrad of Westinghouse will lead the list. His latest photo is shown in the inset above.

RADIO broadcasting as a regular daily service is the outgrowth of a hobby of Frank Conrad.

Assistant Chief Engineer of the Westinghouse Electric & Manufacturing Company, which established Station KDKA, pioneer broadcasting station of the world.

To be more exact, perhaps we should say that radio broadcasting is the outgrowth of one of the hobbies of Mr. Conrad, for Mr. Conrad is a man who from boyhood always has had several hobbies—and radio is not the only one of them from which have sprung developments that have left their impress on the lives of the world's people; radio is but one of his activities, merely the one to which he at the present is putting the greater part of his energies and time. The others have not gained as wide notice as radio because they were not so much in the public eye as radio is, yet they include fields in which Mr. Conrad's inventive abilities have brought about as revolutionary changes as it has in the field of radio.

The Telegraph First

THE very first hobby of Mr. Conrad's boyhood of which he has any recollection was the forerunner of his taking up radio as a hobby, which in turn brought about the inauguration of continuous radio broadcasting. This was the telegraph. Mr. Conrad as a boy "played" with telegraphy and telephony, and as a result later in life became a radio experimenter.

He rigged up a receiving station and a small transmitting apparatus in his home at Wilksburg, Pa., near the East Pittsburgh works and offices of the Westinghouse company where he was working in the research department. As the result of his work in this home laboratory, the company carried on experiments for the government in radio equipment for the armies after the World War began. One of the sets developed as the result of their expert was the only American made radio equipment actually used on the A. E. F. front in France during the war.

By *T. L. BAYARD*

After the war Mr. Conrad resumed his experiments in radiophone transmission putting intermittent programs on the air from his home transmitting laboratory. These programs were made up of music played on a talking machine, or of selections given by musicians invited by Mr. Conrad to broadcast. Noticing the great interest in these programs shown by the radio amateurs, the only individuals then having receiving sets, Mr. Conrad called the possibilities of radio broadcasting to the attention of his company, with the result that a station was constructed in the East Pittsburgh plant and a schedule of regular daily programs inaugurated which has been continued without interruption by the Station, KDKA.

After the establishment of Station KDKA, Mr. Conrad continued his experiments in his home laboratory, with the result that he concluded that the then little-used short waves offered greater possibilities for dependable transmission than the longer wavelengths then in use. To establish this definitely, a short wave transmitting set was established at KDKA, which then was located on the top of a ten-story building at the East Pittsburgh works. His conclusions were found to be correct, and a repeater station was established at Hastings, Neb., to better enable the KDKA engineers to carry on development work in the short wave especially. Mr. Conrad's pioneer work in the short wave was recognized by the American Institute of Radio Engineers when he was awarded the Morris Liebmann prize in 1925 for his short wave achievements.

A Steady Advance

MR. CONRAD'S first research work for the Westinghouse Company had been on the arc lamp. Next he worked on fan motors, and on street railway equipment which then was coming into general use.

Mr. Conrad is 51 years of age, married and has three children. One son, Francis, is a senior at Pennsylvania State College, and the other, Crawford, a senior at the University of Pittsburgh.



On the Airials

CHANCELLOR Charles W. Flint, of Syracuse University has joined the faculty of WGY and recently participated in the dedication of "the new building on the campus of WGY College" when the Syracuse wire of the Schenectady station was used for the first time. Chancellor Flint's address follows:

"It certainly is a pleasure and an honor to be called upon to participate in the dedication of a new building on the campus of WGY College. I do not know the official nomenclature of the aerial colleges and whether this would be called the new Syracuse Hall, a new Syracuse Airshaft or Syracuse Airline or Syracuse Control, but whatever it is, I heartily congratulate WGY on this extension.

"Radio in general and WGY in particular are parts of an extensive American educational system with many and diverse independent units. Education in popular usage is narrowed to refer to schools and colleges, the institutions dealing with the direct disciplinary development of the mind and the awakening and cultivation of the tastes.

"That is, however, only a part of our vast, complex educational process which includes for better or worse, newspapers, magazines and books,—for better when they minister to the higher; for worse, when they cater to the lower interests of mankind; for better or worse, travel; for better if in any direction for culture, for worse if to the north for refreshments; for better or worse, theatres, movies,—for better, if they minister to the aesthetic, for worse, if they pander to the erotic; for better or worse and usually for better, lectures, addresses, forums, sermons, concerts, recitals and orations.

"Into this educational system has recently been introduced a new factor—radio, which includes many of the elements of the groups enumerated above and peculiarly parallels travel as a broadening influence. As is the case with the other groups, radio service may be for better or worse, for better if it furnishes the worth-while or cultural, for worse if it offers the cheap, inane and bizarre.

"Surely we all have been impressed with the ingenuity and skill manifest by our radio faculties in providing so large proportion of their programs of real educational value. It is not easy to be able to secure in lectures, sermon, debate, etc., that which at the same time is entertaining and educational for the majority, or in

music that which is both elevating and entertaining and to do this with the quantity production which is demanded by the number of hours to be filled is a stupendous task. From this standpoint the measure of achievement is certainly commendable.

"I am one of those who are enthusiastic and optimistic regarding the broadening and uplifting influence of the radio on a wide and inclusive scale. If it is true that we in America have been characterized at all extensively by cheapness in taste, may it not have been due in the past to limitation of opportunity? Is it not possible that the latent capacity for the enjoyment of the best may now be developed, for the humblest of homes by hundreds of thousands are now privileged to hear speakers and artists that only the rich could afford but a few years ago? We feel we are justified in our hope that radio is adding to the general culture by enlarging and developing tastes, as millions participate in these programs of sports, politics, music, religion, current events, science, literature, etc., thus broadening their horizons and making them conscious of larger citizenship as daily they feel the pulse of distant states and the throb of life in far-off cities."



Miss Eulalie K. Stade, pianist and accompanist at the new Congress Hotel Studio of KYW, the Westinghouse super station at Chicago. The studio was formally opened amidst general rejoicing and gayety recently.

Will It Work ?

AFTER the last wire is soldered and the final inspection has been given the wiring connections, the greatest thrill in radio comes—will it work?

It is not difficult for the average fan to wire the set and tune in a station or two in the evening and find out how the receiver performs. The manufacturer who is turning out hundreds of sets every day has quite another problem on his hands.

The ordinary fan does his radio experimenting at night while there are plenty of stations to pick up. The manufacturer, on the other hand, does his work during the day when the majority of broadcasting stations are silent and when reception is not nearly as good as during the hours of darkness.

To have a fair factory test, a receiver should be operated on all wavelengths just as it will be when placed in the hands of the final owner. This is very difficult to accomplish during the day. In ON THE AIR'S laboratory we were up against the same problem in testing out the new isodyne receivers and solved it by erecting a miniature broadcasting station of our own to operate on 200, 300, 400, 500 and 600 meters, sending out phonograph music for the set inspectors in their sound proof booths.

The amount of power used is just sufficient to operate the receiving sets as they would be under service conditions, and is not strong enough to be picked up outside the plant. This testing signal runs all day long, the artificial broadcasting is sure and positive and the engineer in charge has no worries about booking programs or dealing with temperamental artists.

Ships Removed from Broadcasting Band

THE actual strength of the broadcasting industry is indicated through the recent action of the United States, British and Canadian Governments in ordering all their vessels to keep off the broadcasting waves when within 250 miles of the shores of these countries.

Considering that the ships were the first to employ radio as a practical means of communication, and that they have been considered first relative to the best channels for communication, this decision reveals the trend of power toward broadcasting and its satisfactory reception.

Explaining the MYSTERIOUS Triode

Q A Non-Technical Talk Telling How to Judge Tubes from Test Data

By ANDREW W. KRAMER

IT'S a changing world. In days gone by, before one bought vacuum tubes like eggs by the dozen, it was sufficient when investing half of your monthly salary in a vacuum tube to peer over the counter of the dry goods emporium, drug store or wherever you elected to buy it, in a vain attempt to see the feeble glow in the tube as the neophyte radio expert who sold it placed the terminals across the poles of a dry cell. Half the time you didn't see it light and would take his word for it, trusting to the gods that they were with you.

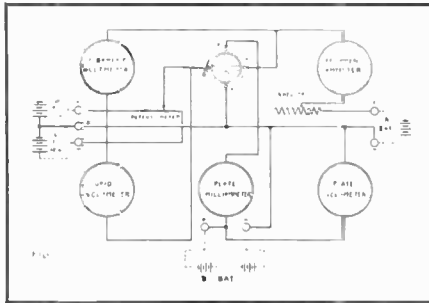


Figure 1. Wiring diagram of a standard tube testing set.

The difference between the old and the new methods of buying a tube with the average non-technical buyer is largely psychological. The elaborate testing instruments somehow or other make him feel more important and rather than ask questions which might be embarrassing he bluffs his way through.

As a matter of fact the average person buying a vacuum tube need not know a great deal about tubes. Vacuum tube phenomena is complicated and any attempt to try to assimilate the mysteries of their operation would only confuse him. What he wants is a tube that will work; he doesn't care a hoot about plate impedance, mutual conductance and other such terms; they are as meaningless to him as the inscriptions on King Tut's tomb.

Yet, in buying your tubes, while no doubt you felt perfectly safe in taking the dealer's word that the tube was good you may have wondered what it was all about. What mysterious message did the vacillating pointers on those instruments convey to the dealer when he placed the tube in the socket, which enabled him to tell you it was a good tube. What sort of an outfit is this test box anyway?

What the Tube Tester Consists Of

LET us take a look at it. Perhaps if we can find out what the various

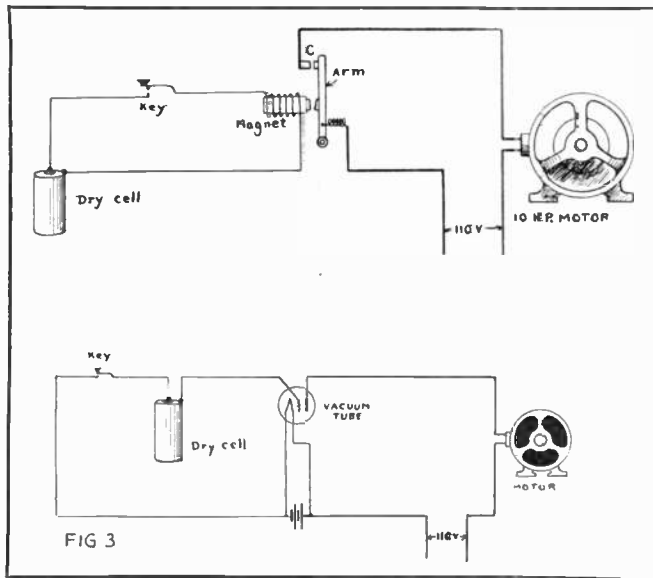


Figure 3. These two diagrams show how the vacuum tubes act as a relay. In the upper diagram when the key is pressed, the magnet attracts the arm closing the contacts C starting the motor. Similarly the tube acts in the lower figure as a relay controlling the power in the plate circuit.

Today things are different. When you walk into any of the 14 radio stores in the block and slam your dollar, ninety-five down on the counter for a tube, the clerk takes a carton from a pigeon hole, removes the wrappings from the tube, looks at it critically and sticks it into a socket. Immediately an array of electrical instruments behind the counter resembling somewhat the main control board of the U. S. S. Saratoga, come into action. Hiding your amazement as best you can, you try to look wise and you nod to the clerk, who often knows less about the proceeding than you do, and the tube is yours. It has passed the acceptance test. The clerk now stamps the carton, "TESTED, NOT RETURNABLE" and again you trust to the gods that they are with you.

Figure 4. Diagram showing the action of the grid in a vacuum tube. It illustrates graphically the action of the grid in the tube, and the resultant decrease of plate current with an increased negative charge placed on this third element.

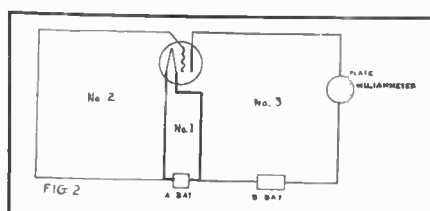
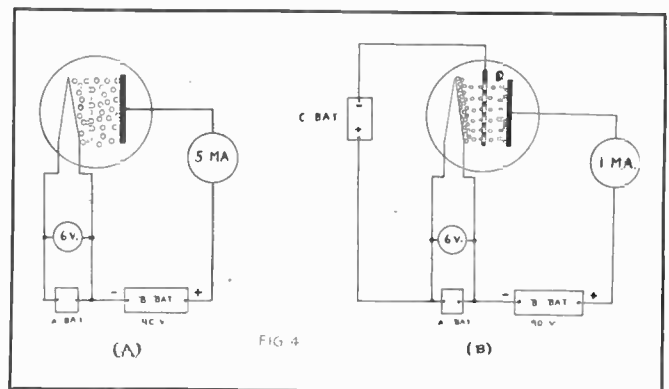


Figure 2. The three elements of a vacuum tube circuit.

meters are, we can learn to read the thing and call the dealer's bluff if he should try to put one over on us, to use the language of the day.

In Fig. 1 is a simple diagram showing the instruments in the usual tube testing set and the manner of connecting them up. Before trying to explain the function of these various instruments, consider the diagram in Fig. 2 which shows the three divisions of an ordinary vacuum tube circuit; the filament circuit, No. 1;

1. The diagram shown in Figure 1 is not strictly the true diagram of the tube tester now in popular use among radio enthusiasts. The diagram illustrates the connections of the laboratory type of tester which is not as frequently employed as the usual "service" type now in demand.—Tech. Edtr.

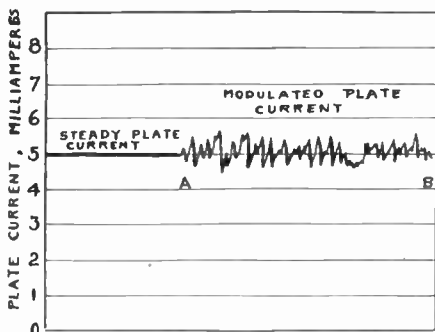


FIG 5

the grid circuit, No. 2; and the plate circuit, No. 3. In each of these circuits we have a separate electric current. The current in circuit No. 1 is derived from the "A" battery and its purpose is to heat the filament to the proper temperature. When the filament is hot and when a suitable "B" battery is placed in the plate circuit, a current will flow in this circuit, the strength of which will vary, first, according to the temperature of the filament and second, according to the voltage of the "B" battery. This plate current is also dependent upon the voltage acting on the grid of the tube.

In testing a vacuum tube what we wish to know is the manner in which the current in the plate current varies when the voltage or currents in the different circuits are altered or maintained at definite values.

How It Is Done

Now this sounds rather complicated but it isn't. Suppose for instance that we wish to test a Radiotron amplifying tube of the UV201-A type. We put this in the tube socket on the tester and by means of the rheostat and the potentiometer we adjust the filament voltage to 5, the grid voltage to 0. The plate voltage due to the B battery we will say is 90 V. Under these conditions, if the tube is good, the plate milliammeter will indicate a current of 6 milliamperes. This we know from the manufacturers data to be correct. If instead of 6 milliamperes the plate milliammeters indicated only 3 or 4, we would know immediately that the tube was not up to specifications.

Table 1—Plate Current for Different Tubes at Various Plate Voltages

	WD-11 C-11	WD-12 C-12	UV-199 C-299	UV-200 C-300	UV-2*1A C-301A
Filament Terminal Voltage	1.1	1.1	3.0	5.0	5.0
Plate Current in Milliamperes (with zero grid bias)				Detector 0.25 to 1.0	
20	0.3	0.3	0.25		
40	1.2	1.2	1.1		1.0
60			2.4		2.6
80	3.9	3.9	3.9		4.8
90					6.0
100					7.5

²This paragraph needs a little checking. For average purposes it is safe to assume that a tube showing a 6 ma. plate current is OK. This does not take into consideration the possibility that a tube might easily show a 6 ma. reading and have faulty internal construction. The only sure way to determine the actual efficiency of a tube is to take two readings, with different values of grid voltage, and determine the change in plate current caused by a given change in grid voltage. This gives the true amplification of a vacuum tube, and is the accepted method of getting the grid voltage, plate current characteristic which is the key to tube performance.—Technical Editor.

Figure 5. (left) Compare the plate current of this illustrative graph with that of the one on the right.



Figure 6. (right) The current is much decreased in this case because a C battery has been used in the grid circuit.

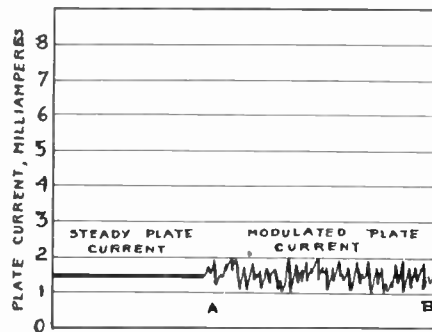


FIG 6

Of course, the current in the plate circuit will vary with the voltage of the "B" battery which is indicated by the plate voltmeter, and it will vary with different types of tubes. In Table I are shown the various values of plate current for various plate voltages with various standard tubes.

Now this isn't anything very complicated, is it? And yet the knowledge may be very useful when buying a tube, for while a tube testing outfit may be used to determine a great many other constants of the tube, the only thing that is usually considered when buying a tube is plate current.

Why the "C" Battery?

Most everyone who has had the instructive experience of getting the "A" and "B" battery leads twisted and seeing anywhere from five to twenty-five dollars worth of tubes go "West" is more or less familiar with the relative functions of the "A" and "B" batteries. The "A" battery, we know, lights up the tube and the "B" battery blows them to "kingdom come." Now what is all this talk about a "C" battery? What is it good for and where is it used?

This brings us to the question of grid potential or grid voltage. It will be recalled in our discussion of the tube tester it was stated that the plate current was also dependent upon the voltage acting on the grid of the tube. To show just how the grid voltage affects the current in the plate circuit let us see what happens inside of a vacuum tube.

The vacuum tube is a relay—a wonderful relay by means of which one tiny electric current controls another much more powerful current. Its action in this respect can be roughly compared to the action of an ordinary magnet relay such as is shown in Fig. 3, where, by means of a very weak current supplied

by the dry cell, the strong current in the motor circuit is controlled. When the key is pressed a circuit is established through the magnet coil, causing it to attract the iron arm and closing the contact, C. This closes the circuit through the motor. The vacuum tube functions in much the same manner as this relay as will be explained. The main function of the modern radio receiver outside of its function to tune to a definite wave length is to amplify. The tiny electric current set up in the aerial wires by the incoming wave is a perfect reproduction of the one setting up the waves at the distant broadcasting station: it needs no shaping, no modulating—it contains all the infinite variations of frequencies that taken together constitute music, or voice or whatever may be transmitted. All that is necessary is to convert it into a form suitable for actuating headphones speaker and to amplify it to a suitable value.

Now, while in a sense the vacuum tube amplifies, if we look into its operation rather closely we will find that the output current is entirely separate from the input current and is merely an enlarged reproduction of it, as it were. The input current merely controls the more powerful current flowing in the plate circuit of the tube in such a way that any variation of the input current is exactly reproduced in the plate current.

Now how does it do this? In Fig. 4A we have represented diagrammatically a vacuum tube without the grid. When the filament is heated, electrons are boiled out of it in much the same way that water flashes into steam. These electrons are negatively charged and are attracted by the plate which is kept positively charged by the "B" battery. If the charge on this plate is made stronger more electrons will be attracted to it, if it is weakened, fewer will be attracted. If the charge remains constant the number of electrons drawn across from the filament will be the same at any instant.

If now we insert in between the filament and the plate a grid as in Fig. 4B (Turn to page 60)

Table 2 Negative Grid Bias Voltage or "C" Battery Voltage for Different Tubes at Various Plate Voltages

UV-201A, C-301A		WD-11, WD-12, C-11, C-12		UV-199, C-299	
Plate Voltage	"C" Battery Voltage	Plate Voltage	"C" Battery Voltage	Plate Voltage	"C" Battery Voltage
40	0.5 to 1.0			40	0.5 to 1.0
60	1.0 to 3.0			60	1.0 to 3.0
80	3.0 to 4.5	45	0	80	3.0 to 4.5
100	4.5 to 6.0	60	1.5	100	4.5 to 6.0
120	6.0 to 9.0	80 to 100	3.0		

CALIFORNIA IN DAYLIGHT—NEW ZEALAND, EUROPE AT NIGHT

with the

Super Frequency Receiver

By FELIX ANDERSON

Technical Editor

ONE of the most interesting, inexpensive and enjoyable things a sophisticated radio enthusiast can do in this day of multitube super-heterodynes, the reception of a broadcast station some 3,000 miles away is accepted in a more or less matter of fact manner; the listener is appropriately enthused but is not as thoroughly thrilled as he was some three years ago when five hundred mile receptions were considered phenomenal.

The low wave high frequency field offers to this type of non-phased radio bug some of the biggest surprises, some of the most baffling difficulties, and some of the greatest rewards that the radio game has ever offered, and because of this unusual appeal, the following article is written with the intention of supplying the intense radio "nut" with material to think over.

One of the salient points of the enjoyment of short wave radio listening is that it is not expensive. The equipment is very very simple, and the average reader will undoubtedly have on hand an abundance of apparatus that has been discarded in the trend of more modern equipment. So expense is not an impediment.

Accuracy Essential

The first consideration in making a low wave receiver is disciplining yourself into the frame of mind that research on low will necessitate absolute accuracy. The second thing to bear in mind is that short wave sets rebel against "hardware" design, and absolutely refuse to percolate with "junk" equipment. A set may function indifferently on the higher waves (broadcast wavelengths) when questionable apparatus is used, but when short waves and high frequencies are involved the receiver abruptly quits working or refuses to work at all when poor apparatus is used. In this way it is a liberal education to build a receiver of this type, for its requirements are exacting, and the

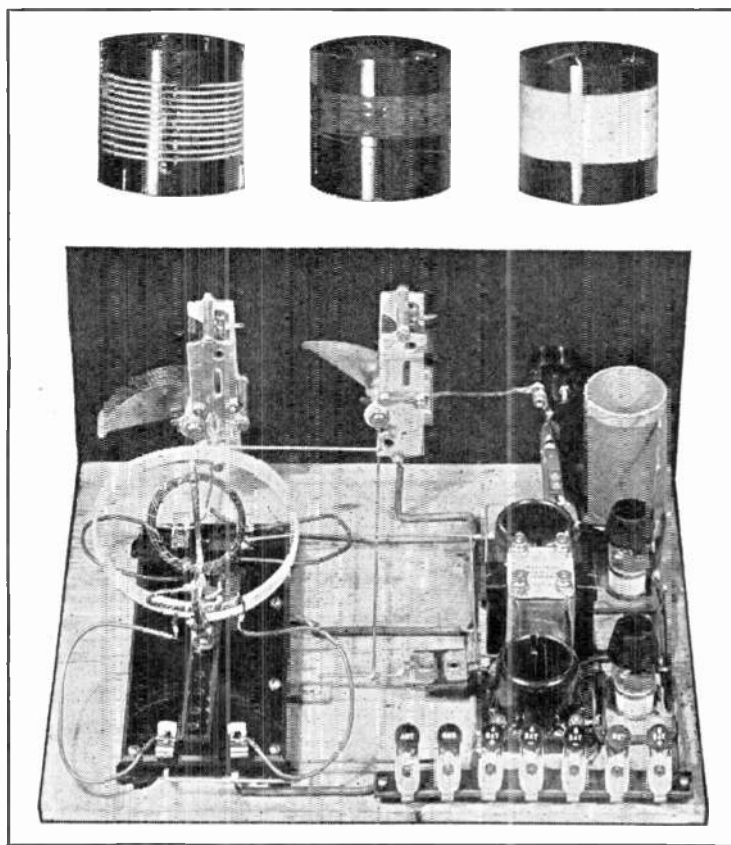


Figure 1. A back panel view of the super-frequency receiver showing the arrangement of parts and layout. It is important that this layout be strictly adhered to if the specifications given in the accompanying text are to produce results. The 20 meter coil is shown in place with the 40, 80 and 200 meter coils above.

apparatus and circuit must be just so before it will even start to work.

The Parts

To build this radio "dark horse" you will need the following parts:

- P—1 Panel 7x12x $\frac{1}{8}$ inches
- BB—1 Baseboard 12x $\frac{3}{4}$ x12 inches. Squared, sandpapered and parafined. 5 mounting screws for panel.
- C₁—1 Variable Condenser, Low Loss type .0003 MFD. capacity.
- C₂—1 Variable Condenser, Low Loss type, .000055 MFD. capacity (Note 1).
- S—2 Good Porcelain Tube sockets.
- R—2 Rheostats (Allen Bradley used in this model).
- TR₁—1 High Ratio Audio transformer, (Thordarson).
- BP—1 set Binding Posts (Fleming).

C₃—0.00025 MFD. Sangamo grid condenser (or Dubilier).

1 Bakelite tube 1 foot long, 3 inches diameter.

P₁—1 Fc. Bakelite 3x7x $\frac{1}{4}$ inches.

K—4 Fahstock Binding Posts.

A—2 Coil Mounting Plugs. (Atlas).

B—8 Coil Mounting Jacks. (Atlas).

Odds and ends of No. 22, 18, 14 and 12 DCC wire.

R u b b e r Covered stranded wire, Rubber insulated No. 18 and mounting screws.

FS—1 F i l a m e n t Switch (if desired).

TEL—1 Carter Telephone Jack.

1 Marcc Vernier Dial.

2 Knobs with Pointers.

1 Univernier (old style scale.)

8 angle Irons $\frac{3}{4}$ x $\frac{1}{2}$ inches brass. (half inch feet).

P₂—1 pc. bakelite 6x1x $\frac{1}{4}$ inches. (for 20 meter coil).

8 pieces bakelite 2 $\frac{3}{4}$ x $\frac{5}{8}$ x $\frac{1}{4}$ inches (L₁ and L₂ mountings).

8 small nuts and bolts with double washers.

Various screws, bolts and accessories.

L—1 spool No. 28 DCC wire quarter pound.

1 Spool No. 20 DCC wire quarter pound.

The other coils are made of odd pieces of any heavy wire you have handy. (Note 1. The secondary condenser is approximately .000055 MFD. and consists of 2 stators and 1 rotor plate. To effect this, buy the smallest variable condenser of the brand you prefer and remove plates).

Construction

BEGIN the assembly of the set by drilling the panel, using the templates furnished by the manufacturer, following the general layout shown in Figure 2. Locate all holes before you start to drill, and drill them all at once. Don't forget the Marco dial requires an anchor hole as does the Walbert metal scale. These holes should be located accurately.

The next operation is to prepare the plug in system used for the coils. On the piece of bakelite (P₁) mount two

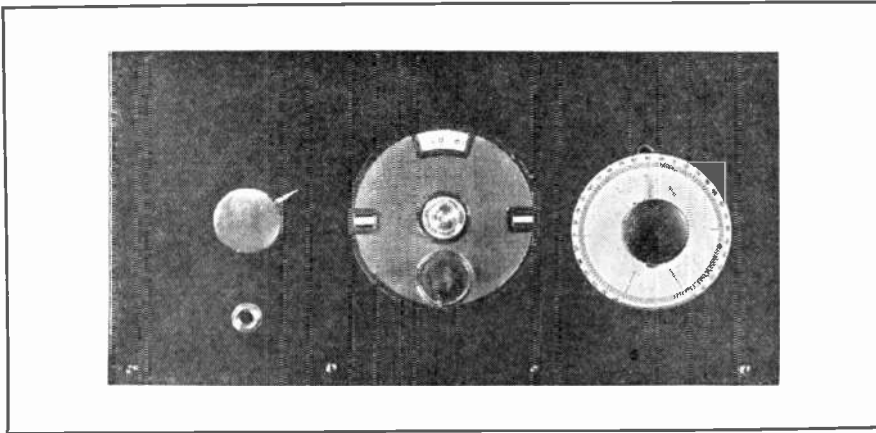


Figure 2. *Simplicity is the keynote of research on the low waves. Only two controls on the panel that are actively used. The filament switch on the left may be omitted if desired. The rheostats are mounted back panel. No cabinet is used with this receiver.*

of the coil plug receptacles two and one half inches apart. On each end of this bakelite piece (P_1) mount two of the Fahnstock clips. Allow for soldering lugs under each screw fastening the post and coil jacks to the bakelite. Then screw the whole business down to the baseboard judging the distances from the photo.

Next mount the coil plugs on the coil tubing. The 12 inch piece is cut into four even sections four inches long. Drill two holes two and one half inches apart in the tubing and assemble the angle iron and coil plugs in the holes. The angle irons act as hinges for the primary and tickler coils which are wound on the 8 two and three quarter inch bakelite strips. See Figure 4 for visualizing the above instructions.

The next job is to mount the coil plugs on the bakelite piece (P_2) which is the mounting for the 20 meter coil. For some reason or other (probably absorption) the 20 meter coil refused to work with bakelite tubing in my experience, so I wound it a la Sanderson (See the June and September issues on coils) and the set worked fine from 15 to 27 meters.

About the only detail that Figure 4 does not show with regard to the coil assembly is the number of turns which is as follows for the various bands:

Wavelength	L_1	L_2	L_3
15 to 27 meters	2	4	4
37 to 55	3	11	5
72 to 95	5	15	10
145 to 220	6	37	15

Coils L_1 and L_2 were seramble wound on a 2 inch bottle, slipped off and then tied together with string. They were then lashed on to the bakelite pieces (P_2) with thread and a drop of collodion, which makes them rigid and firm.

All the other coils were wound on the 3 inch tubing with the exception of the 20 meter coil which is air supported and held together with strips of celluloid. All coils except the 200 meter inductance are space wound or semi-space wound. On the lower range of the tuner, this becomes quite necessary.

Mount the sockets (placing some sort of a cushion system under the

sockets—I used sponge rubber) then the transformer and rheostats. These units are all screwed securely to the baseboard as is the binding post rack.

The RF Choke

Secure a piece of mailing tubing—the diameter should be about 2 to 2½ inches, and with the No. 28 DCC wind 150 turns and secure the ends. This choke coil is quite necessary for good results, though the set will often work without it. If you prefer, proceed to wire the set without it, and if difficulty is encountered in getting the set to oscillate, put it in the first thing you do.

Wiring

The wiring is the next assembly operation, and begins with the filament circuit. Wire the negative lead from the binding ($A-$) post to the two rheostats with one piece of wire, chipping off the rubber covering after you have located the places. Then from the rheostats to the F posts on the sockets and from the other F posts to the filament switch. From the filament switch the lead goes to the rotor plates of the

variable condenser which is in turn wired to the $A+$ post of the rack.

Using a smaller rubber covered wire, put in the B battery wires (you can trace them in the photographs) as indicated on the diagram.

Complete wiring the set by putting the RF leads in place using bus bar, and keeping them at right angles and well up in the air with respect to the other parts.

Close examination of the photos will show that all the leads (at ground potential) run in a more or less well defined path as far away from the inductances as possible. This helps things along a great deal.

The grid condenser is soldered directly to the grid post of the detector socket. In tests, no grid leak was found necessary though the one you build may require such and it is wise to make provision for it.

In the photo shown, the filament switch was not being used as a filament switch in the true sense of the word, it being connected in the $B-$ lead to shut off the B current, and yet leave the tubes burning. The reason for this is that the set was used in transmitting tests, and it was found that the detector tube blocked and refused to give a clear note on the signal while the operator was transmitting. With the B circuit open, only the slightest click can be heard from the transmitter, which makes it very easy for the transmitting operator to read his own sending. Thus in tracing the photos you will notice that the switch is not being used.

Operating the Set

To operate the set, plug in one of the coils (the 40 meter coil is best for testing) and don the phones. Snap on the fil, and adjust the primary and tickler coils until the set oscillates over the whole range of the secondary condenser. In turning the secondary condenser with the tube oscillating you will sit amazed at the countless number of birdlike

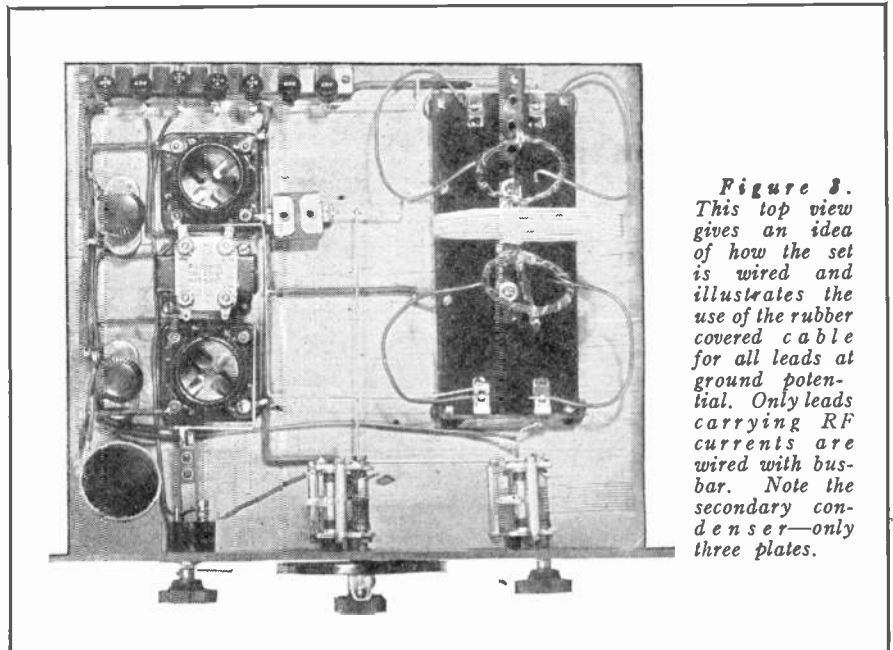


Figure 3. *This top view gives an idea of how the set is wired and illustrates the use of the rubber covered cable for all leads at ground potential. Only leads carrying RF currents are wired with bus-bar. Note the secondary condenser—only three plates.*

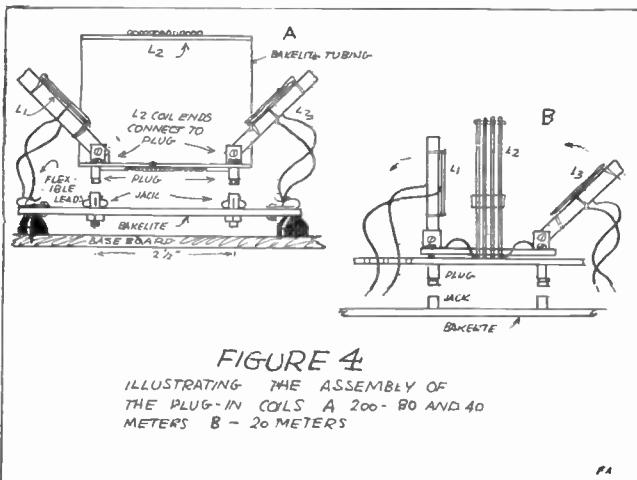


FIGURE 4
ILLUSTRATING THE ASSEMBLY OF THE PLUG-IN COILS A - 200-80 AND 40 METERS B - 20 METERS

Figure 4. The above sketch gives an idea of how the coils are assembled. This assembly applies to the 40, 80 and 200 meter coils though the general idea is the same for the 20 meter inductance. The coupling between secondary, antenna and tickler is varied by moving the coils at different angles on the hinges. This is a very important feature of the set, and helps to get a smooth control of the oscillating condition of the tube.

It is especially important that you learn the numerals well because all transmitting stations belong to a certain district which has a number preceding the call letters.

All these calls can be located in the amateur edition of the radio call book, with the names of the owners and their addresses.

Intermediate Signs

Since the amateur activities have taken on international aspects it has become necessary to distinguish between the various nations who have similar numerical districts, and in order to do this, the method of using different "intermediate signals" has been adopted. If you hear a call as follows:

4CK 4CK 4CK zu (the intermediate)

notes whistling and chirping code signals. And the loudest one can be a South American signal just as well as a local, for it seems that often the DX signals come in louder than local!

This is due to a phenomena now under research by amateurs and large corporations, who are inclined to believe that the short waves have the property of being radiated vertically, and striking the heaviside layer rebound to the earth. In this rebound, it often occurs that your location is "skipped" depending upon atmospheric conditions and sunlight.

Learning the Code

Of course if you are to tell where the stations sending are located you must decipher what they are calling and saying. This is not hard since amateurs on low waves call slowly and distinctly because of the low powers they use and the high frequencies tendency to shift in wavelength. Their calls are repeated again and again, and the average radio listener can, with a weeks practice, copy all but the speediest of transmissions.

The chief trouble with beginners in learning the code is that they visualize it by dots and dashes instead of "audializing" it. Since code is read by sound and not by sight, it is reasonable to understand that it must be learned by hearing and not by sight.

Below I am giving an "auditory" system of learning the code,—the right way. Go over this table carefully and slowly, making especial effort on the accent of the dahs and dits and I'll assure you you'll be able to read 10 words per minute (the average speed used) in less than two weeks.

- A di DAH
- B DAH di di dit
- C DAH di DAH dit
- D DAH di dit
- E dit
- F di di DAH dit
- G DAH DAH dit
- H di di di dit
- I di dit
- J di DAH DAH DAH
- K DAH di DAH
- L di DAH di dit
- M DAH DAH
- N DAH dit
- O DAH DAH DAH

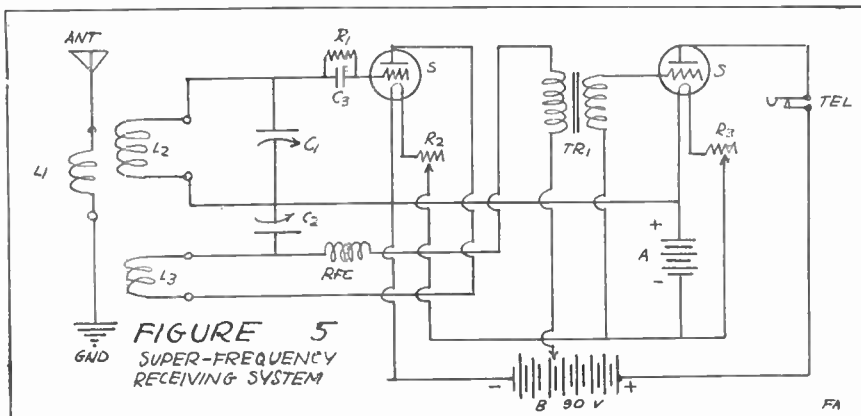


FIGURE 5
SUPER-FREQUENCY RECEIVING SYSTEM

Figure 5. The circuit for this remarkable receiver is a revised Weagant, with the regeneration capacitatively controlled with a condenser shunted across the transformer primary and B battery.

A TYPICAL LOG
with the Super-Frequency Set

20 Meters
6BWJ, 7GR calling Z4AC, 9MM working 9BXM, 6DAX calling CQ, 5AHP calling CQ, 7AKV calling CQ, 7AAJ, 9FJ, 7ZZ talking to 1YB, 1YB calling and talking to 7ZZ, 6BGV, New Zealand 4AC calling some Australian.

40 meters
9AAW calling CQ, 6EC talking to 9BMT, 6VT, 2AES calling CQ, 7BHP, 6DBL calling CQ, 5BG, 6HM, 7HB, 6BON.

80 meters.
9AQP, 8AWQ, 9BRQ.

20 meters IN DAYLIGHT.
10:00 AM 6CTO calling CQ loud.
6BQB working

(Note: CQ is the general call used by stations to inform others that communication is desired.)

9DQS 9DQS you will know that United States amateur 9DQS is calling New-Zealand 4CK.

If the call is merely 4CK (thrice) then U 9DQS you will know the station 9DQS is calling USA 4CK.

The intermediates are as follows:

- A Australia
- B Brazil
- C Canada
- D
- E
- F France
- G England
- H
- I Italy
- J Japan
- K South Africa
- L
- M
- N
- O
- P Holland
- Q
- R
- S Sweden
- T
- U United States
- X
- Y
- Z New Zealand

Not infrequently foreign hams transpose number and letter and their calls read, for example, CB8, meaning Brazilian station 8CB.

- P di DAH DAH |dit
- Q DAH DAH di DAH
- R di DAH dit
- S di di dit
- T DAH
- U di di DAH
- V di di di DAH
- W di DAH DAH
- X DAH di di DAH
- Y DAH di DAH DAH
- Z DAH DAH di dit
- 1 di DAH DAH DAH DAH
- 2 di di DAH DAH DAH
- 3 di di di DAH DAH
- 4 di di di di DAH
- 5 di di di di dit
- 6 DAH di di di dit
- 7 DAH DAH di di dit
- 8 DAH DAH DAH di dit
- 9 DAH DAH DAH DAH dit
- 0 DAH DAH DAH DAH DAH or DAAAAAAAAAH (long DAH)

Designing the APPLAUSE CARD

A Few Suggestions On Appropriateness and Makeup of the "Silent Approval"

By RADIO OPERATOR 39,736

SOMEWHERE in this issue you will find an article by one of the staff writers of ON THE AIR deploring the lack of interest on the part of the listening public in acknowledging exceptional reception and unusual renditions of artists. It is about time that someone took the matter in hand and presented some real logical reasons as to why there should be more applause cards.

It might be that the desire is there, with regard to acknowledging programs and receptions, and it also occurs to us that the reason for the evident lack of interest might be due to not knowing just how to properly acknowledge. So we feel that a few suggestions in behalf of explaining the

types of acknowledgment. Exceptional reception, comprising long distance receiving or other worthy accomplishment calls for a card very similar to those used by transmitting "hams." This card

straightforward applause medium, commending the artist to whom it is sent for some rendition before the "mike" that strikes the fancy of the listener. This calls for an entirely different form of makeup.

L. A. McCORMICK
 1928 Belmont Ave.
 Green Bay, Wisconsin

Radio..... Date..... 19....

I had the pleasure of tuning in on your station today at CST
 and received your program with audibility through
 static and interference. The weather here was and
 and fading was

I would especially like to make comment on the following number
 which I heard broadcast, and trust you will find it of interest:

.....

If check appears in this square
 PLEASE VERIFY

Very truly yours,

How to Make Your Own Cards

THE first thing to consider after deciding you want to express your appreciation or verify your DX records is to choose the type of card you think suits you best. There are several specimen types illustrated on the accompanying pages.

Next journey to your local postoffice and order as many one cent postcards from the postmaster as you think you will need. Remember in ordering, that

Radio..... Date..... 19....

You may be interested in knowing that I heard your signals under the date, time and conditions specified and I would very much appreciate your verifying same.

Time..... CST
 Date.....
 Aud.....
 Static.....
 Fading.....

G. R. PETERSON
CHICAGO
 6027 Farragut Avenue
 "The City of Go"

My Receiver is a three tube 5 circuit regenerative set, home made, using a 120 foot outdoor aerial and dry cell tubes.

Remarks.....

*R*adio Station..... Date..... 19....

I had the pleasure of listening to your station on my *Nighthawk Five Tube Receiver* which uses a 120 foot antenna in a fairly good location. You may find the data listed below of interest to your operating staff.

Date of Reception..... 19.... Time..... CST

Audibility..... Static.....

Fading..... Weather.....

Remarks:

Very truly yours,
R. C. REMINGTON,
 Post Office Box 102, Mount Morris, Ill.

PLEASE VERIFY

accepted forms of verification and applause will not be amiss.

Where Applause Cards Started

APPLAUSE or verification cards had their start in amateur transmitting circles, and made their appearance just before the war when the first long distance communication work began between amateurs. The postcard form became the accepted and popular method of communication verification between citizen radioists because of convenience, and because they presented a material proof of what was then considered "phenomenal" accomplishment in radio work.

Program broadcasting calls for two

Figure 1 (top). A typical applause-verification card now much in use. Figure 2 (lower left). Another interpretation of the demand for applause-verification card. Figure 3 (lower right) is a straight verification card designed to report long distance reception.

usually includes blank spaces specifying the time of transmission, meteorological conditions, audibility remarks and other data valuable to the engineers of the station to whom the card is sent. The card also has room for jotting down some part of the program or announcement that can be checked with the program director's record as evidence of the reception.

The second type of card is a plain 500 cards will be almost as cheap as

200 as far as printing is concerned. Order as many as you think you can possibly use, because your total cost will be much smaller in the end.

Next turn to the classified advertisements of the current radio magazines and find the advertisements of acknowledgment card printers or personal stationery firms who deal in printing of this type. You will find a number of them engaged in this work. Pick out the best price, wrap up your cards and "copy" (the matter you want printed on the card) and specify whether you want one or two colors. Then mail it off. It is always a good policy to indicate that you wish to see proofs of the

(Continued on page 40)

"A CLINIC" for RADIO LISTENERS

Solving Radio Problems in a Non-Technical Way

By A. J. Strong

EVERY radio dealer knows that broadcast reception is entering upon a new era in regard to the class of people who are now becoming interested in radio. In the old days radio ownership was confined almost exclusively to a comparatively small group of experimenters and tinkerers who were drawn into the game purely by their mechanical instincts and who were not in the slightest degree interested in the programs. To them, a broadcast program was simply a convenient means of tuning in their latest brain child and it is likely that not more than one per cent of these experimenters ever listened to a complete program without tearing the set apart to make real or imaginary improvements. This class of enthusiasts were well able to fight their own battles so far as trouble shooting was concerned, and as a result, very little information was published regarding the care and maintenance of radio receivers.

At the present time, the great bulk of the new radio fans are people who buy a radio receiver for the simple purpose of listening to music and lectures. As a class, they are not in the slightest degree interested in the mechanical or electrical features of radio reception any more than they are interested in the mechanism of their talking machine or piano. The old time radio amateur has been succeeded to a large extent by the non-technical listener-in who does not know the difference between a milliamper and a vario-coupler, nor does he care to know. Just so long as the old crate perks along he is satisfied, but when trouble arises he is of course distinctly out of luck.

It is for this last class of radioites that the following list of radio remedies was prepared—simple remedies that can generally be worked out by the most inexperienced persons providing that the receiver still retains the majority of its original parts. While we cannot expect to cover the entire field of trouble shooting in one short article, yet the more prevalent diseases can be handled without calling upon the local service station or the pestilential amateur radio expert who infests all neighborhoods to the detriment of reception.

Selectivity

FIRST and most important of the radio ills on the list is the problem of selectivity, or rather the lack of selectivity that is the curse of the city dweller

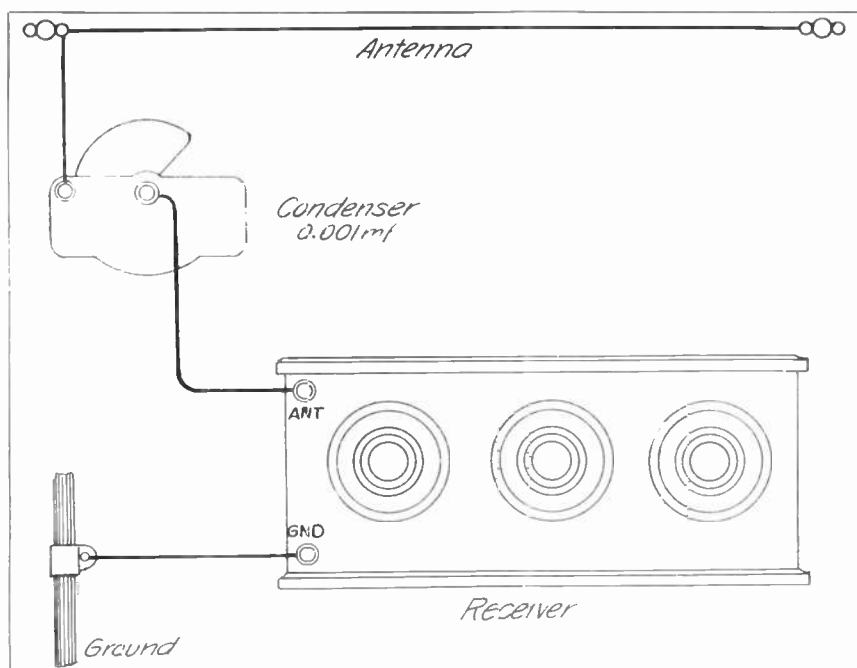


FIGURE 1

living within a short distance of powerful local broadcasting stations. In most cases, the difficulty of separating stations is caused by a long aerial wire which should be shortened to 50 or 60 feet to gain the required degree of selectivity. While shortening the aerial may slightly decrease the sensitivity of the circuit and the distance receivable on silent nights, yet this loss is more than offset by the greater clarity of the signals. In very bad locations the tuning can also be sharpened by disconnecting the ground wire, or by disconnecting the aerial and then reconnecting the ground wire to the post formerly occupied by the aerial wire. Disconnecting the ground wire greatly reduces the sensitivity and increases the tendency toward body capacity so that the set is likely to squeal when the hand is moved toward the dials, but it is the only remedy for a desperate case.

Another method of sharpening the tuning without causing the high losses above is to "trap" the foreign signals by means of a 0.001 m. f. variable condenser in the antenna line as illustrated by Fig. 1. This is of great assistance in moderate cases of interference but adds to the difficulty of tuning by increasing the number of tuning controls handled. A still more effective secondary tuner is had by the use of a 0.0005 m. f. variable condenser (C1) in the antenna circuit as per Fig. 2 with a 50 turn honeycomb coil (L) connected across the ends of the condenser. I am not greatly in favor of adding so much complication into the circuit, and believe that when matters reach such a point that trapping is necessary that a new receiver is by far the best method of eliminating the interference.

Still another method of sharpening up the tuning is to change the "B" battery voltage on the detector. As a general rule, a set tunes sharper with the 45 volt battery tap connected to the "DET" post of the receiver than when 22.5 volts is used at this point, and when the "B" battery is nearly exhausted it will be well to move the detector tap until a higher voltage is obtained. Gradually decreasing selectivity is very frequently caused by a decreasing "B" battery voltage.

Next we come to the reverse case—that of excessive selectivity or "critical tuning," which is encountered principally in the country or at great distances from the desired station. It is possible to make a set so sharp that dozens of stations will be jumped over

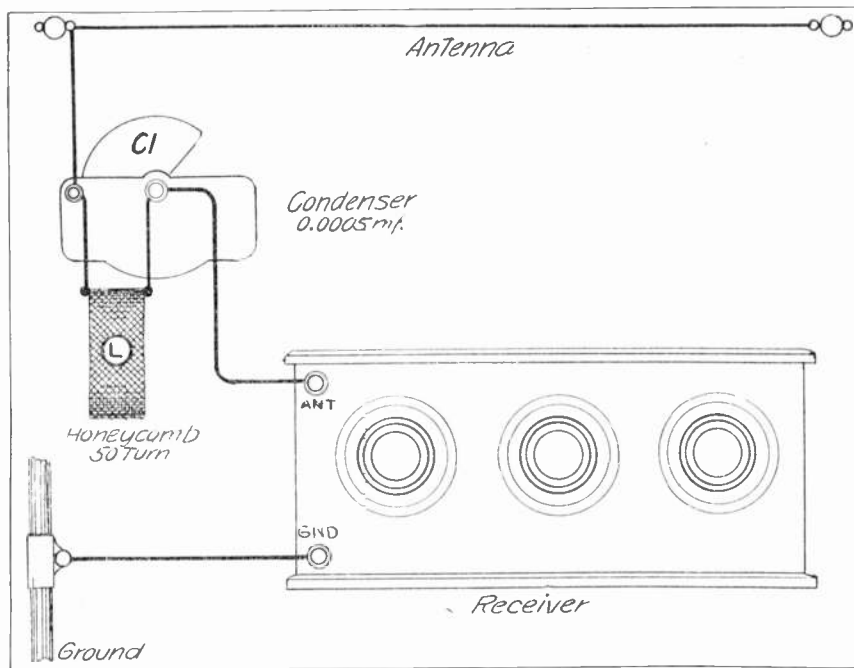


FIGURE 2

without any whistle or snap to indicate their presence even when strong stations are near at hand. It is really more difficult to remedy a critical set than a set that tunes broad by any simple means. In the first place the antenna length should be increased until it is from 100 to 150 feet long. If this does not greatly improve matters, then the use of special vernier dials is of great assistance in obtaining slow and accurate condenser adjustments. The slower the dials are moved, the better will be the chance of picking up a station on a critical tuner and the easier it will be to log the stations. When a set is so critical that a station comes in and out completely on a small fraction of a dial division, the use of vernier dials is almost imperative.

Any other corrections for excessive sharpness generally require interior adjustments of the apparatus or changes in the circuit, and these are rather out of the scope of the present article. Closer coupling between the primary and secondary coils, a high resistance connected between the grid and plate of the detector tube and similar alterations fall under the head of adjustments that can only be performed successfully by a skilled radio man. In a few commercial factory built sets provision has been made for sharp or broad tuning adjustments and to my mind these are among the most important of all radio improvements. One manufacturer provides two binding posts for the antenna, one for broad tuning to be used in rural districts and one for very sharp tuning in congested city districts. Several other makers incorporate an adjustable primary coil by which the degree of coupling can be varied.

Decreasing Volume

THERE are a multitude of causes for a gradually diminishing volume of sound but by far the most common cause is exhausted batteries, both "A" and "B." A radio receiver of the tube type is not a perpetual motion device and therefore requires a constant supply of energy from the batteries which must be above a certain minimum value if we are to retain the required volume at the phones or speaker. To prevent embarrassment from this trouble, the batteries should be tested frequently and charged or replaced

before they are completely drained to the last ultimate drop. Nothing is sweeter than to have a battery flop on your hands when entertaining at a radio party or when demonstrating a set.

A discharged "A" battery can be first detected by noting the brightness of the filament when the rheostat knob is placed in a given position. If the tube does not light brightly with the rheostat turned over to the "full on" position toward the right, then you may be certain that the "A" battery is at least partly to blame. The proper method with a storage "A" battery is to provide yourself with

a battery hydrometer, or a battery testing ammeter if dry cells are used. These instruments leave nothing to guesswork and are infallible indicators of the battery condition.

To test a storage battery, remove the filler caps on the three cells and draw up a sample of the fluid from each cell in turn by means of the rubber syringe bulb. With sufficient solution in the hydrometer tube, the bob should float up until the surface of the liquid is on a level with the 1200 mark at least. At from 1275 to 1300 we are assured of a fully charged battery, at 1250 the battery is three-quarters charged, at 1225 it is half charged and at 1200 only one-quarter of the original charge remains. In no case should the battery be allowed to drop below 1150, and preferably it should always be kept above 1225 if you wish maximum service.

A dry battery ammeter should show at least 10 amperes when the instrument is momentarily connected across the terminals of a single cell. When new, it may show above 30 or 35 amperes. Do not hold the ammeter on the battery for more than an instant, and never use it for testing a storage battery. The resistance of the ammeter is so low that it will be burned out almost instantly on a storage cell and it is likely that the storage battery will also be damaged by the sudden rush of current.

As a rule, the "B" batteries will outlive five or six chargings or replacements of the "A" battery or even longer, but in the end they will also cash in their chips and cause weakened fading signals. They fail so slowly and do it in such a sneaking way that the owner is not aware of the approaching trouble unless he has formed the habit of systematically testing the batteries with a voltmeter. In some cases the approaching death of the battery is heralded by various grating crackling noises in the horn, sounding much like static, but as this warning is not invariable with all batteries it is best not to wait for the noise until the batteries are replaced or recharged. Connecting a 50 volt scale voltmeter across the terminals of a 45 volt dry cell "B" battery should show at least 34 volts. If the battery shows less than this it should be replaced by new. When a storage "B" is used, charging should be started when the voltage drops to 36 volts. These

voltmeters are cheap and can be obtained at almost any radio store.

Dirty antenna insulators, covered with soot or dirt, ground the incoming waves and reduce the signal strength. Clean them off occasionally or replace them with new. In the same way, a dirty lightning arrester or an arrester more than two years old may weaken the signals by grounding. Rust, dirt or grease getting under the ground clamp where it attaches to the water pipe obstructs the circuit and loose dirty connections to the receiver are always probable causes of trouble. Dampness is the enemy of the radio set, and loss of signal strength has been traced very frequently to moisture entering the set when installed near an open window or below a bird cage. One very bad case of signal loss was traced to a canary bird who periodically sprinkled the set with water when taking a bath. Keep the receiver in a dry place and see that the lead-in insulators are also dry.

Watch the Polarity, Too

LOUd speaker connections must be made properly with respect to polarity. The red colored cord tip of the speaker should always go to the positive post or output jack blade. If the polarity is reversed, then there will be a loss of volume and the speaker will have a mushy, distorted tone. Try the effect of reversing the speaker connections and choose the connection that gives the loudest purest tone. It is quite surprising how many cases of trouble are charged to the receiver that are really due to the speaker connections.

A "C" battery, usually installed within the receiver cabinet, lasts a very long time. However, at the end of six months or a year the "C" battery will finally die of old age rather than exhaustion and must be replaced by new. The usual symptom of an old dried up "C" battery is a whining noise accompanied by a loss of volume. For the reason that the "C" battery is usually well covered up within the cabinet, it is often overlooked in the diagnosis but it can cause trouble just the same.

Tubes age slowly and usually will outlast several installments of "B" battery if taken care of and burned at a low temperature. However, if the tubes are used with the rheostats turned on full at all times, the filaments will depreciate rapidly and become useless before they actually burn out. If the condition of the set is such that the tubes must be burned at

The Big Body of Radio Fans is no Longer a Scientific Clique; But Some Radio Knowledge May Be Learned Easily and Here's How

with an additional bonus of from five to ten dollars to get prompt delivery.

There is no simple method of testing a vacuum tube except by comparing it with a new tube placed in the same position in the radio set. At the end of about eight or nine months of hard service the tubes should be checked up, and if found weakened they should be rejuvenated or replaced by new. The new tubes should be carefully tested by the dealer before they are accepted for the tubes are often damaged in shipment from the factory or by handling in the store, and where the dealer is willing the tubes should be given the test in a receiver rather than in a tube tester.

Loss of volume in a reflex set is usually caused by a defective or worn out crystal detector. If the loss in volume is accompanied by a continuous whistling or howling you can be almost certain that the crystal is at fault. The remaining troubles of the reflex are as with other receivers.

Noisy Reception

NOISE in the receiver can be traced to a great many causes but one of the most common reasons for rattling crashing grating noises is an exhausted "B" battery or reversed connections to the speaker. Loose wiring connections come next in order with dirty variable condenser plates a close third. Microphonic noises produced by a close proximity of the speaker to the receiver also contribute to the uproar. The speaker vibrations jar the tubes when the speaker is placed on top of the radio or on the same table,

(Turn to page 54)

ONE OF THE CAUSES OF RADIO ILLS—

is evident from the photo at right, which shows a bunch of well meaning radio fans stampeding one of New York's "Gyp" radio stores in search of a bargain. As a result of the "bargain" they save money for the time, but incur everlasting grief until they are forced to buy reputable merchandise.



Kadel and Herbert photo

Designing the APPLAUSE CARD

(Continued from page 36)

setup before they run off the complete job, as this gives you an opportunity to check for mistakes. The printer is glad to do this if you say so. It relieves him of the responsibility for error.

Some Examples

FIGURE 1 is a typical example of a combination applause and verification card made up in the accepted style. It has room for technical data valuable to the station engineers, and has additional space for artist applause or verification comment. The square in the lower left hand corner is checked if a return answer is desired. Most broadcasting stations are glad to verify receptions.

The card is so designed that it can be attractively printed in one or two colors. Two colors of course run into more money, but makes your card stand out more. When they strike the eye, the station engineer or program director usually takes the trouble to tack them on the bulletin board of the station or in the operating room as decoration.

Figure 2 is a card designed more expressly for DX verification. The word Chicago in large letters will usually find a place on the station walls, especially if the station happens to be in California or Porto Rico. Similarly the card shown in Figure 3 is designed for this type of effect.

Figure 4 is a dignified but inexpensive type of applause card that is much appreciated by artists and station personnel. It is purposely made up to be sent direct to the artist or station manager, and has room for program comment, criticism or suggestion. This type of card is especially convenient for the listener who is not interested in DX but rather centers his activity over program quality and station accomplishments from an educational or entertainment viewpoint. To make it just a little more elastic, a few technical comments are included that are invaluable to the station management, and in consideration of the possibility that exceptional distance is covered and verification is desired, the verification request is included.

This type of card can be attractively printed in a decorative type face, and will find a prominent place in the artists' hope chest.

Advertising Possibilities

The applause card has advertising possibilities, as well as social aspects, which can be gracefully incorporated in the card as illustrated in Figure 5. This card is the applause card designed by our circulation department that is given away free with each subscription. Entertaining business men who turn to

radio as their evening hobby find the applause card an excellent method of subtly spreading their propaganda wide-spread. An attractive card invariably commands attention, and gives the sender the benefit of inadvertent advertising as well as grateful thanks upon the part of the recipient.

Some very original cards have come to our attention, in talking along these lines. We have seen cards that are especially interesting since they contain humorous cartoons of the sender, characterizing his business or radio activities or some other humorous diversion. Artists have expressed themselves in beautiful two and three color cards with tasteful and appropriate illustration. There is exceptional room for thought along these lines, and there is no reason why a little art shouldn't manifest itself in radio applause card design in keeping with the artistic tendencies of the profession.

While the foregoing suggestions incorporate generally the ideas that should be kept prominent in designing applause cards, there is no reason why the listener should accept the designs as final. We print them with the express intention of giving the prospective card user a general conception of what the card should convey.

Express Originality, Ingenuity

In the applause card field there are unusual possibilities for enterprising people to design high grade applause cards of personal type, the design being expressly executed for the acknowledgment of broadcast entertainment. We have in mind tastefully made high class looking cards, expressing individuality very similar to Christmas cards or formal social correspondence. One can readily appreciate the effect a beautiful acknowledgment card, artistically drawn and printed, would have on a temperamental artist who has rendered part of his or her genius before the cold critical microphone of some station. The warmth and feeling of thanks more than amply pays for the effort expended in giving to radio that distinction—the fineness, that high grade music and beautiful rendition can give.

At present the radio broadcasting seems infested with too much of the "cheaper" type of entertainment—it is because high class artists require applause and balm for their temperaments that we hear less of them. The less

artistic, commercial type of vaudeville performer, with shrewd business acumen capitalizes this dearth of quality entertainment, and offers his services with the ulterior motive of advertising as his object.

Truly if radio is to become a source of education in music it must have more applause cards, and now that you have some idea as to what the card should constitute, let's see some action. We will gladly comment or suggest layouts and designs for our interested readers and our art staff is at your disposal as far as criticism of artistic taste in applause cards is concerned.

If any of our readers do make cards embodying this idea, we should like very much to inspect them. If there are not too many, we should like to print illustrations of such cards as evidence that the radio broadcast listener is not one who selfishly takes all "but gives nothing."

During the past several months, it has been reported that correspondence from radio listeners has increased, rather than decreased, therefore the need of proper applause cards, which will make the fan's comment all the more impressive, is especially evident at this time and should be recognized by everyone.

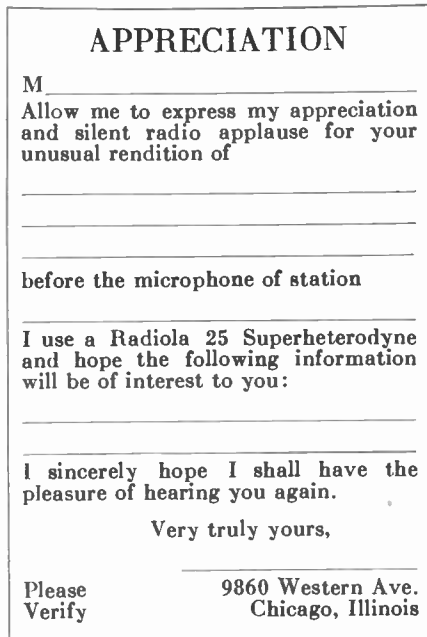


Figure 4 (top). Advertising can be inoffensively included in the applause card with gratifying results if the card is made up comprising the spirit illustrated. The lower card (Figure 5) is a dignified semi-formal acknowledgment of hearing an especially pleasing selection, and is directed to the artist rendering.



The Technical Editor to the Broadcast Listener



W. G. Clarence, Iowa

QUESTION: After I purchased one of your ON THE AIR magazines I was interested in the topic "Pepping Up the Reliable Reinartz" on page 35 of the November issue. I own a one tube Reinartz and would like to make a two tube out of it, and would like to know what to add. Please tell me whether to use radio or audio frequency amplification. What is the difference between "tuned" radio frequency and just plain "radio frequency?" I don't profess to know much about radio though I can hook up a receiver with a diagram.

ANSWER: I am printing in Figure 1 a diagram showing how one stage of audio frequency may be added to the Reinartz receiver you now have. I believe you will find the addition of audio frequency the best, due to the fact that it will increase the audibility of the stations you are now hearing, and will make the weak reception on stations you can now just about hear very plain.

Tuned radio frequency differs from plain radio frequency in that the tuned radio frequency amplifier can be tuned to exact resonance with the signal you want to hear. This gives great amplification. With fixed radio frequency, the whole wave band of from 200 to 550 meters is amplified in a general way and you get

TECHNICAL INFORMATION SERVICE

ON THE AIR is inaugurating this special technical service department for the convenience of its readers in helping them to solve technical and general difficulties common to radio broadcast listening.

There is no charge for this service which is maintained by a corps of technical men, and readers who wish to avail themselves of the service need only to observe a few efficiency rules.

1. Do not ask for comparisons between products advertised in this or other journals. In justice to our advertisers, we cannot convict one product and recommend another.
2. Don't ask too many questions. Boil your letter down to just what you really need.
3. Don't ask questions that require too much research work or reference. Give the other fellow a chance.
4. A letter of inquiry written in the following form always gets a quick reply. If you would expect speed, make your inquiry conform to the requirements.
 - A. Enclose a standard business size stamped addressed envelope. No envelope, no answer. Foreign countries need no stamps.
 - B. Write, don't scrawl. Use typewriter if possible. One side of paper only.
 - C. Diagrams and drawings on separate sheets. Fasten all correspondence together.
 - D. Number your questions or paragraphs, and keep the subject matter of the paragraph unified. When we answer, we'll refer to the number of the paragraph. Keep a copy of your letter for reference.
 - E. Put name and address on each sheet.
5. Address your questions to ON THE AIR, Technical Editor, 1322 Kimball Hall Bldg., Chicago, Ill.
6. And have patience, brother, patience.

frequency especially adaptable to your needs appears in Figure 2.

A. P. West Philadelphia, Pa.

QUESTION: I have a three tube Reinartz receiver, and I note your article on "Pepping Up the Reliable Reinartz", and I should like very much to have you print a diagram showing how a stage of radio frequency of the most effective type can be added. My present receiver uses a .0005 MFD, condenser for the tuning control and a .0005 MFD condenser for the regeneration. The grid return lead of the set is made to the switch lever of a 400 ohm potentiometer. Please include these in the diagram, making provision for the two stages of audio I already have.

ANSWER: I take pleasure in showing in Figure 2 the best connections for the Reinartz receiver you speak of, and have included all the parts you list in your query. If there are any questions, feel at liberty to call upon me again.

E. P. El Dorado Springs, Mo.

QUESTION: I surely appreciate your sympathy for the three circuit tuner. It is my favorite. I intend to build your "Technical Editor's Set" but there are some questions I would like to ask you.

(1) Would it be possible to tap the coil as to give three ranges viz: between 20 and 25 to give a wavelength range of 125 to 225 (approximately) then make a few more turns and tune from 200 to 300, and with still another set of taps go from 275 to 450 and from 400 to 600 meters?

(2) Would it be necessary to use fixed condensers on the upper waves to keep the coil from getting too big?

(3) Would a .00025 MFD. condenser give greater ease in tuning or would I gain by using a larger condenser with decreased coil resistance, effected by using a smaller coil?

(4) Can I secure Isolomite in small quantities and suitable shape for insulating low loss coils, even as scraps from of the companies using such material?

(5) Can insulated silver plated wire be secured? If so where?

ANSWER: I am showing in Figure 3 a diagram of a circuit that would embody the idea you are striving to materialize. In this circuit the predominant idea is the use of a large coil (giving a greater voltage variation on the grid of the tube and of course a stronger signal) and a small variable condenser. I have no actual data that I can give you for condensers smaller than 11 plates (.00025 MFD.) and I doubt that it is any advantage to use a condenser smaller than

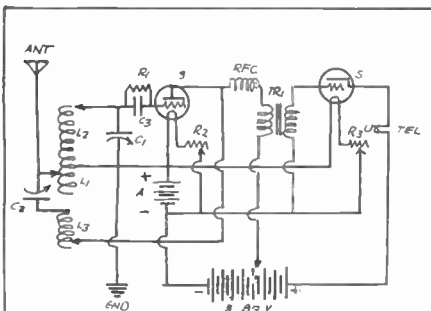


FIGURE 1

SHOWING ADDITION OF ONE STAGE OF AUDIO FREQUENCY TO STANDARD REINARTZ RECEIVER

The Reinartz receiver is much improved with the addition of one stage of audio frequency as shown above. Many of our readers have been asking for this information since the article "Pepping Up the Reliable Reinartz" appeared in the November issue.

only a certain percentage of amplification. The only virtue that 200 to 550 meter fixed radio frequency has to offer is that it dispenses with a variable control.

A typical diagram of tuned radio

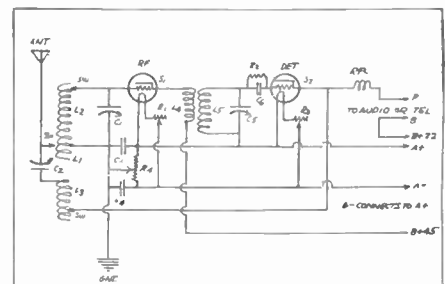
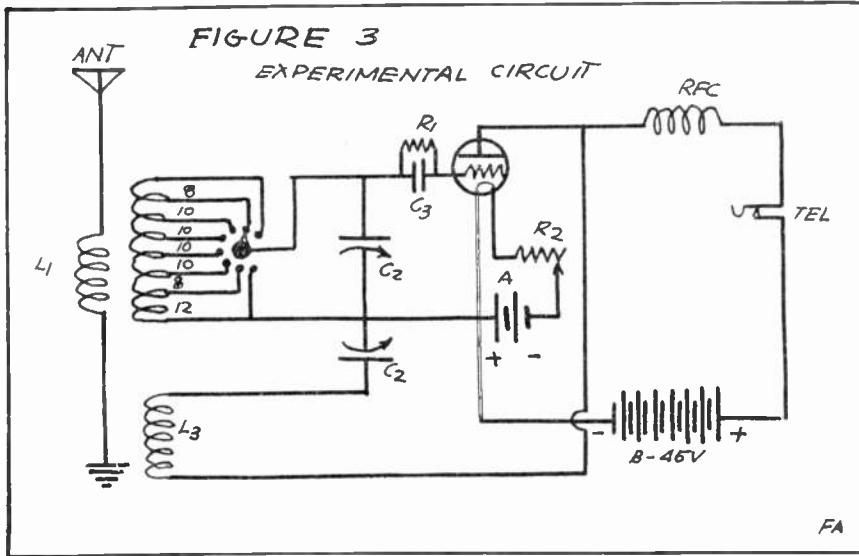


FIGURE 2

SHOWING ADDITION OF RADIO FREQUENCY TO STANDARD REINARTZ RECEIVER - WITH PROVISION FOR AUDIO FREQUENCY AMPLIFICATION

This shows how a stage of radio frequency is added to the good old Reinartz. If an amplifier is used (see Figure 1) the connections are made to the extended leads shown in the diagram.

that. In the following table I am suggesting values that you might like to use:
L1—15 turns No. 18 DCC 2" low loss form.
L2—Secondary coil 3 1/2" in diameter wound with No 22 or 24 DCC



The above diagram represents an interesting experiment in using a large coil and a small condenser to tune with. Taps are taken off the secondary coil to change the wavelength in bands. The circuit is the good old Wegeant, now very popular with the transmitting amateurs and should give excellent results and sharp tuning if assembled properly.

wire partially spaced, tapped as follows:

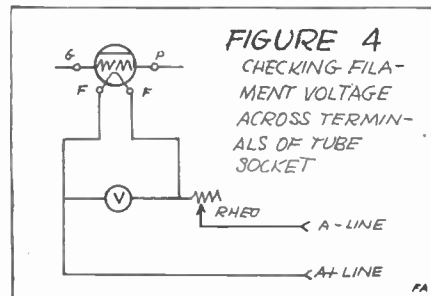
- Begin
- Wind 12 turns and tap. 80 meters or lower.
- Wind 8 turns and tap. 125 to 225 meters.
- Wind 10 turns and tap. 200 to 325 meters.
- Wind 10 turns and tap. 275 to 425 meters.
- Wind 10 turns and tap. 300 to 500 meters.
- Wind 10 turns and tap. 325 to 550 meters.
- Wind 8 turns and finish. 375 to 600 and up.
- L3 40 turns No. 24 DCC 2" low loss form
- C1 .00025 MFD. SLF
- C2 .0005 MFD.
- C3 .00025 MFD fixed.
- R1 Grid Leak 3 to 5 Megohms
- R2 Rheostat to suit tube.

After you have built the set up with the .00025 MFD secondary capacity and after the wavelength range of the coil and various taps have been checked (with a wavemeter) you can take plates of the condenser and make the above approximate wave bands smaller.

- (2) It would not be necessary to use parallel fixed capacities as the coil will not be excessively large.
- (3) The coil resistance on the broadcast wavelengths would not be a limitation. The generally accepted method to use is to use the smallest condenser and largest coil possible to cover a given wave band.
- (4) There is no advantage in using Isolante if you don't have it handy. Use what you have,—it won't make such a great difference.
- (5) If you use insulated silver plated wire, you defeat the purpose of the silver plating. The object is to provide a thin skin of highly conductive metal because RF currents travel on the wire surface. Absorptive rubber or insulation of course does not further this action. Use bare silver plated wire if you must use silver plated stuff. You can get it at your jewelers.

T. D. C. Chicago, Ill.

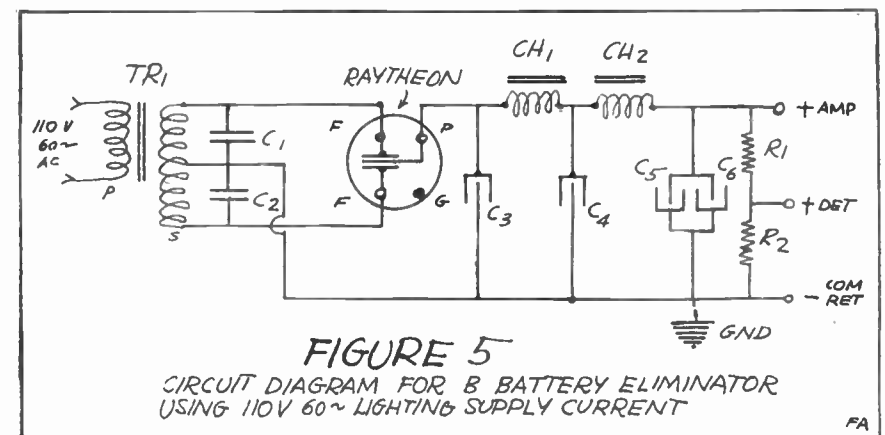
QUESTION: I am building a receiver, and I want to use a voltmeter that can be connected up to give me an exact check on the filament current of the tube in



The correct connections for the voltmeter appear in the schematic diagram above. This gives the exact voltage across the filament terminals of the tube.

the set. Will you suggest a method for this?

ANSWER: Figure 4 shows a circuit that uses the correct system to give you



The diagram for a B battery eliminator using house lighting mains for supply current. This circuit uses manufactured equipment and can be easily assembled by any enthusiast with excellent results. It uses the popular Raytheon rectifier tube for full wave rectification, and the hum is thoroughly choked out with a well designed filter.

the voltage applied across the filament of your tube.

J. H. M. Champaign, Illinois.

QUESTION: I am very much interested in using my house current (which is 110 volts 60 cycle AC) for the B voltage supply for my radio receiver. Please print a circuit showing the parts I will need and the method of connecting them up.

ANSWER: The diagram shown in Figure 5 will amply suit your requirements for a lighting circuit B supply. It will require the following equipment:

- T1—Step up transformer
- L1—Choke coil
- L2—Choke Coil
- C1—2 MFD High Voltage Condensers
- C2—2 MFD High Voltage Condensers
- C3—8 MFD High Voltage Condensers
- C4—.5MFD Bypass
- C5—1 MFD High Voltage
- R1—10,000 to 100,000 ohms
- R2—10,000 ohms

Ground all metal cases through B-lead. One side of A battery should be grounded. Condensers of the HV type should stand a minimum of 450 volts.

I will gladly supply you with trade names on request.

STRAYS

If you will compare Figure 3 on this page with the diagram of the Super Frequency Receiver on page 34 of this issue you will notice a distinct similarity in connections.

It occurs to us that readers who try out the experiment (which is an interesting one in coil and condenser ratio) might use the layout of parts and coil design of the super frequency set to good advantage.

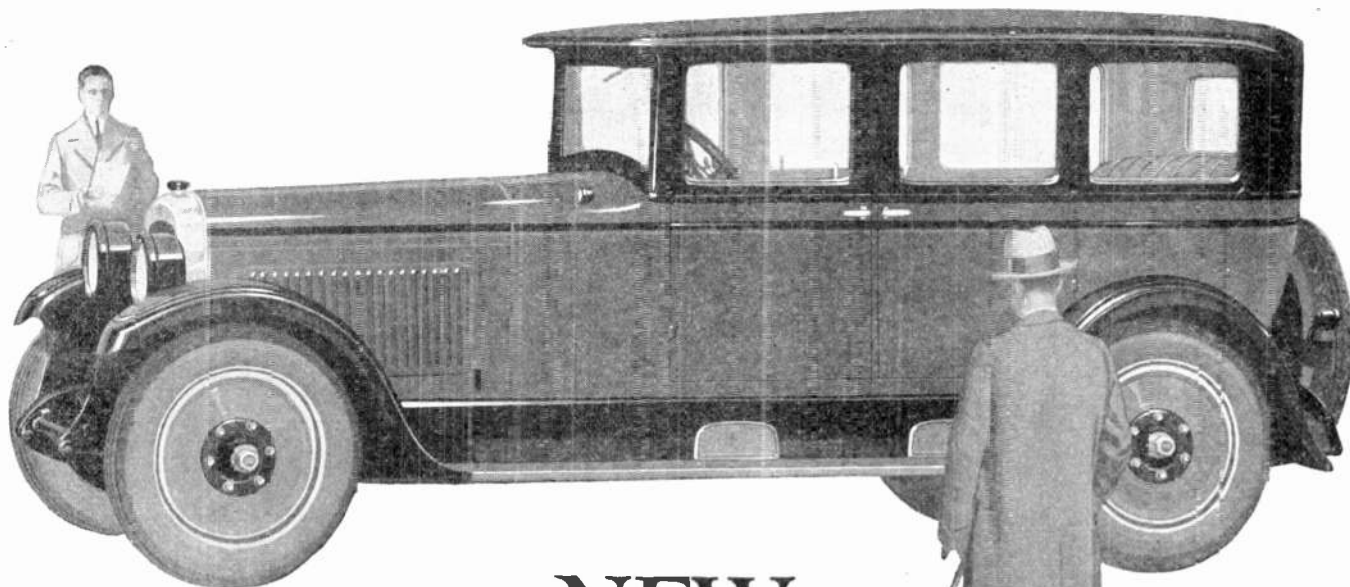
RFC or Radio Frequency Chokes shown in diagrams in ON THE AIR for broadcast receivers should be wound with No. 28 SCC or DCC wire on a two inch tube. The coil should have about 250 turns of wire, and will make a coil about five or six inches long. It should not be doped and should be treated much in the manner of a tuning inductance with respect to mounting.

The Wizard Wire Winder, made by a California company, can be used to good advantage in winding chokes with this many turns.

NASH

Leads the World in Motor Car Value

Announces



The **NEW** Advanced Six 4-Door Sedan



This brilliantly distinctive new model is the greatest example of value-giving the industry has ever known.

Were its price set a couple of hundred dollars higher this 4-door sedan would still be a motor car value to create national comment. Nothing you have ever observed in its field will cause you to hesitate a moment when you observe the beauty and the quality — *and hear the price*—the lowest price at which Nash has ever offered an Advanced Six 4-Door Sedan.

The broad and restful seats are upholstered in the internationally famous Chase Velmo mohair velvet. The silver-finished hardware pursues the exquisite Colonial design. And doors are generously wide to enable freest entrance and exit.

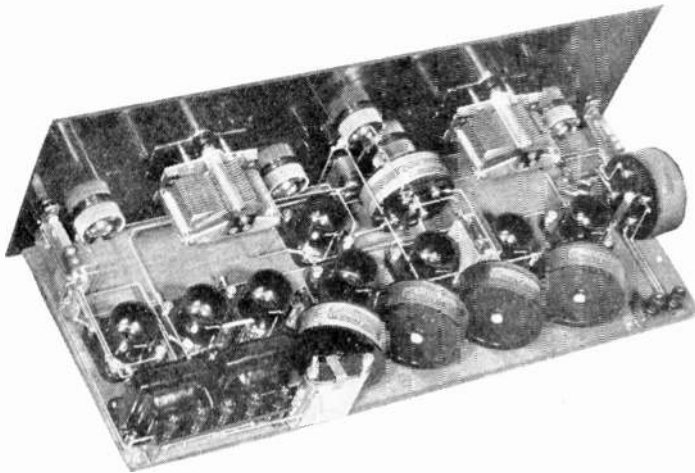
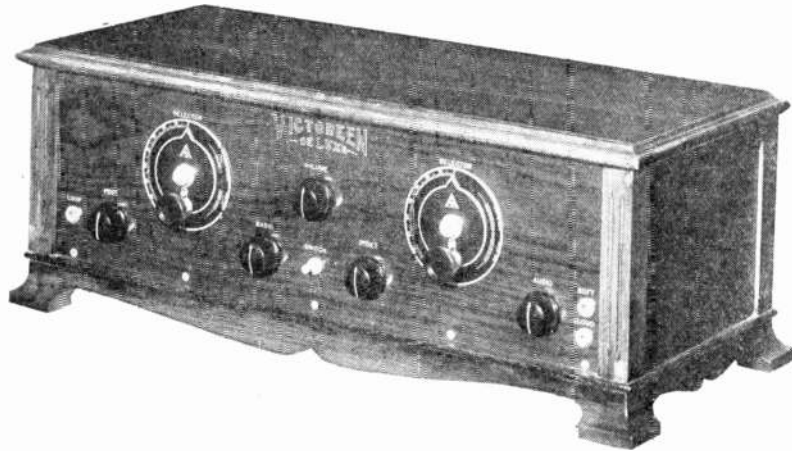
As is true of all Nash models there are 4-wheel brakes, full balloon tires, and five disc wheels included at no extra cost.

(2678)A

THE NASH MOTORS CO., Kenosha, Wisconsin
Tell them you saw it advertised in On the Air.

A Page of Photos for Super-Het Fans

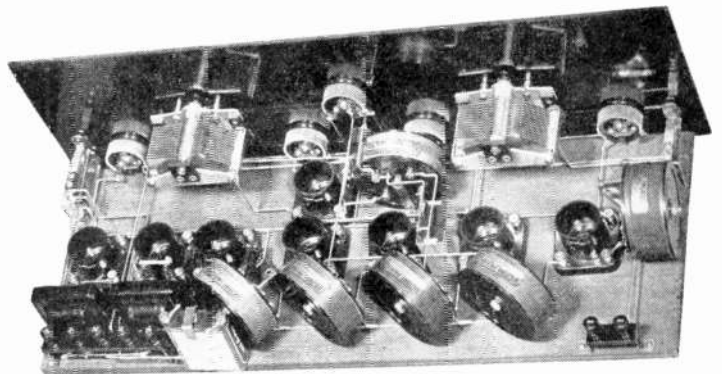
The front panel view of this exceptional super-het is one of simplicity and characterizes easy operation. Every control has a purpose, and efficiency has not been sacrificed for too few tuning adjustments.



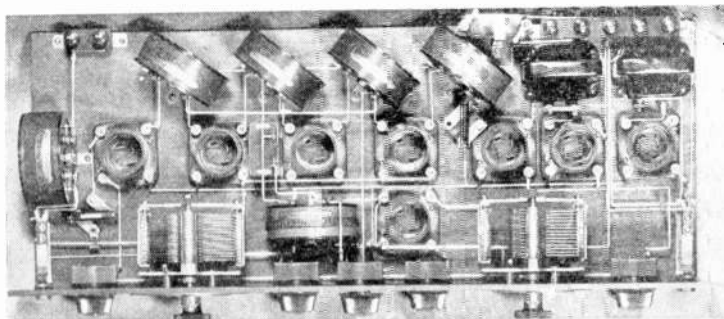
DUE to the tremendous interest shown by readers of ON THE AIR in the Victoreen Super-Heterodyne, we are violating one of our basic policies—that of refusing to devote editorial space to comparison of advertised products. In this case reader interest demands that we make an exception to the rule, and in order to simplify assembly and construction problems for the many fans who are building this super, we have asked our laboratory to assemble a set, the photographs of which appear herewith. We believe this will help to stem the tide of assembly and construction detail questions that have flooded our technical department.

The layout of apparatus, made according to the manufacturer's plan, indicates that the designer knows super-heterodynes. The performance at tests this contention abundantly.

The clear views on this page give the exact appearance of the set when completed.



Another view of the super-het that will eliminate doubt in the minds of ON THE AIR fans building this efficient super-heterodyne.



COMPLETE WIRING PLANS IN OUR NEXT ISSUE
 Wiring diagrams showing how each department of the set is completed, step by step, so that you cannot go wrong, will appear in the February issue of ON THE AIR.

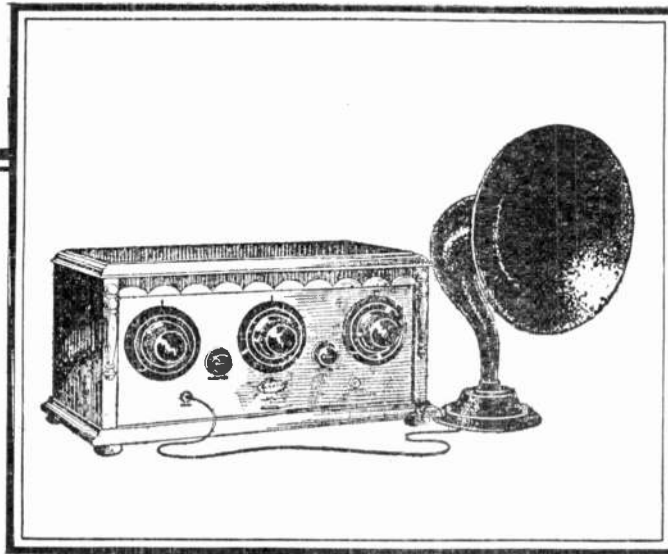
FIRESIDE

RECEIVER

Price

\$55

Without Accessories



Price

\$85 to \$95

Complete With All Accessories

No Radio at Any Price Can Give You Greater Satisfaction

Perfect tone, simple operation, greater selectivity and greater pride in your set characterize the Fireside Radio Receiver. You may pay more for other sets, but you cannot realize greater value than is found in this remarkable 5-tube R. F. model.

HERE IS A COMPLETE LIST OF FIRESIDE EQUIPMENT, READY TO INSTALL:

- 1 Fireside Model 1926 Five tube receiver.
- 1 100 Ampere Hr. Storage Battery, ready to hook up
- 2 Guaranteed, nationally advertised 45-volt B batteries, tested before shipment
- 5 Type 201A tested and approved Tubes Guaranteed for 30 days
- 1 4½ volt. C battery
- 100 feet enameled aerial wire, ground wire, antenna insulators, connection wire, etc.
- 1 Loud speaker plug
- 1 Nationally advertised loud speaker.

NOTE: Cost of the above equipment is either \$85 or \$95, complete and all ready to install.

The \$95 equipment merely means that a bigger and more expensive loud speaker is used. Otherwise the accessories remain the same.

The receiver is the same in both instances.

HERE is an efficient five tube receiver of the radio frequency type that will clearly and faithfully reproduce broadcast programs as though the selections were being rendered in the same room!

Quite a claim for a set manufacturer to make, but in the Fireside Receiver quality and naturalness of tone have been combined with a selectivity and simplicity that make this new set adaptable to any conditions; it is efficient in congested city areas as well as in the country, and brings in all stations within a radius of 2500 miles on the loud speaker, clear, forceful, and consistent.

The performance of the Fireside Receiver is reliable, because each set is laboratory assembled and tested. Each set is built with precision parts such as are used in the best circuits and receivers, everywhere. How easily it tunes! You merely set the three dials uniformly, adjust the volume control and listen to wonderful programs from the country's best stations.

The Latest Type

The Fireside is a five tube set incorporating the latest tuned R. F. circuit. It is an up-to-date 1926 model designed to meet present-date requirements, and a set that we guarantee will be just as up-to-date five years from now as it is today. Coast-to-coast reception over the entire wave band of 200 to 550 meters is assured. The set is encased in a beautiful solid mahogany cabinet, designed to satisfy the most discriminating tastes in furniture.

In order to acquaint readers of this magazine with the unheard-of qualities of the Fireside Set, we are offering for a limited time one hundred Fireside Radios at a price that will mean quick sales of our initial allotment for 1926. This is a limited offer, and to take advantage of it you must fill out the coupon below immediately. No money is necessary, nor are you obligated to buy. But sets will be delivered in order of the inquiries received.

Fireside Radio Co.

Manufacturers

25 East Jackson Boulevard
Chicago, Ill.

Fireside Radio Company
25 East Jackson Blvd.
Chicago, Illinois.

Gentlemen:

Without obligation please send me full information on the New 1926 Fireside Five Tube Receiver. I am particularly interested in

Console Model Standard Model (illustrated)

Name.....

Address.....

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

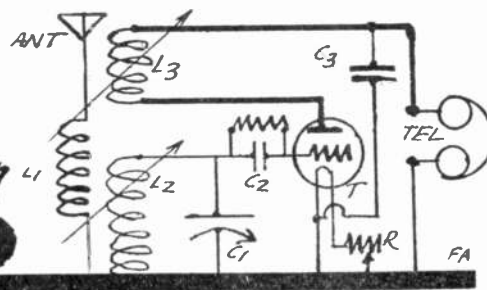
Are you interested in the
 Completely guaranteed model and accessories? Non-Guaranteed Accessory Plan?



Tell them you saw it advertised in *On the Air*.

A DEPARTMENT FOR OUR READERS

Feedbacks



This department is composed of contributions by our readers, and ON THE AIR assumes no responsibility for statements made by such contributors. It is a department where readers may discuss and submit ideas, achievements, kinks and experiences for the mutual benefit of all enthusiasts.

HMMMM! Happy New Year everybody. Hope you had a nice Christmas. Hmmm! (As we roll up our sleeves) Our New Year's Resolution was that we were going to make this department better and better each month. Lotsa mail this morning. Lesees now—here's a letter from Toledo, Ohio.

Technical Editor's, "On the Air."
1322 Kimball Bldg.,
Chicago, Ill.
My Dear Sir:

It was with extreme pleasure that I was again able to secure a copy of "On the Air" for October for I certainly missed the snappy articles always so ably written in this magazine.

In fact after not seeing an issue since late spring, I felt that the query for ideas to constitute a real radio magazine, had brought such a deluge of suggestions that the editors had decided it impossible to publish a magazine that would please all fans, from many possible diversified ideas.

However, I was agreeably surprised on perusing my October issue to find, that not only had they been able to "get out from under", but had published an honest to goodness radio magazine that incorporated about everything interesting to the most critical radio fan, and here's hoping they keep it up. Really, I believe that "On the Air" as now published, fills a long felt want in radio. **KEEP UP THE GOOD WORK.**

Sincerely,
D. H. GOON,

3380 Monroe St.,
Toledo, Ohio.

Well, waddayuh know about that. Mr. Goon likes our magazine, and likes it much. We're mighty glad he does, and we hope the rest of you are finding it just as interesting and instructive. Only we wish you'd write us a little more and tell us when we please you and when we don't. Just like a radio program, we've got to depend on acknowledgement to feel the pulse of your wishes. If we're not treating you right, TELL us. Don't be a dead sport. It's a lucky thing we aren't sensitive. We'd think you were browng us.

G. B. Bassler, the fellow we kidded last month about not being able to find the "resonance" point (and Mr. M. subsequently whittling one for him out of a packing case), came back at us with the following list of stations heard on a Mon-

day night with a Bremer-Tully Counterphase:

WLW, WHB, WBZ, KDKA, WJAR, KPRC, WRBC, WDOJ, WRR, WHAD, WMAK, KWKH, WCLO, WSOE, WHN, WSMB, KSD, WOAW, WSUI, WBAP, WTAM, KTHS, WJAD, WSM, WSAI, WMCA, KOA, WJR, WSB, WAHG, WDAF.

Personally, we think he must have used the resonance point to spear them out of the air. On second thought, we are inclined to retract, knowing just what a BT Counterphase will do.

The Redfield Advertising Agency writes and tells us some good news in regard to draftsmen's equipment. They say that the American Lead Pencil Company of 220 Fifth Ave., New York City, are putting out a thin leaded blue pencil upon the request of radio engineers who use them in drawing circuits. The pencil comes in various colors, and these varied colors can be used to distinguish separate circuits in schematic and circuit diagrams. You radio men write for a free sample.

A radio amateur in the Eighth district recently wrote our esteemed contemporary QST that he blew out eight tubes in his super-



THE "YL" AT KGO

The "young lady" at KGO is none other than Roberta Wood, a member of the San Francisco YWCA, who is one of the group of girls engaged in regular educational talks from KGO on Friday nights. After gazing and sighing over her photo we've decided to tune in to KGO next Friday night at 5:30 P. ST.

heterodyne recently by accidentally short circuiting the A and B batteries in pushing his Corona typewriter to one side. He asks them if that is what you would call a "Corona discharge." Personally we think it was mighty darn expensive.

WHICH REMINDS US THAT FRED GOOD, WHO DREW OUR DECEMBER COVER, CAME IN THE OFFICE THE OTHER DAY, AND UPON SEEING FELIX ANDERSON'S PORTABLE REMINGTON WANTED TO KNOW WHICH ONE OF THE L. C. SMITH'S HAD PUPS. HII

Here's is a list of stations heard by a California fan that should make the rest of you oscillate. His name is J. H. Terry, and lives in Monrovia, California, way out where the wind starts. The list is as follows:

WOQA, WKRC, KBCL, KFOA, KTCL, KFSG, KNRC, KTBI, KRCA, KHJ, KFI, KFWB, KFQZ, KNX, KMJ, KFVD, KFWO, KRE, KFGV, KFRC, KPO, KLX, KGO, KTAB, KFON, KFQV, KPCC, WHT, KYW, WBBM, WOK, KFBR, KOA, WFAA, WOAI, CFN, CNRV, KFVR, KSL, KFCB, KOB, KGW.

Mr. Terry uses a Turner Radio Model A. Can you beat that list and with what? This was heard in one evening, September 19th, 1925.

Here's a suggestion to make the Regenerator in the September issue still more selective than it already is. Some antennas vary with respect to inductance and capacity (and consequently natural wavelength period) and often impair the effectiveness of "fixed tune coupling" which is employed in the circuit as given.

The remedy is to wind a loading coil of fifty turns of number eighteen double cotton wire on a three inch tube. Take taps off every fifth turn and run them to a set of switchpoints on the panel or to a clip arrangement. Reduce the number of turns on the primary coil to about five or six, and connect up the whole shooting match as illustrated in Figure 1. When you tune the set the next time, notice the difference.

By the way, you can use this scheme on any tuned RF receiver that uses a semi-aperiodic (fixed tune) primary. The coil is connected with the finish end of the coil to the antenna post on the receiver, and the clip or switch to the antenna. It does make a difference.

O yes. Keep the loading coil at right angles and at least a foot from the secondary or tuning system of the set. (Turn to page 48)



Let Our Own Engineers Help You Choose a Radio!

IF YOU are contemplating buying a new radio set or new parts to build your own receiver, you will want the best for your money, or you will never be satisfied. The average fan has not the facilities or the inclination to study the peculiarities of a radio before making his decision. He takes a chance; and sometimes he is lucky, while invariably he wishes he had bought another set.

TO SERVE those readers who want expert technical counsel, ON THE AIR installed a research laboratory in its offices—the most efficiently equipped and modern radio laboratory maintained by any radio publication. A group of nationally known engineers preside over this laboratory, and their services are at the command of ON THE AIR readers, at no charge. All we ask is that you fill out the coupon on this page, indicating your needs, and by return mail will come all the information you are seeking.

ON THE AIR'S Laboratory engineers are ready to supply you with a detailed analysis of your radio problem; diagrams if you wish to build your own; recommendations, prices and other buying specifications if you wish to purchase equipment complete; or our engineers will merely give you their personal opinion of the apparatus inquired about, sending you detailed manufacturers' literature if you desire.



This Service Takes the Guesswork Out of Radio Buying!

THIS COUPON WILL HELP YOU—FREE!

Editor, On the Air,
1322 Kimball Building,
Chicago, Ill.

Dear Sir: I am interested in { radio receivers } and would like your advice on what apparatus to choose, at no obligation to me. I am particularly interested in { radio parts }

(Note: Specify above whether you want specifications of receivers, and if so, number of tubes and circuit or diagrams for your own use. Buying specifications, prices, etc., will be furnished if desired. If detailed information is wanted, use another slip of paper.)

Name.....

Address.....

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

1-26

Note:— Purely technical inquiries should be addressed to the Technical Dept. and NOT sent with this coupon

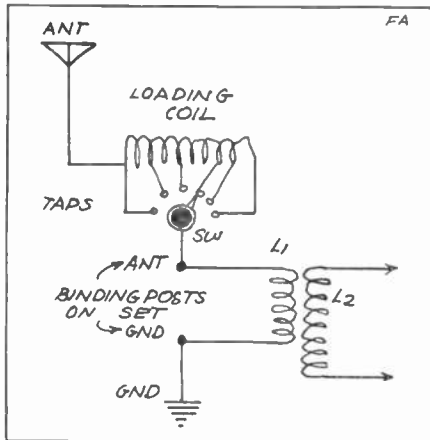
Tell them you saw it advertised in On the Air.

(Continued from page 46)

Clarence Class tells us that he hopes they never start to advertise Listerine or Lavis over the air by actual demonstration. "How," asks he, "will I be able to tell when my radio is working right or not?" Does anyone remember the way Art Linick used to sing Mrs. Schlagenbauer? If you do, you can easily get what we mean when we say that we thought our receiver had an audio frequency mutter in it. The R's were distorted awfully.

Here's one of our readers who got his FIFTEEN cents worth of radio out of ON THE AIR judging by the following letter:

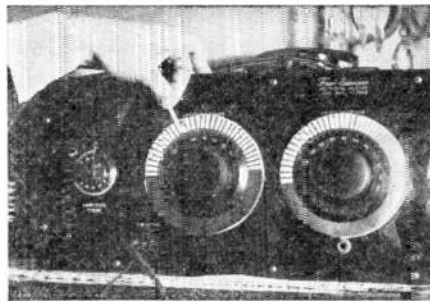
In the November issue of your maga-



The above is a suggestion for further improving the selectivity of the Technical Editor's Set described in our September issue. The wavelength of the antenna is varied by means of a tapped coil, and the secondary primary ratio is much reduced. Try it; the results are surprising, and can be incorporated with most any set.

zine I found an article that I know must be of interest to every radio fan, as it was to me: Interference in Radio.

The great number of radio stations and their closeness together in wavelength, has caused me, and I know it has others, lots of trouble, and there are times that it has been impossible in the lower wave lengths to separate them, and all one could get was squeals. I am using a Crosley Trirdyn and have had wonderful luck with it, but I have had this trouble. After reading your article and looking at the picture of the counterpoise shown, an idea occurred to me and I immediately put it into operation. I am inclosing a sketch of my house and aerial to give you a clearer idea of what I did. My aerial as you will see is of the umbrella type, and I could not build the counterpoise as your article suggested, but I got to wondering if the tin roof on which the aerial mast sat, would not act in the same capacity, so I soldered a very fine wire to the edge of the tin roof, led it into the house and direct to the post on which my ground wire was fastened, removing the ground wire. In the evening I tuned in and was simply amazed at the change. From 18 to 22 on my dials I had been unable to get anything but squeals, imagine my sur-



A NOVEL STATION FINDER

This arrangement called the Simplifinder consists of pasting a series of small strips of paper as illustrated, bearing the call letters of the station, on a piece of cardboard fastened to the panel. When zero of the dial is turned toward the paper marker, the station is received. This makes a novel and permanent record of stations.

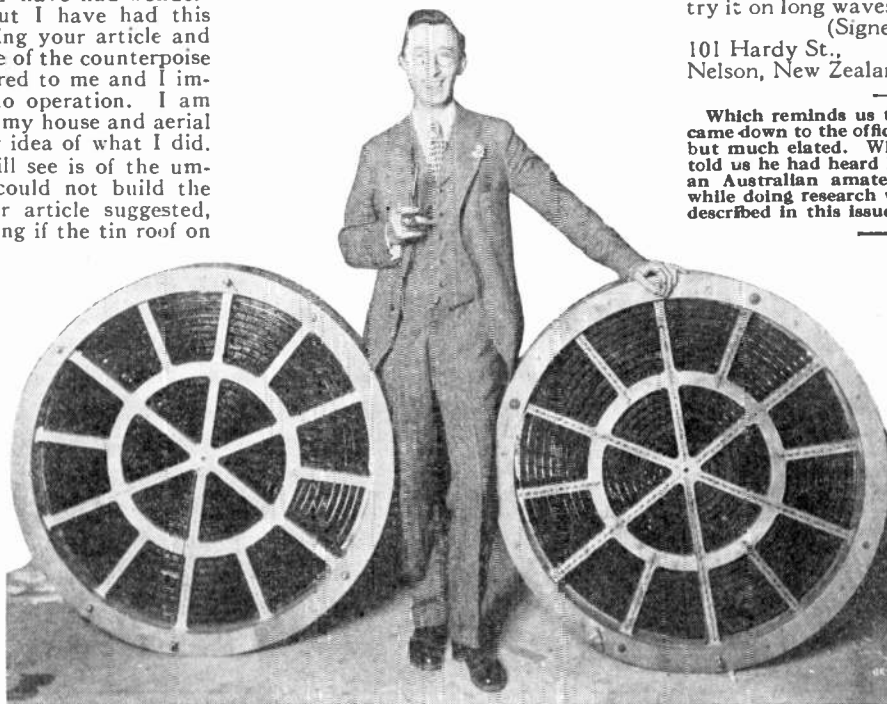
prise when in the space of 2 1/2 degrees at this point I cleared up and heard clearly five separate stations, I also find that the general tone of the music is largely improved.

I am not enough of a radio expert to know whether what I did has had the same effect that your proposed counterpoise would have done, but I know that it has improved my reception wonderfully.

On Tuesday night of last week at 1:30 I picked up KFI without any trouble. Thinking that perhaps some other radio lover might be interested in my experiment, I am sending you this idea, with my permission to use it in any way you may see fit. THANK YOU.

E. W. REMINGTON,
17 North Fifth Ave., Ilion, N.Y.

For Mr. Remington's benefit we'll say that the tin roof made an excellent counterpoise system, and it is only regrettable that more fellows don't do a little trying here and there with what they have. The moral of this whole business is, don't always blame the receiver. Many times it's the fault of the accessories—and my how we trust antennas and ground connections.



No—this gentleman is not standing at the output end of the Grand Avenue sewer. The two circular affairs are giant power loudspeakers, each three and a half feet in diameter and weighing 450 pounds. They consume over 4,000 watts of electrical power and supply sufficient volume to entertain 50,000 people.

We ask you—why bother with a good secondary tuning circuit when all your signal is dissipated in antenna resistance? You know there is such a thing as antenna resistance, and OH Boy what it doesn't do to that DX signal.

H. A. Hobbs, a New Zealand ON THE AIR fan, writes to us and tells us that he has had unusual success with the little Myers HI-MU tube. He says:

It may be of interest for you to know that a few days ago I made a short wave set from specifications in an English radio magazine. When trying this set out I



RADIO'S GREATEST LIAR

The above cut is a photo of one Mr. Tarrybeil Obnoxious, the radio profession's greatest prevaricator. His latest story is that he built a one "pup" receiver delivering such tremendous volume that he had to use a special loudspeaker employing a stove lid for the vibrating diaphragm of the unit.

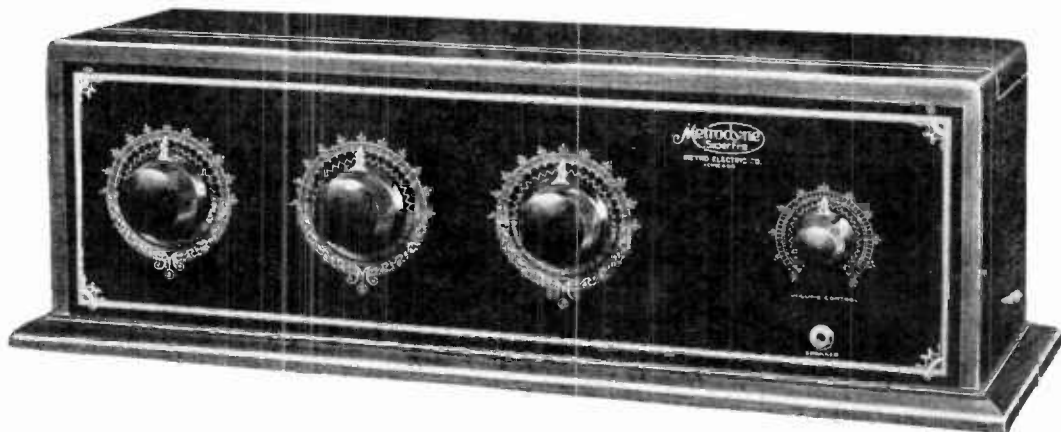
heard the call WNP." [You are all acquainted with WNP I am sure. The MacMillan exploration ship SS Bowdoin Wireless at the North Pole.]

"I was using only one Myers HI-MU valve (thats what the Zeddies call them—Valves heh heh) and the tuning was on about forty meters. Naturally I am much pleased with the valve and shall try it on long waves.

(Signed) H. A. HOBBS,
101 Hardy St.,
Nelson, New Zealand.

Which reminds us that our technical man came down to the office one morning all groggy but much elated. When asked "howcum?" he told us he had heard New Zealand 4AC calling an Australian amateur early that morning, while doing research work on that wave tuner described in this issue.

30 Days' Free Trial



Wonderful long distance 5-tube radio set, get coast to coast on loud speaker. Mail coupon below. Do not buy a radio set until you send for our liberal Free Trial Offer. Direct from factory to you at less than dealer's cost (until we have a dealer to represent us in your district). This wonderful coast-to-coast 5-tube radio set will be shipped anywhere in the U. S. for 30 days' FREE trial. Test it yourself in your own home and if you do not agree that it is the greatest Radio Set in the country, return it to the factory.

Metrodyne Super-Five Radio Set

Price \$48.50 (Retail Price)

Agents—Dealers! Wholesale prices! Make big money selling Metrodyne sets—all or part time. No competition—lowest prices. Send for 30-day FREE TRIAL Demonstrating Set.

Thousands are enjoying this wonder 5-tube radio. Buy now and save 50%. Tune in on the Merry-makers—listen to the world's best music—hear lectures—market reports, news! Get New York, Honolulu, Canada, Mexico! To prove that the Metrodyne can do all this—that it is the best radio buy on the market—we will send you a Metrodyne Super Five-Tube Radio set on 30 days free trial. We have thousands of testimonial letters from happy buyers who took advantage of this astounding offer! Some of them have made money on last minute farm market reports which paid for their set many times over.

World's Greatest Radio Set

The Metrodyne Super-Five is a 5-Tube Tuned Radio Frequency Set, approved by America's leading radio engineers. Highest grade low-loss parts. Magnificent Walnut Cabinet. Beautiful genuine bakelite panel with all designs, charts, and borders heavily plated. Anyone can operate the Metrodyne Super-Five—the last word in volume, clearness and powerful long distance reception.

MAIL THIS COUPON

Only a 2c stamp or a postal card brings you positive proof from thousands of owners that the Metrodyne is unequalled for selectivity, long range, and all around performance and quality. Remember, we give you 30 days free trial in your own home. Mail the coupon now.

METRO ELECTRIC CO.

1243 S. Wabash Ave.

Dept. 118

Chicago, Ill.

Read what some owners say:

J. W. Bryant, Perry, Kan.: Received Metrodyne at 2 o'clock. By 5 I tuned in New Orleans, Omaha and Memphis. C. M. Charlton, Donora, Pa.: I think the Metrodyne is the best on the market. M. Livingston, Port Huron, Mich.: My Metrodyne brings stations from coast to coast. Works better than our old \$275 set.

Andrew Harcharek, Lyon, Pa.: My trial is up and I have decided to keep the Metrodyne. Four of my friends want to buy Metrodyne.

D. S. Newton, R. S., Centerville, Kans.: We sure have enjoyed our Metrodyne. We have listened in on three stations in Chicago, also Lansing, Council Bluffs, Portland, Long View, Wash., Pittsburgh, Miami, New Orleans and others. It is a wonderful outfit.

Wm. Nottitz, R. 10, Columbus, Ind.: I have about 75 stations "logged that come in on the horn. This is about the best instrument I ever heard, and for long range it cannot be equalled by any other five-tube set.

Harry S. Phelps, Laurel, Md.: I am well pleased with the Metrodyne. I am boosting your set and shall be pleased to induce my friends to buy.

E. M. Sierler, Box 301, Mishak, N. Dak.: Today I let you know that I got my radio Metrodyne Super Five and set it up. It worked good for summer. Fine. If the nights are good I get New York, Chicago, California, so I believe it is a good set.

METRO ELECTRIC CO.,
1243 S. Wabash Ave.
Dept. 118, Chicago, Ill.

Gentlemen:

Send me full particulars about the Metrodyne Super-Five Radio sets, and your 30-days FREE trial offer.

Name.....

Address.....

Tell them you saw it advertised in *On the Air*.

On the Air Research



Radio Laboratories

With the general improvement of radio apparatus in mind and with the object of presenting the arguments of the manufacturer to the reader in a way that places responsibility with this magazine, we are maintaining the On The Air Research Laboratories as a part of this organization.

Manufacturers disposed to do so may send apparatus to this department for test and approval. If the apparatus does not pass the requirements, it will be returned to the sender with suggestions for improvement. Each approved device is awarded a certificate, with permission to use the seal of approval of the laboratory shown above.



LOUDSPEAKER

Test No. 146. The Lakeside Supply Company of 73 West Van Buren St., Chicago, Illinois, submitted one of their new metallic loudspeakers for test in our laboratory, and after putting it through an elementary test our engineers agree it passes our requirements for loudspeakers of the metal classification. There is a distinct absence of metallic ring in the reproducer, and the percentage of volume and faithfulness of reproduction are highly satisfactory.

AWARDED THE ON THE AIR RESEARCH LABORATORY CERTIFICATE OF MERIT AND APPROVAL NUMBER 248.



INSULATOR

Test Number 149. The wall insulator illustrated in the above cut was submitted by the Wirt Company of 5221 Greene St., Germantown, Pa., and needs little comment as to effectiveness. When used in the transmitting system at the laboratory station 9DQS no measurable flaws could be detected, and the insulator stands up well under the strain of high frequencies generated by a 50 watt oscillator.

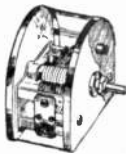
AWARDED ON THE AIR RESEARCH LABORATORY CERTIFICATE OF MERIT AND APPROVAL NUMBER 251.



FIXED RHEOSTAT

Test No. 155. Our readers are no doubt familiar with the good Amperite of the Radiall Company of 52 Franklin Street, New York City. The newer types for the UX and CX tubes were submitted for tests and Mr. Hopkins of the research staff says they measure up to standard, being designed for considerable overload minimizing the possibility of burning out, and in general being very serviceable.

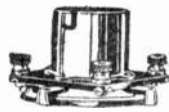
AWARDED ON THE AIR RESEARCH LABORATORY CERTIFICATE OF APPROVAL AND MERIT NUMBER 254.



VARIABLE CONDENSER
Straightline Frequency Type

Test No. 147. In testing the Walbert .00035 and .0005 MFD types of straight line frequency condensers we find them to have a rather high value of minimum capacity but comparatively low losses. We attribute the high minimum capacity value to the two large metal end plates which form a condenser all of their own. This does not detract from their efficiency however, since they are justified by acting as the supports for a very neat looking transparent dust shield. The condensers are manufactured by the Walbert Manufacturing Company of 925 Wrightwood Ave., Chicago, Illinois.

AWARDED THE ON THE AIR RESEARCH LABORATORY CERTIFICATE OF MERIT AND APPROVAL NUMBER 249.



TUBE SOCKET
Cushion Type

Test No. 150. These cushion sockets manufactured by the Illinois Radio Company of Springfield, Illinois, are one of the finest types of tube sockets that have yet been submitted to the laboratory for inspection and test. They are of the metal shell type, of good insulation, and exceptionally meritorious construction. The entire socket is suspended (it practically floats in air) by a very resilient rubber base of excellent design and material. In tests in a super-heterodyne circuit no microphonic noises could be generated in the tubes unless the support on which the receiver stood was subjected to a terrific jolt of intensity that is never experienced in radio listening. Our engineers all agree that it is one of the finest sockets on the market.

AWARDED ON THE AIR RESEARCH LABORATORY CERTIFICATE OF MERIT AND APPROVAL NUMBER 252.

RADIO EQUIPMENT

Test No. 151. The Bremer Tully Manufacturing Company of 528 S. Canal Street, Chicago, Illinois, submitted the following apparatus for test, and the corresponding test numbers were assigned:

Test Number 151. Straightline Frequency Condenser .0005.

Test Number 152. RF Choke Coil

Test Number 153. Indicator Dials

Test Number 154. Tube Sockets.

The SLF condenser easily passed the requirements for a good variable condenser, since we find there is some question as to whether the losses were not lower than the laboratory standard we use. The frequency curve is practically flawless and the entire unit is characteristic of the "better tuning" policy of Bremer Tully. The RF choke coil did just what it is designed for, efficiently and with dispatch, and only an operating test was accorded it. Our engineers decided that while the dial is a little rough in appearance, it will certainly stand heavy duty, and will bear the strain of continuous operation without deteriorating in performance. The tube sockets are of average design except with respect to the contacts. They employ a special wiping contact of excellent work, which are certainly positive. Mr. Kelley remarked during the inspection that they must have been designed to cut the tube prongs off.

The above equipment has been AWARDED ON THE AIR RESEARCH LABORATORY CERTIFICATE OF MERIT AND APPROVAL NUMBER 253.



RADIO EQUIPMENT

Test No. 156. While the Crosley Pup receiver submitted by the Crosley Radio Corporation does not represent absolute perfection in radio engineering, our engineers have considered the purpose of its design and performance, and are ready to agree that for a cheap large production receiver it is entirely meritorious, and that excellent results are obtained. The Crosley Musicone which represents Powell Crosley's latest contribution to the radio accessory field of the radio profession is a beautiful piece of workmanship as well as a very efficient loudspeaker. In test number 157, this speaker performed very well indeed.

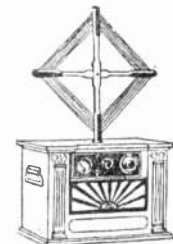
This equipment has been AWARDED ON THE AIR RESEARCH LABORATORY CERTIFICATE OF MERIT AND APPROVAL NUMBER 255.



TELEPHONES

Test Number 148. The headphones submitted by the Trimm Radio Manufacturing Company of 24 S. Clinton Street, Chicago, Illinois, were subjected to a rigid test on low wavelengths in an effort to determine just how effective they were on weak signals. In the tests we are pleased to report that when they were used in connection with the low wave super frequency set described in this issue, New Zealand station 4AC was heard calling; six California amateurs were heard with good audibility in daylight on short wavelengths, and the critical variations in frequency of KDKA, WGY and other low wave phone stations were reproduced with remarkable faithfulness.

AWARDED ON THE AIR RESEARCH LABORATORY CERTIFICATE OF MERIT AND APPROVAL NUMBER 250.



RADIO RECEIVER

Portable Type

Test No. 161. The portable radio receiver manufactured by the Operadio Corporation, 8 Dearborn Street, Chicago, Illinois was rigidly tested under various conditions by our Chief Engineer in exacting locations and both favorable and unfavorable surroundings. He reports that the receiver is very efficient, and that we make no mistake in awarding it a certificate.

AWARDED ON THE AIR RESEARCH LABORATORY CERTIFICATE OF APPROVAL AND MERIT NUMBER 259.



**PHONE PLUG
Flush Type.**

Test Number 158. After exacting inspection and critical examination with a complete operating test, we are ready to announce that the telephone plug manufactured by the Carter Radio Company of 322 S. Racine Ave., Chicago, Illinois, is a worthy piece of apparatus and that it merits approval. It is of the new flush type, and has positive contacts for the phone tips.

AWARDED ON THE AIR RESEARCH LABORATORY CERTIFICATE OF MERIT AND APPROVAL NUMBER 256.



FIXED CONDENSERS

Test Number 159. A capacity and radio frequency resistance check on the condensers of the Sangamo Manufacturing Company of Springfield, Illinois, comprising tests on their .00025 and .005 MFD types show that they are very accurate and vary imperceptibly from their rated capacities. Their construction is very commendable and our engineers are pleased to recommend them. They have a moulded bakelite housing which keeps the capacity fixed and definite despite changes in atmosphere, and in all around design they represent a very high standard of condenser manufacture. There should be more condensers such as Sangamo on the market.

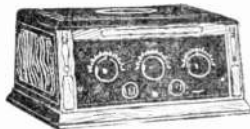
AWARDED ON THE AIR RESEARCH LABORATORY CERTIFICATE OF MERIT AND APPROVAL NUMBER 257.



**AMPLIFYING UNIT
Resistance Couple Type**

Test Number 160. Our engineering department at the request of many readers secured one of the popular types of resistance coupled amplifiers of the ready made type and put it through rigid tests comprising voltage amplification, volume increase, musical range and power consumption. The type tested was the Allen-Bradley three tube resistance coupled amplifier, manufactured by the Allen-Bradley Company of 286 Greenfield Ave., Milwaukee, Wisconsin. In recognition of its excellent performance under exacting conditions it has been

AWARDED ON THE AIR RESEARCH LABORATORY CERTIFICATE OF APPROVAL AND MERIT NUMBER 258.



RADIO RECEIVER

Test Number 162. It is our policy to test out advertised products in advance of accepting their contracts, and in accordance with this policy our engineering staff was asked to test and report on the Erla Five Tube Radio Frequency receiver. The report reads that the tests show the set to be highly selective, productive of a very beautiful tone quality, and that it has exceptional range. The electrical inspection and test furthered the strength of the approval report of the receiver in question.

AWARDED ON THE AIR RESEARCH LABORATORY CERTIFICATE OF APPROVAL AND MERIT NUMBER 250.



FIXED CONDENSER

Test No. 163. The Micamold Radio Corporation of Flushing & Porter Avenues, Brooklyn, N. Y., submitted samples of their .0005 Fixed Condenser and this condenser was tested at the same time the Sangamo condensers mentioned elsewhere in these columns. The Micamold is very much the same type of condenser as the Sangamo, and performs very well indeed. A check on the capacity rating and losses show it to be very efficient.

AWARDED ON THE AIR RESEARCH LABORATORY CERTIFICATE OF APPROVAL AND MERIT NUMBER 261.

**ON THE AIR
Radio Research Laboratory
Certificates**

are awarded to manufacturers of apparatus who submit samples of the devices they manufacture. To acquire a certificate for a product the following requirements should be observed:

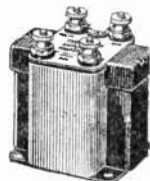
1. A sample for test should be carefully selected and forwarded to ON THE AIR Radio Research Laboratories, Room 1322 Kimball Hall Building, 306 S. Wabash Ave., Chicago, Illinois.
2. A letter stating that the device is submitted for approval and test should accompany the package.
3. This service is maintained for non-advertisers as well as space users of ON THE AIR magazine. Any manufacturer is free to submit apparatus for a certificate.
4. Apparatus passing the laboratory requirements will be returned whenever possible. At times tests require the dissection of the sample submitted. In such cases, we will notify the manufacturer.
5. Apparatus not passing tests will be returned whenever possible to the sender with suggestions for improvement.
6. Advertising writeups for these pages will not be accepted. Only actual tests will appear in the columns of ON THE AIR Radio Research Laboratory department.
7. Upon completion of tests, a certificate is furnished regarding the tests signed by our technical staff.



BATTERY CHARGER

Test No. 171. The organization of Straus & Schramm, Dept. 2219, Chicago, Illinois, announced their intention of advertising the Balkite Charger, so our engineering department was instructed to test out this charger. A check was made on the charging rate and efficiency of the charger, and we take pleasure in announcing that this charger has been

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AUDIO TRANSFORMERS

Test Number 166. We had the pleasure of testing out the Autoformer manufactured by the Thordarson Electric Manufacturing Co. of 500 W. Huron Street, Chicago, Illinois some time ago, and Mr. Coombs, their sales engineer was so pleased with the tests that he promptly sent us four of their standard types, including ratios of 2:1, 3 1/2:1 and 6:1. After testing these transformers out and making curves on their amplification characteristics, we feel that they are just as worthy of our OK as the Autoformer, if not more so.

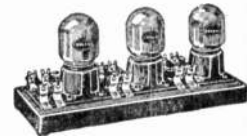
AWARDED ON THE AIR RESEARCH LABORATORY CERTIFICATE OF MERIT AND APPROVAL NUMBER 264.



LOOP ANTENNA

Test No. 170. The W. I. Thomas Company of 217 N. Desplaines Street, Chicago, Illinois, submitted their entire line of loop aerials, the most popular of which is illustrated above. All types manufactured by the Thomas Company were tested and inspected for electrical design and materials, construction and performance, and it is with pleasure that we are enabled to announce that they have been

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**AMPLIFYING UNIT
Resistance Coupled Type**

Test Number 167. While we had the laboratory set up, we decided to test as many ready made resistance coupled amplifiers as we possibly could, and so the Daven Resistance Coupled Amplifier, 3 tube type was obtained, and tested along with the Allen-Bradley. We like this amplifier very much, since it is designed with the intention of using the Daven H-MU tubes, expressly used for resistance coupled amplification. This amplifier made by the Daven Radio Corporation, 158 Summit Street, Newark, N. J. is only another reason why the Daven organization is earning for itself the title "Resistor Specialists."

AWARDED ON THE AIR RESEARCH LABORATORY CERTIFICATE OF MERIT AND APPROVAL NUMBER 265.



AUDIO TRANSFORMER

Test No. 168. The audio transformer illustrated above of the Karas Electric Company of 4038 N. Rockwell Street, Chicago, Illinois has been tested by our technical staff in research work with the Technical Editor, Set described in the September issue, and its performance as to voltage amplification, quality and musical range warrants our certificate and OK. It is sturdily constructed and somewhat larger than the usual transformer, and the results are much above the standard types. We believe this justifies the higher price charged for the transformer.

AWARDED ON THE AIR RESEARCH LABORATORY CERTIFICATE OF MERIT AND APPROVAL NUMBER 266.



SUPERHETERODYNE EQUIPMENT

Test No. 169. The super-heterodyne kit of ne A. E. Hill Manufacturing company of Atlanta, Georgia, Department OA1, was tested in accordance with our policy of testing apparatus advertised in the columns of ON THE AIR. Our engineers are pleased to report that the transformers are so designed to give sharp tuning effect, without sacrificing any tonal quality, that the oscillator unit easily covers the broadcast band of wavelengths now in use, and that the suggested circuit arrangement of the super is very good indeed.

AWARDED ON THE AIR RESEARCH LABORATORY CERTIFICATE OF APPROVAL AND MERIT NUMBER 267.

Where is Radio Drifting?

Where will we be a year from now in this fascinating sport of the ether?

Amos J. Strong, whose first contribution to "On the Air" may be found on page 37 of this issue, has just completed a trip throughout the United States, studying radio conditions from every conceivable standpoint. His observations have been published during past years in all the big magazines throughout the world, in many languages.

And now the readers of "On the Air" are to have an entirely new series by Mr. Strong—exclusively written for the "Magazine of Radio" that everybody understands and likes!

WHERE IS RADIO DRIFTING?

will be the pertinent subject of Mr. Strong's first article, which appears in the February number of ON THE AIR. In addition, there will be new features by

S. R. WINTERS
BRAINARD FOOTE
H. FRANK HOPKINS
ARMSTRONG PERRY
C. CLYDE COOK
LINDSAY McPHAIL
FELIX ANDERSON
and Many Others!

Radio's First and Only Indian Tenor

(Continued from page 10)

the tomb of the Unknown Soldier and possibly none paid a truer nor more solemn tribute than Kiutus, a Yakima Indian, at the shrine of America's Hero. He also visited and placed wreaths on the graves of three comrades of the World War and sang the tribe's death song, placed beads and trinkets upon their graves; a custom which has prevailed for many centuries within the tribe. Among the graves visited were that of the great Chieftan Tecumseh, as well as the resting place of an Indian soldier, Joseph Take the Shield, who was killed in action in France, Eugene Walking Shield and Ray Red Fox, who died during the early part of the war.

Upon arriving in New York, Tecumseh found himself well heralded with front page pictures and stories telling of his arrival and important part that he was to play over WEAf that evening, as he was to sing on the same program with John McCormack.

Now, much regarded, he returned once more to Chicago to be offered a position on the staff of WLS. At the same time, however, he returned to musical college to resume his studies and here he met a much needed and a well chosen companion, Simeon Oliver, an Eskimo lad from the Aleutian Islands at Unalaska, Alaska, who was studying the piano. They became fast friends.

Oliver is an orphan, but at 4 years old he played quite well; in fact, so well that he was the only spot of happiness for miles around. As the cowboys tramped from miles around to hear Tecumseh, so did the Eskimos and tourists come to hear little Oliver. He completely wore out his small "Billy Sunday" piano (which he called a tiny piano that he had used), and he attracted so much notice that his people called him a genius. Raised at a mission school, he had little opportunity to really study music, so he came to Chicago and enrolled at The Chicago Musical College, where he met Tecumseh.

Now both chums appeared regularly over WLS as staff artists and won much favor among Chicago listeners. Last Spring, "Ford and Glenn," with Tecumseh and Oliver, went on a tour—toward the west this time, and Kiutus looked forward to greet his parents.

Traveling Homeward

FROM city to city they went, making great "hits" over popular radio stations and winning in the next morning papers many columns of applause. Thus they traveled until Tecumseh reached—"Home"—his "Land of Sunshine and Apples," his "Valley." Were they not his? Did not his people roam the prairies first? Until the paleface drove them far west, and now back in The Valley, stood Kiutus, not uttering loud shrill cries of the warrior's return, but blowing the horn of his taxi which brought him before the house of his parents. Thus the old legends are only memories. True and beautiful, but only memories.

Home at last. Now he greets his

Now Come the "Villagers" of Radio

(Continued from page 20)

time they face a microphone? *You're not, anyway!*"

"Oh, no! Mike makes your knees shake the first time."

"They did?"

"Ummm."

"But I notice they don't tonight.—Do you like to broadcast?"

"Well, if you must know," pouted the wayward Miss Carey, "broadcasting is so dumb!"

"Tut-tut! What will my readers think?"

"Oh, but I love to broadcast," Miss Carey retrieved—"because my dear mother sits home in the apartment and listens to me!"

Joseph Plunkett has so many talented artists that justice can't be done them all. For a similar reason justice is not done them on the published programs. Have you often wondered just who were those four chaps, with the fine smooth voices that blend so evenly into one another, that are announced each week as the Strand Male Quartette?

Their names are—as they appear in the photo—Frank Meller, John Young, John Reardon, and Fred Thomas. All but Mr. Thomas lead troubled lives, or, at least, are married. But independent Fred finds that radio makes up for the lack of a wife. "The broadcasting station is a club and home in itself," he says. "And I've found plenty of people, plenty, to appreciate me over the air. I don't need a wife!"

Hooray for Mr. Thomas, cry we all! This foursome of smiling faces has launched records for the Victor, Edison, and Brunswick companies.

Mr. Plunkett himself is the sort of man you don't notice such an awful lot till an emergency, when he is right there with the goods. First of all, he's a business man. He doesn't believe in decorative announcements, preferring to let his artists speak for themselves. Down in his office after the program he talked—a little. He gets a joy out of giving the public such fine entertainment as free as the air; but if you ask him why he broadcasts he'll tell you frankly it's because it pays in box office receipts.

father, then his mother. They are proud of their son. But why shouldn't they be? Isn't he *working* his way toward success? All his people are proud. They ask him to give a concert for only his friends. He consented to sing four numbers, but they held him until he had sung ten different songs.

He installed a super-heterodyne in the home of his parents so that they might follow his return trip. On September 3, he met Glenn Rowell, Ford Rush and Oliver at KGW, in Portland, Oregon. Going east again toward Chicago the boys appeared from such stations as KJK, Seattle, KGW, Portland, KPO, San Francisco, KGO, Oakland, KFL, Los Angeles, KNX, Hollywood, KSL, Salt Lake City, KOA, Denver and WDAF, Kansas City.

The "Beguiling Voice" From WENR

MANY a prowler through the quiet after-midnight ether has rested for a moment from the search, to listen to a low, beguiling voice on 266 meters. At this time of the night some broadcasters seem to feel that dial twisters care but little what they hear in the way of talent, preferring rather the "music" of the distant call-letters—moreover, those midnight performers who are well worth listening to, often run to jazz of the most lurid variety. So the voice with the quiet charm from WENR has been attracting a great deal of notice.

Its owner is Miss Marie Tully, and in her four months at the All-American company's station she has made an enviable reputation. Marie was born twenty-two years ago (or maybe a little more, but not much!) in the little village of Otterbein, Indiana, near the thriving university town of Lafayette. An ambition to be something more than a movie-theatre pianist kept urging Miss Tully to greater efforts in her instrumental study, while at the same time she was delighted to find that she possessed a real singing voice—a mellow, vibrant contralto that began to be talked about far beyond the little town. When a visitor from the east was heard to say that the slim girl singer had "personality," her mind was made up—she was going away to become a celebrity.

The path toward stardom led at first through many long hours of study and practice at Miami University, in Ohio. It was during these years that radio broadcasting was coming into being. One evening Miss Tully was visiting at the home of a friend who had a radio set—and got a new kind of a thrill as she heard a song over the air. From that time on her ambition was to carve out a career in the new art. She came to Chicago and presented herself as a radio artist to station WGN. To her great joy, she was accepted at once, and success was assured.

One after another, the great Chicago broadcasting stations began to offer Marie Tully, Contralto, on their programs. Applause by mail was often startling in its volume. And when Frank Westphal was given the job of finding for the new station WENR the best of Chicago's entertainers, Miss Tully was engaged as singer and accompanist.

Then came a new discovery—that she possessed that rare attribute in a woman, a good announcing voice. With its added prestige, she became Assistant Studio Director at WENR.

Listeners seem to agree heartily in appreciation of what Elmer Douglass, radio critic of the Chicago Tribune, calls the "crystal-clear voice of the woman announcer at WENR." Not all of these listeners know, however, that the voice which speaks during the intervals between numbers from Frank Westphal's All-American Pioneers is the same one which rings out a few minutes later in some stirring ballad or aria.



Free Mailing Lists
Will help you increase sales
Send for FREE catalog giving copies
and prices on thousands of classified
names of your best prospective customers—
National, State and Local—Professionals,
State, Professionals, Executives, etc.

99¢ by refund of **5¢** each

ROSS-Gould Co. St. Louis

Tell them you saw it advertised in On the

What About the Silent Majority?

(Continued from page 14)

No two homes have exactly the same radio taste. The number in which radio is taken seriously, and used for definite, constructive purposes, is larger than most broadcasters know. A retired vaudeville artist listens in and composes music as a result of the inspirations received. Many boys fish the ether for the slow-speed code instruction transmitted by a few stations. I know farmers who never miss the weather and the market reports. Some of them are also taking college courses by radio. Many watches are regulated by the radio time signals—but whoever acknowledged the receipt of a time signal?

The number of listeners whose only interest is in killing time is smaller than the casual observer would suppose. In fact, it is hard to find a listener who does not have some definite idea as to what he wants and why he wants it. The manager of a department store in Albany tells me that it is a poor week when his radio counter, with nothing priced over one dollar, takes in less than \$500.00. Surely the hundreds of customers here, representing the millions that purchase radio parts in thousands of other stores, do not spend their hard-earned cash week after week for the purpose of frittering away their time.

When all these millions begin to express their desires to the broadcasters, the evident desire of program managers to give the public what it wants can become more fully effective.

If the cat has your tongue, use a pencil and a post card. Tell the broadcasters what you want. Those who are interested in community welfare can start important movements without fighting for a place in the community chest. Programs for public schools can be multiplied indefinitely and the pupils can build the receivers. Sunday School classes can receive instruction from eminent Bible scholars, via radio. Dancing to the radio-received music of the better class has hardly begun to be developed. The community's shoulders can be straightened and its chests expanded by setting-up exercises led by experts in far-off gymnasiums. Grand opera can be heard in hall or home and radio vision may soon enable us to see the society folks in the boxes, if we want to.

The silent majority can control radio broadcasting, but not by remaining silent.

Other broadcast fans have become infatuated with the amateur side of radio and built short wave sets.

A "Clinic" for Radio Listeners

(Continued from page 39)

and if the tubes are even slightly loose in their sockets you will hear the characteristic swelling howl. This trouble is met with more often when "199" tubes are used without the proper cushions or shock absorbers beneath the base of the sockets.

Tubes are sometimes microphonic in one socket and may perform perfectly well in the other sockets owing to a defect in the socket spring contacts or notches. It is a good plan to change the position of the various tubes (except in neutrodyne) until the best arrangement is found in regard to clarity of reproduction and volume. Very often the volume can be materially increased by the simple expedient of changing the tube positions.

Howling in radio frequency sets may be caused by improper rheostat or volume control adjustments, or by too high a "B" battery voltage on the radio frequency tubes and detector. As a rule, the voltage on the radio frequency tube plates should never exceed 45 volts, while 22.5 volts is usually ample for the detector. The higher voltages are used in the audio stages. Speaking of audio stages brings to mind the fact that an old dried up "C" battery can cause a lot of noise and distortion, and also that loose jack connections or a poorly fitting plug can cause still more noise. Reflex howling is generally due to the crystal detector which should be replaced by new when the howling becomes persistent.

A low growling continuous hum may be caused by the proximity of electric light wires, either to the set or to the antenna. The antenna should be kept as far away as possible from electric light lines, and preferably should be run at right angles to the lines. For the same reason, the receiver should be kept away from light wiring and particularly from drop lights.

A Compact S-L-F Condenser

The Allen-Bradley Company of Milwaukee has designed an unusually compact Straight Line Frequency Condenser. A unique feature of this condenser is a cam which converts a symmetrically shaped condenser into an S. L. F. condenser, and distributes stations uniformly over a 360 degree dial. The Bradleydenser avoids the ungainly, unsymmetrical shape common to ordinary straight line frequency condensers, and requires little panel space. In fact, the new S. L. F. Bradleydenser, as it is called, can be mounted in place of practically any ordinary condenser. The uniform spacing of stations over a 360 degree dial facilitates close tuning.

The one hole mounting of the new S. L. F. Bradleydenser makes installation easy. The plates are of brass and soldered to provide highest conductivity.

Many Old Stations Stop Broadcasting

Now that broadcasting is well developed, insuring sufficient and regular high-class radio information, news and entertainment for years to come, it is perhaps time that someone gave attention in a systematic way of caring for or servicing the millions of receiving sets in operation. While many fans are amateur electricians or at least expert in handling and repairing their receivers, millions of them are almost helpless—let us say—behind the panel. The only thing some listeners know is that their sets don't work well or cease to function. Then they try to get some one to fix them up. There is undoubtedly a necessity of receiving set service.

Radio editors, dealers and Department of Commerce officials bear out the writer in that thousands of letters, and 'phone or personal calls are made each week either asking for advice or assistance in fixing sets. A few manufacturers and local dealers cooperate with their purchasers to a certain extent, but the Department of Commerce is unable to aid in this respect. Its inspectors are far too busy to be greatly concerned with receivers; with all the transmitters on the air, which they have to inspect and watch.

A radio supervisor suggests that a national servicing organization is now needed. He even offers to join such an enterprise, believing it would be both a blessing to the fans and a source of great income to the projectors. He suggests that membership on the part of the fans would require a payment of only fifty cents a year, which would entitle them to a year's service on a set. It would insure its being kept in first class condition; incidentally, it might eliminate a number of squealing receivers.

Million Sets in One City

ESTIMATING that in Philadelphia alone, there are a million receiving sets, the supervisor foresees a fortune in this business if it is properly organized and operated. Radio officials from all parts of the country join in testifying to its need and practicability.

The inspection of receiving sets by any branch of the Government is neither provided for in appropriations, nor permitted for that matter. Members of Congress have even frowned upon the mention of such inspection, deeming it an indication or forerunner of licensing such as is practiced in Europe. But everyone knows it is the government's idea to keep radio free. Government receiving set inspection and service to the fans, however, it has been pointed out, would be so beneficial that it might become permissible if funds for such work were available. However, such is not the case; there is no money for it, and no champion of the radio public in Congress seems bold enough to recommend legislation establishing such service. Naturally it would entail great additional work

on the part of the small field force of Radio Inspectors.

If such a service was organized, how would we pay? One system of collecting a government fee suggested was payment by the use of a special stamp procurable at all Post Offices for about fifty cents to cover the estimated annual fees.

This plan would of course require Congressional action and might be held too advanced, or not practical. There are many individuals, nevertheless, who advocate it; either as an added activity of the radio section or through the organization of a private organization backed by the radio industry and the fans; which would, of course, require no government sanction.

There is, of course, a third solution; that is that the manufacturers all maintain service stations in the principal cities, or combine interests and operate joint service stations. One part manufacturer who tried out free servicing in several cities is said to have gained a most popular and profitable following.

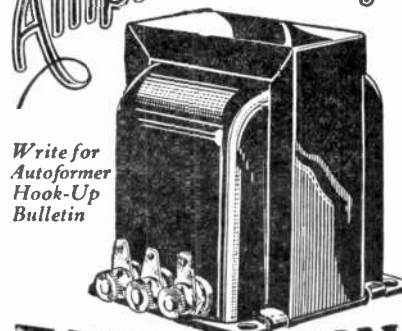
Twenty-six of the smaller broadcasters known as Class A stations, quit operating in November. Considering that no new stations were licensed recently some might think there was now considerable open space in the ether, but, as all of these broadcasters were operating on low power and sharing wave lengths between 202 and 278 meters with other stations, the loss does not go far toward relieving the congestion in the broadcast band. Had they been the higher-powered stations using the longer wave channels, considerable relief might have been noted. But there are about 180 potential broadcasters awaiting licenses, so this space would soon have been occupied by newcomers, provided, of course, there appeared good and sufficient reason for licensing them.

Some of the deleted stations listed below may be old friends to some fans particularly the Detroit Police Station which carried the significant call letters KOP. However, most of them are known to only local and district listeners in the sixteen states represented in these broadcast vital statistics.

- WCAZ Carthage College, Carthage, Ill.
- KOP Detroit Police Dept., Detroit, Mich.
- KFNV L. A. Drake Battery & Radio Supply Shop, Santa Rosa, Calif.
- KFRZ The Electric Shop, Hartington, Nebr.
- WBEA The Electric Shop, Highland Park, N. J.
- WNAR First Christian Church, Butler, Mo.
- KFGX First Presbyterian Church, Orange, Tex.
- WKAP Dutee Wilcox Flint, Inc., Cranston, R. I.
- WQAC Gish Radio Service, Amarillo, Tex.
- KFFV Graceland College, Lamoni, Iowa.
- WBBU Jenks Motor Sales Co., Monmouth, Ill.
- KFOC Kidd Bros. Radio Shop, Taft, Calif.
- KFRX J. Gordon Klemgard, Pullman, Wash.
- WBBQ Morton Radio Supply Co., Salem, N. J.
- KFIO North Central High School, Spokane, Wash.
- WBEA Plymouth Congregational Church, Newark, Ohio.
- KFAW Radio Den, Santa Ana, Calif.
- KFVX Radio Shop, Bentonville, Ark.
- WIBQ F. M. Schmidt, Farina, Ill.
- KFOF Texas National Guard, Denison, Tex.
- WQAC The Tulane University of La., New Orleans, La.
- KFDH University of Arizona, Tucson, Ariz.
- WGBW Valley Theatre, Spring Valley, Ill.
- WBBG Irving Vermilya, Mattapoisett, Mass.
- WRHF Washington Radio Hospital Fund, Washington, D. C.
- KFKQ B. H. Woodruff, Conway, Ark.

Tell them you saw it advertised in On the Air.

4 Big Improvements in Amplification!



Write for Autoformer Hook-Up Bulletin

THORDARSON Autoformer

Trade-Mark Registered

All Frequency Amplifier

It Gives You

- 1 Full amplification of those bass notes hitherto largely "lost"
- 2 Greater clarity on all notes
- 3 Improved reception of distant programs
- 4 Better volume control

Latest development of the world's oldest and largest exclusive makers of transformers. For those who wish the finest reproduction of programs to be had. May be used with any set in place of regular audio hook-up. Autoformers are \$5 each at dealers'.

THORDARSON ELECTRIC MFG. CO., CHICAGO

PATENTS

Time counts in applying for patents. Don't risk delay in protecting your ideas. Send sketch or model for instructions or write for FREE book, "How to Obtain a Patent", and "Record of Invention" form. No charge for information on how to proceed. Communications strictly confidential. Prompt, careful, efficient service. Clarence A. O'Brien, Registered Patent Attorney, 241-A Security Bank Building (directly across street from Patent Office) Washington, D. C.

Radio Supplies Wanted

England is calling for radio sets and parts according to advices reaching the Department of Commerce. Agents in Belgium and Germany also have filed inquiries with the Department's representatives relative to American radio supplies, as well as sets and parts. Information as to details of these inquiries may be secured from the Department at Washington or through representatives at large Chambers of Commerce.

The Interesting Story of Charles Freshman

FOUR years ago a man still on the sunny side of forty boarded the train for Florida, vowing never again to do a stroke of work. He had been highly successful in the rubber business in Akron, Ohio, and he had determined to enjoy life while he was still young. He had worked hard from the time of his early youth.

He found that retirement for him was only an Elysian dream. He grew restless for active business again and came back to the world of business in the North. Having been successful once, he was confident of being successful again, providing that he could find a business that would appeal to him. With this in mind he started to investigate "business" and propositions which were submitted to him. He dabbled in real estate.

Baseball was his favorite sport. During the World's Series of 1921 between the New York Giants and the Yankees he had an appointment to go to the Polo Grounds. A business conference detained him. He hadn't even time for lunch. The start of the game was only a few minutes removed and it was useless for him to try to make the game as he was several miles away. Reluctantly he started for a restaurant. But on his way he met a young man, a friend whom he had known for some time. The friend seemed excited. He told him he was going "to hear the game." "Hear the game?" cried the devotee of the sport. "Why, I had my heart set on seeing the game—what do you mean by 'hearing' it?" "Come with me, I'll show you," said the friend. "You won't need lunch when you start to hear this—you will be so excited you won't have any appetite."

He and the friend jumped into a taxicab and a few blocks away entered a home, which seemed to the stranger to be right inside of the Polo Grounds, for he heard the roar of the crowds, the shouts of the peanut vendors, and lo and behold he heard every action and play of the ball players. He was listening to a "radio set."

When the last man was out and the game over his excitement subsided and he realized he was hungry.

Although the two went to a restaurant they ate very little because one old "radio bug" was talking to a new "radio bug" created that afternoon. The vast possibilities of the Radio Industry appealed to the imagination of the retired business man. He immediately saw it as a new and coming business. That was the business he wanted. And that is how Chas. Freshman Co. started to manufacture radio sets.

The Charles Freshman Co., Inc., commenced operations in 1922 with a capital of \$500.00 common stock, to manufacture receiving sets and accessories. In 1923, while making small parts for set builders the Company's gross sales were \$400,977. In August, 1924, the first Freshman receiving sets were made, and this year gross sales will approximate \$7,500,000.

Travelling the Pace That Thrills

(Continued from page 22)

ordinary "paid program" style of entertainment with the Hollywoodians.

Going at Full Speed

NOW, folks," went on Wellman over the Mike, "I have a little surprise for you. Mr. Monte Blue, Warner Bros. star, has just stepped into the studio, and I'm going to ask him to entertain for a few moments."

Monte stepped up and did his stuff, in the way of telling some thrilling experiences he went through in Royal Gorge, Colorado, while they were making "The Limited Mail."

"It is the first time in the history of pictures that Colorado has been used as the shooting place of a big photoplay," explained Monte, "and, having lost twenty pounds weight while making it myself, I'm going to try to persuade Warner Bros. to make it the last time as well! Call Louise, Mr. Wellman, to give me a lift on this speech. I ain't what I used to be!"

Who Louise was, we were soon to find out. At any rate the girl sitting right next to me got up when Wellman called for Louise, and imagine the surprise when I found I had been sitting right next to Louise Fazenda, another Paramount star! Louise surely was full of pep, and they say she always is, for that matter, and seems to be the life of any party (And her name's not Lulu!) whether it be a radio party or otherwise. She told some very clever stories, children's stories, most of them, and sang one popular song besides. As she finished, Harry had another surprising announcement to make (he's full of these 'surprises') and that was that he was switching over to the new Hollywood Roof Ballroom, where Henry Halstead and his orchestra were to play a group of dance selections. This band is one of the best on the Pacific Coast, and make Victor records on the side.

Truly, this sample of an evening's entertainment at KFVB was a good reason why nobody ever leaves the state of California, once they get here. It's not only the climate, it's RADIO, like the brand given out from KFVB, and I had to take the count of ten and concede Wellman the entire argument about "paid talent." It will have to be the law of the future in RADIO.

KFVB has discovered that the ukelele is by far the most popular instrument in radio, and has no less than ten radio stars of that instrument under contract, who all use the instrument as an accompaniment to their songs.

KFVB is another splendid instance of the Warner Brothers enterprise. It was completed in twenty-eight days. The studio is three hundred feet from the operating room, which is on the second floor of the Warner Bros. Administration Bldg. The equipment used is standard Western Electric.

It was thought that when Warner Bros. installed this station, others in the movie industry would follow, but they did not.

"Behind the Mike" With Jack Nelson

(Continued from page 27)

of WCX in Detroit, I've said enough for those who have heard him, but for fear that this might be taken in the wrong way, want to say that he's a great fellow, very popular with the fans, and is now running WGHP for George Harrison Phelps Inc., at Detroit, after three and a half big years at the above mentioned station. He has started now what promises to completely outdo his former "Air Club,"—"The Midnight Mariners aboard the Good Ship Skylark." More power to you, Tomy.

No particular event makes me want to mention Bob Boniel of WEBH. That really is why I think people should know him better. Bob, I think, is one of the most modest men in broadcasting work, and his modesty is very much admired. I've had the pleasure of knowing him for ten years now, even before "broadcasting" was heard of, yes, or heard, and think I know him pretty well.

Those of us who understand what a tremendous job it is to build up a station to the point where it is running smoothly and where, by virtue of interesting programs, it commands listeners, take off our hats to him. He stepped into WEBH at a critical time, and in a little over a year has placed it among the leaders of Chicago, with a very small staff to help him,—in fact I think he has done most of the good work himself, and this with all due credit to Howard Neumiller, his able assistant. You all know Bob's announcing, the familiar, "Chicago—WEBH," and I for one hope we will hear it for a long, long time.

And mentioning WEBH brings to mind a change in broadcasting circles in Chicago that was made recently. D. D. Richards, who was the Radio Editor of the Chicago Evening Post, which works in co-operation with the Edgewater Beach Hotel where WEBH is located, forsook his editorial duties to become, as I understand it, Assistant Director of WLS. Congratulations, Dudley. Congratulations, WLS. Again, more power to you.

Don't forget that this column has been planned by the editors of "ON THE AIR" for you, and it is up to you to write in and ask us anything about what happens "behind the mike," about studio arrangements and handling, or if you prefer we'll keep up on the line of little "personals" of the boys we happen to know at other stations. Or what have you? Send what you have to Jack Nelson, Care of ON THE AIR, Kimball Building, Chicago.

Have you seen "On the Air's" corrected broadcast list?

Tell them you saw it advertised in On the Air.

COOOPERATION from the radio listeners is urged by Officials of the Radio section of the Department of Commerce, as the next step in perfecting radio broadcasting, which in recent months has improved greatly.

The Department has gone as far as it can under present appropriations, the broadcasters are striving to give the fans what they want, and the industry itself is improving both transmitting and receiving apparatus, but the big thing remains undone, according to Chief Radio Supervisor W. D. Terrell. The fans don't tell the stations what they like; at least, not enough of them report.

Some may think this is unnecessary; others that it is desired only for the publicity value to broadcasters, while many will admit that they are too lazy to send a telegram, letter or postal. However, Mr. Terrell is very serious in his suggestion, urging that fans assume the responsibility which rests upon their shoulders and let the stations know whether they like a program or not and why.

In this country there are no fees charged for listening in and no taxes for owning and operating a receiving set. Some fans appreciate this, but yet seem unwilling to fulfill the requirement of reporting frequently to their favorite station managers what they like.

The stations are entitled to criticism and deserve this small amount of co-operation, even though the fans' names may not be broadcast or published. It is likened to the applause we all accord a good act on the stage, or a good play in any sporting event. The stage analogy is even carried to the "hissing," which at least serves to advise the theatrical managements that something is not quite right or is misunderstood; except of course when we hiss the villain in the melodramas—that literally is equivalent to applause.

Music Master Installs New Service

In order to better take care of its rapidly expanding business, and also help solve the many problems in sales service, the Music Master Corporation has recently established a "Distribution Department."

It is expected that the new department will be of great assistance in sales pro-



H. N. McMenimen

motion and will be placed in full charge of all sales plans and operations. The Sales Department will hereafter function under his guidance.

Mr. McMenimen has had a long and valuable experience in systematizing and correlating all of the elements that go to make up a smoothly running sales service.

Musselman Makes New Power Tube

The A. J. Musselman organization, distributors of the Van Horne Tube, announce a new Power Amplifier tube that incorporates some radical ideas in tube design. It is a heavy duty sturdily built tube, well deserving of the title "Mogul."

It has special strap arrangements enabling its use as either a detector or amplifier, accomplished by opening and closing connections between two sets of binding posts located on a specially arranged base. This makes the tube exceptionally flexible.

It uses storage battery current for the filament consuming approximately one half ampere at five volts. The plate voltage is variable depending upon the use to which it is put, and has a maximum of about 200 volts for power amplification.

A preliminary model was submitted to the laboratory of ON THE AIR for test and inspection, which indicated that the tube is undoubtedly to be a popular seller.

The tube lists at \$5 at all dealers, and is furnished with the customary Musselman certified "characteristic curve" slip.

Does your Radio enhance the beauty of your home?



GONE are the days when a radio set consisted of a bunch of wires, bulbs and unsightly batteries scattered all over the living room. Today beauty is the prevailing idea, and a radio set that does not fit in with the home's furniture harmoniously is considered out of date.

There is a "Fireside" console table or beautiful cabinet for every standard design of radio set. Loud speaker may be included, and spaces are provided for batteries, where they may be out of sight. If your set has not been housed in a beautiful cabinet or console, now is the time to put that problem forever out of your mind.

Prices from \$25 Up

You may get a beautiful "Fireside" console type radio table for as low as \$25, with loud speaker built-in. The unit, of course, is extra. Cabinets alone may be had for much less, while for the pretentiously-inclined, beautiful cabinets, blending with the finest furniture, may be had at a price within the reach of all.

Tell us your individual problem and let us tell you how much it will cost to beautify your radio and your home. All material used is the best mahogany and walnut. Or we will build to suit your own specifications. No obligation for this information. Our famous "Fireside" Cabinets are used exclusively in all models of the new 1926 "Fireside" Radio Frequency Receivers advertised in this issue of ON THE AIR.

Address

Fireside Radio Co.

Cabinet Division

25 E. Jackson Blvd. Chicago, Ill.

COUPON

Fireside Radio Co.,
25 E. Jackson Blvd.,
Chicago, Ill.

Gentlemen: At no obligation please send me information and prices on your () Radio cabinets— () or radio console tables with loudspeaker built-in.

Name.....

Address.....

(If special cabinet is desired, write your specifications on a separate sheet.) (1-26.)

*Clarity
Volume
Beauty*

PRICES
Three Finishes
\$22.50 \$25.00
\$30.00

Burns
FOR REAL ENJOYMENT

Use the BURNS Loud Speaker on your receiving set. Produces utmost in volume and clarity of tone. Reaches full range of musical scale—equal to hearing the original production.
At your dealers or direct

American Electric Company
State and 64th Streets Chicago

Tell them you saw it advertised in On the Air.

The Mysterious Vacuum

(Continued from page 32)

we will find when we charge this grid negatively or positively, that the number of electrons drawn to the plate will be decreased or increased. If the grid is charged positively, more electrons will be drawn through to the plate. If the grid is charged negatively as shown in the diagram the electron flow will decrease.

In a radio receiving tube, this grid is connected directly or indirectly to the aerial and the charge on it, although extremely minute varies in accordance with the sound waves impressed on the microphone at the broadcasting station. This variation in grid potential causes the powerful plate current to undergo similar variations in the manner already described.

In Fig. 5 is shown a diagram representing the plate current. The steady current it will be seen is 5 milliamperes but when voice currents are impressed upon it, as from A to B its value varies between about $4\frac{1}{2}$ and $5\frac{1}{2}$ milliamperes. This means that ordinarily there is a drain of approximately 5 milliamperes upon the "B" battery.

Now "B" battery current is expensive and anything we can do to conserve it will be welcomed. Suppose then, that if instead of drawing the straight line representing the steady plate current at 5 milliamperes, we draw it at $1\frac{1}{2}$ milliamperes as shown in Fig. 5 in which case it varies between one and two milliamperes. Here we haven't changed the quality nor the magnitude of the voice current any, but we have cut down the steady drain on our "B" battery by $3\frac{1}{2}$ milliamperes.

This is all very nice and our "B" battery will now last at least twice as long but so far it has only been done on paper. How can we actually accomplish it?

By means of the "C" battery. We have stated that when the grid of the tube is charged negatively the electron flow from the filament to the plate is reduced or expressing it in the more common way, the plate current is reduced. The greater the negative charge on the grid, the smaller will be the plate current. Finally when the

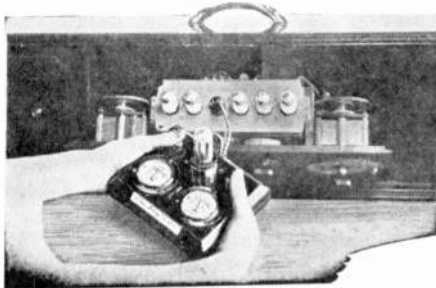


Figure 2. The "Universal" type of tester illustrated in the above cut is one manufactured by the Sterling Mfg. Co., of Cleveland, O. This tester like its little brother (shown in Figure 1) does not require separate A and B batteries, and operates directly from the receiver's tube socket, testing any tubes from the CX to the larger A types.



Figure 1. A simple home type of tube tester designed for use with the small dry cell tubes of the UV 201A, C 301A, UV 200, C 300, WD 12, C12 and corresponding numbers in the new UX bases

negative charge reaches a certain value the plate current will become zero.

Here then we have a means of bringing the line representing the plate current in Fig. 5 down to the point shown in Fig. 6. In other words, by inserting a "C" battery, which is usually a small dry battery of the flashlight variety in the grid circuit of the tube, connecting the negative pole to the grid, we place a definite negative charge on the grid at all times. The radio or audio frequency, as the case may be, representing the signal voltage is superimposed upon this constant battery voltage; it is in no way affected by it.

This is only one of the many advantages of the use of a "C" battery but it is an extremely important one. The reduction in plate current not only lengthens the life of the "B" battery but also the life of the tube. The amount of negative potential needed varies with each different type of tube and also with the amount of plate voltage applied. With a UV201A or C-301 and when using a 90 V "B" battery, a "C" battery voltage of from 3 to 4.5 will be found most effective. In Table 2, are given the proper values of negative grid bias to use with the most commonly used tubes.

APPLYING THE PRINCIPLES

By The Technical Staff

THE average radio enthusiast, while not averse to thinking in terms of radio theory, is vastly more interested in the actual material application of the principles that have just been set down, and is more concerned with the methods of how the advantages of tested tubes may be applied to every day life. It is interesting to find that there are several units now on the market that have been designed to meet the general requirements of practically any radio installation,—devices that are sufficiently elastic not only to giving actual comparisons of vacuum tubes, but act as servicers troubleshooters, and checks on radio receivers as well.

In Figure 1 on this page is illustrated a commercial type of tube tester designed for use by the average radio fan who is discriminating as to what kind of tubes he uses, and who is seeking to obtain the best results.

In operation it is very simple. The

set is adjusted for normal reception with the tubes in the sockets. The tube to be tested is then removed from the socket, and the plug of the tester is substituted in its place. The tube is inserted into the socket of the testing unit. The reading on the meter is noted and recorded. The button on the tester, (which is the switch changing the grid voltage) is then pressed and the milliammeter reading is again noted and recorded. The smaller reading is then subtracted from the greater. The difference in readings compared with those of corresponding B battery voltage in the table below indicate the amplifying ability of the tube under test.

For UV-199 and C-299 Amplifier Tubes

* "B" Bat. (Volts)	Typical Plate Current Reading from good tube		Difference in Plate Current Readings		
	Button Up	Button Down	Good Tube	Fair Tube	Poor Tube
22½	0.2	0.9	0.7	0.5	0.3
45	1.0	2.0	1.0	0.7	0.5
67½	2.0	3.2	1.2	0.9	0.6
90	3.0	4.2	1.2	0.9	0.6

*If your "B" battery voltage is higher than those given in the table, move your battery connections temporarily to a lower voltage tap corresponding with the table. Otherwise pointer on tester meter will go beyond the scale.

NOTE: If tube sockets in set are not wired to standard polarity, the meter reading for "button up" and "button down" will be reversed.

If the tubes themselves are to be compared with one another, do not disturb the rheostat setting, and make readings using the same receiver socket, inserting the different tubes in the tester socket.

With higher B battery voltages, the meter reading will go beyond the scale, and the remedy is to lower the comparison voltage so that it fits the requirements of the tester. This particular type has 90 volts as its limit.

Sometimes tube sockets are not wired in the accepted manner (with respect to grid return lead or polarity) and in such cases the readings with and without C battery will be reversed. The button up and button down readings will be reversed in other words.

Other Commercial Types

The device shown in Figure 3 is a "Universal" type of tester that can be used for all tubes. Like the one shown in Figure 1, the tube is placed in the socket of the tester and the tester plug substituted in the receiver socket.

The receiver is then turned on and filament adjustments are made so that



Figure 3. This is the tester commonly used by radio dealers for sales purposes. It requires separate batteries for operation, or independent connections to power supply.

normal voltage (5, 3 or 1.1 volt depending on tube) is obtained across the filament terminals. This reading is shown on the lower scale of the voltmeter. The voltmeter button is then pressed and the upper scale will indicate the amount of B voltage flowing in the plate circuit of the tube. These two operations enable the operator to determine whether or not the proper potentials are being applied to the elements of the tube under test.

The milliammeter is then read and recorded. After this has been done, the milliammeter button is then pressed, and the milliammeter is again read and recorded. The second reading is then subtracted from the first. The difference in readings is what indicates the amplification ability of the tube, and represents the change in plate current produced by a given change in grid voltage. The table shown below can be used as a comparison and check on the efficiency of the tube under test.

TABLE FOR TUBE TESTING
UV-199 and C-299 Tubes
Filament Volts 3.0

"B" Bat. Volts	Difference in Plate Current Readings			† Sample Readings	
	Good Tube	Fair Tube	Poor Tube	Button up	Button Down
22½	.2	.15	.1	.2	.0
45	1.0	.7	.5	1.0	.0
67½	1.6	1.2	.8	2.0	.4
90	1.9	1.5	1.0	3.0	1.1
112½	2.0	1.3	.8	3.7	1.7

UV-201A, UX-201A and C-301A Amplifier Tubes
Filament Volts 5.0

22½	.3	.2	.1	.3	.0
45	1.3	.9	.6	1.3	.0
67½	2.6	1.9	1.3	2.8	.2
90	3.8	2.8	1.9	4.7	.9
112½	4.8	3.6	2.4	7.0	2.2
135	5.6	4.2	2.8	9.5	3.9

*UV-200 and C-300 Detector Tubes
Filament Volts 5.0

22½	.5 to 1.3 (*see note)	.5 to 1.3	.0
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WD-11, WD-12, WX-12 and C-12
Filament Volts 1.1

22½	.3	.2	.1	.3	.0
45	1.0	.7	.5	1.1	.1
67½	1.6	1.2	.8	2.2	.6
90	1.9	1.4	.9	3.4	1.5
112½	2.2	1.6	1.1	4.8	2.6

†NOTE: The "Sample Readings" given in the two columns at the right are examples which show the method of computing the "Difference in Plate Current Readings", which latter determine the tube amplification.

*NOTE: A soft detector tube is quite sensitive to filament and plate voltage change and may often give excessive or erratic plate current readings. The above table gives, therefore, only a general indication that the tube has possibilities as a detector.

The tester shown in Figure 3 is of the "independent battery type" and requires separate batteries, or makes necessary independent connections to the source of filament and plate supply of the radio installation. This is the type generally used by radio dealers and tube retailers.

It makes provision for adjustment of the filament current with a rheostat built in the tester, and uses a voltmeter to get precise adjustment of the filament current. The two buttons to the right of the plate milliammeter are the switches for checking the plate voltage and for changing the grid bias. The type illustrated is an accurate laboratory device and for any experimenter who is involved in radio to any great extent it is a big necessity.

If you value tube-life and want continuous good radio—

Test your tubes and renew them with

Sterling

TUBE SERVICING EQUIPMENT

"Home" Tube Tester

A compact, accurate instrument for testing the amplifying ability of UV and UX-201A, also UV and UX-200 types of vacuum tubes. Operates with receiving set without disconnecting any units, simply by exchanging positions of tube and tester plug. Two readings taken on milliammeter dial of tester show rise in plate current of tube. This rise, compared with table affixed to bottom of tester, accurately determines whether tube is good, fair or poor amplifier.



No. R-401 for large tubes. List Price \$8.50. No. R-399 for small tubes \$10

"Universal" Tube Tester

This tester operates the same as the No. 401-399, and in addition is provided with an adapter and mechanism suited to testing UV-199, C-299 and WD-11-12 and C-12 tubes in the radio set. It has also a combination meter for testing plate and filament voltages, and in addition to the milliammeter for testing plate current. Thus it serves not only as a tube tester, but as an "A" and "B" Battery tester, and is also valuable in locating defective set wiring, open transformer wiring, weak sockets, etc.

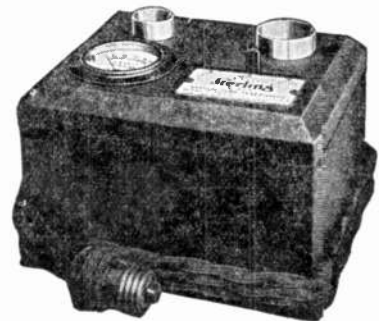


List Price \$18.00

Tube Reactivator

By the use of this Reactivator, either large or small types of tubes may be reactivated repeatedly, thereby multiplying the use of the tube to many times its normal life.

One of the distinct advantages of the Sterling Reactivator is provided by its being equipped with a filament emission meter, thus enabling the user to determine instantly by test whether a tube needs reactivation and to what degree the filament emission has been restored by the process. No guesswork.



List Price (50 to 60 cycle) \$12.50 (25 to 40 cycle) \$14.50

Practically all good radio dealers sell Sterling Radio Products. If you can't be conveniently accommodated, write us direct.

The Sterling Mfg. Company

Cleveland, Ohio

Tell them you saw it advertised in On the Air.

A Wealth of Radio Information!

—can be found in the back-numbers of ON THE AIR.

Readers who are buying the "Magazine of Radio" for the first time may be interested in knowing how they can increase their fund of radio knowledge by reading some of the enlightening articles published in past issues of "On the Air."

Especially are these numbers valuable to the fan interested in the technical side of radio. Back numbers of "On the Air" were noted for their up-to-date articles on taking care of your radio receiver, and improving its performance.

A limited number of copies of the September, October and November issues of "On the Air" have been laid aside for readers interested in "On the Air's" laboratory developments. They may be had for the price of 20c each, postage prepaid. Following is a summary of the features in these issues:

September, 1925

- Short Wave Broadcasting
- The Technical Editor's Set, Incorporating some unusual features of design
- The Browning Drake Receiver
- The Super-autodyne
- Operating the Famous Deresnadyn

October, 1925

- Causes of Fading
- How to Make a Wavemeter
- How to Handle Interference
- What Set Shall I Make?
- The Celeradyne Receiver
- The Story of the Ultradyne

November, 1925

- Rehousing Your Set for the Winter
- Remedies for Interference
- The Vacuum Tube Question
- Pepping Up Your Reinartz Set
- Revitalizing the Neutrodyne
- A 3-Stage Audio Amplifier

December, 1925

- How Loud is Light?
- Low Loss, and What It Means
- Reviewing The Tread of Circuit Design
- The Torrid Coil
- The "Counterphase" Receiver

20c A Copy!

ON THE AIR
1322 Kimball Bldg.
Chicago, Ill.

Latest Government List of Broadcasters

(Continued from the December issue.)

WAFD	Albert B. Parfet Co.	Port Huron, Mich.	233
WAHG	A. H. Grebe & Co.	Richmond Hill, N. Y.	315
WAMD	Hubbard & Co.	Minneapolis, Minn.	244
WAPI	Alabama Polytechnic Institute	Auburn, Ala.	248
WBAA	Purdue University	W. Lafayette, Ind.	283
WBAC	Clemson Agric. College	Clemson College, S. C.	331
WBAH	The Dayton Co.	Minneapolis, Minn.	417
WBAK	Pennsylvania State Police	Harrisburg, Pa.	275
WBAO	James Millikan University	Decatur, Ill.	360
WBAP	Wortham-Carter Publishing Co. (Star Telegram)	Fort Worth, Texas	476
WBAV	Erner & Hopkins Co.	Columbus, Ohio	292
WBAX	John H. Stenger, Jr.	Wilkes-Barre, Pa.	254
WBAY	Western Electric Co.	New York, N. Y.	492
WBBG	Irving Vermilya	Mattapoisett, Mass.	248
WBBL	Grace Covenant Presbyterian Church	Richmond, Va.	253
WBBM	Atlass Investment Co.	Chicago, Ill.	226
WBBN	Blake, A. B.	Wilmington, N. C.	275
WBBP	Petoskey High School	Petoskey, Mich.	246
WBBR	Peoples Pulpit Asso.	Rossville, N. Y.	273
WBBS	First Baptist Church	New Orleans, La.	252
WBBU	Jenks Motor Sales Co.	Monmouth, Ill.	224
WBBX	Ruffner Junior High School	Norfolk, Va.	222
WBBY	Washington Light Infantry Co. "B" 118th Inf.	Charleston, S. C.	268
WBCN	Foster & McDoland	Chicago, Ill.	266
WBDC	Baxter Laundry Co.	Grand Rapids, Mich.	256
WBES	Bliss Electrical School	Takoma Park, Md.	222
WGBA	Jones Elec. & Radio Mfg. Co.	Baltimore, Md.	254
WBOQ	A. H. Grebe & Co., Inc.	Richmond Hill, N. Y.	236
WBR	Pennsylvania State Police	Butler, Pa.	286
WBRC	Bell Radio Corporation	Birmingham, Ala.	248
WBRE	Baltimore Radio Exchange	Wilkes-Barre, Pa.	231
WBS	D. W. Ma, Inc.	Newark, N. J.	252
WBT	Southern Radio Corp.	Charlotte, N. C.	275
WBZ	Westinghouse Electric & Mfg. Co.	Springfield, Mass.	333
WBZA	Westinghouse Electric & Mfg. Co.	Hotel Brunswick, Boston, Mass.	242
WCAD	St. Lawrence University	Canton, N. Y.	280
WCAE	Kaufmann & Baer Co. and The Pittsburgh Press	Pittsburgh, Pa.	461
WCAH	Entrekin Electric Co.	Columbus, Ohio	286
WCAJ	Nebraska Wesleyan University	University Place, Nebr.	283
WCAL	St. Olaf College	Northfield, Minn.	336
WCAO	Sanders & Stayman Co.	Baltimore, Md.	275
WCAP	Chesapeake & Potomac Telephone Co.	Washington, D. C.	468
WCAR	Alamo Radio Electric Co.	San Antonio, Texas	263
WCAS	W. H. Dunwoody Industrial Institute	Minneapolis, Minn.	280
WCAT	State College of Mines	Rapid City, S. Dak.	240
WCAU	Durham & Co.	Philadelphia, Pa.	278
WCAZ	University of Vermont	Burlington, Vt.	250
WCAB	Carthage College	Carthage, Ill.	246
WCBC	Charles W. Heibachm	Allentown, Pa.	280
WCBD	University of Michigan	Ann Arbor, Mich.	280
WCBE	Wilbur C. Voliva	Zion, Ill.	344
WCBF	Uhalt Radio Co.	New Orleans, La.	263
WCBG	Paul J. Miller	Pittsburgh, Pa.	236
WCBH	Howard S. Williams (Portable)	Pascagoula, Miss.	298
WCBM	University of Miss.	Oxford, Miss.	242
WCBN	Chas. Swars	Baltimore, Md.	229
WCBQ	James P. Boland	Ft. Benj. Harrison, Ind.	269
WCBR	First Baptist Church	Nashville, Tenn.	236
WCBT	C. H. Messter	Providence, R. I.	246
WCBX	Clark University, Collegiate Dept.	Worcester, Mass.	238
WCCO	Radio Shop of Newark (Herman Lubinsky)	Newark, N. J.	233
WCLO	Washburn-Crosby Co.	Twin Cities, Minn.	416
WCLS	C. E. Whitmore	Camp Lake, Wisc.	231
WCSE	H. M. Couch	Joliet, Ill.	214
WCX	Henry P. Rines	Portland, Maine	256
WDAD	Free Press and Jewett Radio & Phonograph Co.	Detroit, Mich.	517
WDAE	Dad's Auto Accessories, Inc.	Nashville, Tenn.	226
WDAF	Tampa Daily Times	Tampa, Fla.	365
WDAG	Kansas City Star	Kansas City, Mo.	365
WDAR	J. Laurence Martin	Amarillo, Texas	263
WDAY	Lit Brothers	Philadelphia, Pa.	393
WDBA	Radio Equipment Corp.	Fargo, N. Dak.	244
WDBB	Fred Ray	Columbus, Ga.	236
WDBC	A. H. Waite & Co., Inc.	Taunton, Mass.	229
WDBD	Kirk, Johnson & Co.	Lancaster, Pa.	258
WDBE	Herman Edwin Burns	Martinsburg, W. Va.	268
WDBJ	Gilham-Schoen Elec. Co.	Atlanta, Ga.	278
WDBK	Richardson Wayland Electric Corp.	Roanoke, Va.	229
WDBL	M. F. Broz	Cleveland, Ohio	722
WDBN	Wisconsin Dept. of Markets	Stevens Point, Wis.	278
WDBO	Electric Light & Power Co.	Bangor, Me.	252
WDBQ	Rollins College, Inc.	Winter Park, Fla.	240
WDBR	Morton Radio Supply Co.	Salem, N. J.	234
WDBY	Tremont Temple Baptist Church	Boston, Mass.	256
WDBZ	The Strand Theatre	Fort Wayne, Ind.	258
WDCH	North Shore Congregational Church	Chicago, Ill.	258
WDOD	Boy Scouts, City Hall	Kingston, N. Y.	233
WDWF	Darmouth College	Hanover, N. H.	256
WDZ	Chattanooga Radio Co., Inc.	Chattanooga, Tenn.	256
WEAA	Dutree Wilcox Flint, Inc.	Cranston, R. I.	414
WEAF	J. L. Bush	Tuscola Ill.	278
WEAH	F. D. Fallain	Flint, Mich.	250
WEAJ	American Telephone & Telegraph Co.	New York, N. Y.	485
WEAM	Hotel Lassen	Wichita, Kans.	280
WEAN	Cornell University	Ithaca, N. Y.	286
WEAO	University of South Dakota	Vermillion, S. Dak.	283
WEAR	Borough of North Plainfield (W. Gibson Buttfield)	North Plainfield, N. J.	286
WEAU	Shepard Co.	Providence, R. I.	273
WEB	Ohio State University	Columbus, Ohio	293
WEBB	Goodyear Tire and Rubber Co.	Cleveland, Ohio	389
WEBC	Davidson Bros. Co.	Sioux City, Iowa	275
WEBD	Benwood Co.	St. Louis, Mo.	273
WEBE	Electric Shop	Highland Park, N. J.	233
WEBF	Walter Cecil Bridges	Superior, Wis.	242
WEBG	Electrical Equipment and Service Co.	Anderson, Ind.	246
WEBH	Roy W. Walker	Cambridge, Ohio	248
	Edgewater Beach Hotel, Chicago Herald-Examiner Station	Chicago, Ill.	370

Tell them you saw it advertised in On the Air.

WEBJ	Third Avenue Railway Co.	New York, N. Y.	273
WEBK	Grand Rapids Radio Co.	Grand Rapids, Mich.	242
WEBM	Radio Corporation of America	Portland	226
WEBP	E. P. Pedicord	New Orleans, La.	280
WEBV	The Dayton Coop. Industrial High School	Dayton, Ohio	280
WEBW	Beloit College	Beloit, Wis.	283
WEI	The Edison Electric Illuminating Co.	Boston, Mass.	475
WEHS	Robert E. Hughes	Evanston, Ill.	205
WENR	All-American Radio Corporation	Chicago, Ill.	266
WEV	St. Louis University	St. Louis, Mo.	280
WFAM	Dallas News & Dallas Journal	Dallas, Tex.	472
WFAY	Times Publishing Co.	St. Cloud, Minn.	273
WFBC	University of Nebraska, Department of Electrical Engineering	Lincoln, Nebr.	275
WFBD	First Baptist Church	Knoxville, Tenn.	250
WFBE	Gethsemane Baptist Church	Philadelphia, Pa.	234
WFBG	Van De Walle Music and Radio Co.	Seymour, Ind.	226
WFBH	The Wm. F. Cable Co.	Altoona, Pa.	261
WFBJ	Concourse Radio Corporation	New York, N. Y.	273
WFBQ	St. John's University	Collegeville, Minn.	236
WFBP	Wynne Radio Co.	Raleigh, N. C.	255
WFBR	Fifth Inf. Md. Nat'l Guard, 5th Reg. Armory	Baltimore, Md.	452
WFBZ	Ainsworth-Gates Radio Co.	Cincinnati, Ohio	309
WFI	Knox College	Galesburg, Ill.	254
WFKB	Strawbridge and Clothier	Philadelphia, Pa.	394
WFL	Francis K. Bridgman	Chicago, Ill.	217
WFLM	Robert Morrison Lacey	Brooklyn, New York	205
WFUV	G. Pearson Ward	Springfield, Mo.	252
WFUW	Earl William Lewis	Moberly, Mo.	233
WGAL	Lancaster Electric Supply & Construction Co.	Lancaster, Pa.	248
WGAO	Yource Hotel	Shreveport, La.	252
WGAZ	South Bend Tribune	South Bend, Ind.	360
WGBB	Harry H. Carman, 217 Bedell St.	Freepor, N. Y.	244
WGBC	First Baptist Church	Memphis, Tenn.	266
WGBF	Fink Furniture Co.	Evansville, Ind.	217
WGBI	Frank S. Megargee	Scranton, Pa.	240
WGKB	Lawrence Campbell	Johnstown, Pa.	248
WGKM	Theodore N. Saaty	Providence, R. I.	234
WGBO	Stout Institute	Menominee, Wis.	234
WGBR	Marshfield Broadcasting Assn.	Marshfield, Wis.	229
WGBS	Gimbel Brothers	New York, N. Y.	315
WGBU	Florida Cities Finance Co.	Fulford By-The-Sea, Florida	278
WGEX	University of Maine	Orono, Me.	252
WGHP	G. H. Phelps, Inc.	Detroit, Mich.	270
WGES	Coyne Electrical School	Oak Park, Ill.	250
WGHB	G. H. Bowles Developments	Clearwater, Fla.	266
WGI	American R. & R. Co.	Medford Hillside, Mass.	261
WGMU	A. H. Grebe & Co., Inc., Portable	Richmond Hill, N. Y.	236
WGN	The Tribune	Chicago, Ill.	370
WGR	Federal T. and T. Co.	Buffalo, N. Y.	319
WGY	General Elec. Co.	Schenectady, N. Y.	379
WHA	University of Wisconsin	Madison, Wis.	535
WHAD	Marquette University and Milwaukee Journal	Milwaukee, Wis.	280
WHAF	University of Cincinnati	Cincinnati, Ohio	222
WHAM	Hafer Supply Co.	Joplin, Mo.	283
WHAP	University of Rochester (Eastman School of Music)	Rochester, N. Y.	278
WHAR	H. Alvin Simmons, 290 Flatbush Ave.	Brooklyn, N. Y.	240
WHAS	Seaside House	Atlantic City, N. J.	275
WHAT	Courier-Journal & Louisville Times	Louisville, Ky.	399
WHAT	Dr. George W. Young	Minneapolis, Minn.	231
WHAV	Wilmington Electrical Specialty Co.	Wilmington, Del.	360
WHAZ	Rensselaer Polytechnic Institute	Troy, N. Y.	379
WHB	Sweeney School Co.	Kansas City, Mo.	365
WHBA	C. C. Shaffer	Oil City, Pa.	250
WHBC	Rev. E. P. Graham	Canton, Ohio	245
WHBD	Chas. W. Howard	Bellefontaine, Ohio	222
WHBF	Beardsley Specialty Company	Rock Island, Ill.	222
WHBG	John S. Skane	Harrisburg, Pa.	231
WHBH	Culver Military Academy	Culver, Ind.	222
WHBI	Lauer Auto Co.	Ft. Wayne, Ind.	234
WHBK	Franklin St. George, Inc.	Ellsworth, Me.	231
WHBL	James H. Slusser	Logansport, Ind.	220
WHBM	C. L. Carroll, Portable Station	Chicago, Ill.	233
WHBN	First Ave. Methodist Church	St. Petersburg, Florida	258
WHBP	Johnstown Automobile Co.	Johnstown, Pennsylvania	256
WHBQ	St. John's M. E. Church South	Memphis, Tenn.	233
WHBR	Scientific Electric & Mfg. Co., 3664 Vine St.	Cincinnati, Ohio	216
WHBU	Riviera Theatre and Bing's Clothing	Anderson, Ind.	218
WHBW	D. R. Kienzle	Philadelphia, Pa.	215
WHBY	St. Norbert's College	West De Pore, Wis.	250
WHCC	Hickson Electric Co., Inc.	Rochester, N. Y.	258
WHK	The Radio Air Service Corp.	Cleveland, Ohio	273
WHN	George Schubert	New York, N. Y.	360
WHO	Bankers' Life Co.	Des Moines, Iowa	526
WHT	Wrigley Building, Chicago	Deerfield, Ill.	238
WIAD	Howard R. Miller	Philadelphia, Pa.	254
WIAO	Chronicle Publishing Co.	Marion, Ind.	229
WIAS	Home Electric Co.	Burlington, Iowa	283
WIBA	The Capital-Times Studio	Madison, Wis.	236
WIBC	L. M. Tate Post, No. 29, Veterans of Foreign Wars	St. Petersburg, Florida	222
WIBG	St. Paul's Protestant Episcopal Church	Elkins Park, Pa.	222
WIBH	Elite-Radio Stores	New Bedford, Mass.	209
WIBI	Frederick B. Zittell, Jr.	Flushing, N. Y.	219
WIBJ	C. L. Carrell (Portable)	Chicago, Ill.	216
WIBO	Nelson Brothers	Chicago, Ill.	226
WIBQ	F. M. Schmidt	Farina, Ill.	205
WIBR	Thurman A. Owings	Werton, W. Va.	246
WIBS	New Jersey Nat'l Guard Hdqs. Co.	Elizabeth, N. J.	203
WIBU	The Electric Farm	Poynette, Wis.	222
WIBV	Dr. L. L. Dill	Logansport, Ind.	220
WIBX	Grid-Leak, Inc.	Utica, N. Y.	205
WIBZ	Powell Electric Company	Montgomery, Ala.	231
WIL	Continental Electric Supply Co.	Washington, D. C.	360
WIP	Gimbel Bros.	Philadelphia, Pa.	509
WJAB	American Electric Co.	Lincoln, Nebr.	229
WJAD	Jackson's Radio Engineering Laboratories	Waco, Texas	352
WJAG	Norfolk Daily News	Norfolk, Nebr.	283
WJAK	Clifford L. White	Greentown, Iowa	254
WJAM	D. M. Perham	Cedar Rapids, Iowa	268
WJAR	The Outlet Co. (J. Samuels & Bro.)	Providence, R. I.	306
WJAS	Pittsburgh Radio Supply House	Pittsburgh, Pa.	286
WJAZ	Zenith Radio Co.	Mt. Prospect, Ill.	322
WJBA	D. H. Lentz, Jr.	Joliet, Ill.	207
WJBB	L. W. McClurg	St. Petersburg, Fla.	207
WJBC	Hummer Furniture Co.	LaSalle, Ill.	234
WJBG	Interstate Radio, Inc.	Charlotte, N. C.	224
WJBI	Robert S. Johnson	Red Bank, N. J.	219
WJBK	E. F. Goodwin	Ypsilanti, Mich.	233
WJBL	Wm. Gushard Dry Goods Co.	Decatur, Ill.	270
WJBN	St. Johns Ev. Luth. Church	Sycamore, Ill.	256
WJJD	Denison University	Granville, Ohio	226

FOR CLEAR, QUIET "B" POWER



RADIO Storage "B" Battery

12 Cells 24 Volts Lasts Indefinitely—Pays for Itself Economy and performance exceeded of before. Recharged at a negligible cost. Delivers unflinching power that is clear, pure and quiet. Approved an "I" listed as Standard by leading Radio Authorities, including Pop. Radio Laboratories, Pop. Sci. Inst. Standards, Radio News Lab., Lefax, Inc., and other important institutions. Equipped with Solid Rubber Case, an insurance against acid and leakage. Extra heavy "d" jars. Heavy rugged plates. Order yours today!

SEND NO MONEY Just state number of batteries wanted and we will ship day order is received. Extra offer: 4 batteries in series (96 volts), \$10.00. Free exp. exam after examining batteries. 5 per cent discount for cash with order. Mail your order now!

WORLD BATTERY COMPANY 1219 So. Wabash Ave., Dept. 94 Chicago, Ill. Makers of the Famous World Radio "A" Storage Battery. Prices: 6-volt, 100 Amp. \$11.85; 180 Amp. \$13.25; 140 Amp. \$14.00. All equipped with Solid Rubber Case.

World STORAGE BATTERIES Set your Radio Dials at 210 meters for the new 1000 watt World Storage Battery Station, WDRS, Chicago. Watch for announcements. WDKA - WFAF - WGN - WJIS - KHJ - KGO - KFAP - WJY - KOP

LATEST "COAST TO COAST" FULLY GUARANTEED

RADIO'S-10 DAYS FREE TRIAL SAVE 1/3 to 1/2

Users everywhere report Miraco Radios get programs coast to coast on loud speaker; outperform sets three times as costly. Many hear foreign countries. Radio's most amazing values in unconditionally guaranteed, factory-built long distance sets—let testimony of users convince you.

MIRACO RADIO GETS 'EM COAST TO COAST Powerful New Multi-tube Miraco gets long distance on loud speaker. Set, ONLY \$27.35 retail. FREE Literature on latest improved 1 to 6 tube mod. els., new low prices, testimony of users and SPECIAL OFFER. Write: MIDWEST RADIO CORP N. Pioneer Builders of Sets 845-W E. 8th St. Cincinnati, O. AGENT USERS WANTED Write for discounts.



APPLAUSE—The radio Artist is doing all he can to make you evenings pleasant, but it must be discouraging to do this without a little praise.

The old saying is give an artist a little applause and they will work their head off. The only way a radio artist can feel that his efforts are appreciated, is to send them an applause card. These you can have in a convenient form at \$1.35 per hundred with your name printed in a different color. Just fill out the coupon, don't send any money. Pay the postman on arrival plus a few cents Postage.

A. BOWMAN, Bldg. Chicago, Ill. Radio You may send me 100 of your ap- please cards, by mail, I will pay Postman \$1.35. NAME, ADDRESS, CITY, STATE.

Do You Keep Track of Stations You Receive?

Don't depend on your memory or your imagination when you get those tantalizing "DX" stations on your receiver. Know conclusively what station you are receiving, and where it is located, by referring to the complete

List of U. S. Broadcasting Stations,

the last half of which was printed in this issue of ON THE AIR.

Watch the February issue for the first half, brought strictly up-to-date!

Keep Your Radio Log Up-to-Date!

Tell them you saw it advertised in On the Air.

A 3-Tube with Five Stage Efficiency

A NEWLY improved three-tube reflex receiver that provides five-stage efficiency is the latest contribution to amateurs and experimenters by the engineers of the Electrical Research Laboratories of Chicago.

Exceptional range and volume are attained in this design through the incorporation of circlloid transformers, the new closed field type of inductance that has been gaining so rapidly in popularity of late.

Two stages of radio frequency amplification, detector, and two stages of audio are embodied in this construction, with crystal rectification.

Not only maximum amplification but also extreme selectivity with virtually complete absence of annoying oscillation or howling when tuning in stations are outstanding characteristics of the design.

Withal, it is quite simple to construct and economical to operate, with correspondingly broad appeal to those who prefer to "roll their own."

Both radio frequency coils are mounted on the backs of 0.00035 mfd. variable condensers, and these two condensers afford the only tuning controls necessary. The Circlloid coupler is the antenna coupler while the balloon circlloid is the first stage radio frequency transformer and carries the usual independent primary and secondary coils. As the magnetic field is contained entirely within the coils of wire, the coils cause no interference nor feed-backs among themselves and at the same time do not act as receiving antennae as is usually the case with solenoid coils. Howling or whistling due to feed-backs and the resulting excessive regeneration are entirely absent, and perfect selectivity is assured for the reason that the circular coils are indifferent to external influences.

A fixed or "aperiodic" air core transformer is used as the second stage audio transformer in order to do away with a third tuning control, and the transformers for the audio stages are of the usual low ratio type. When Erla parts are used, the circuit is perfectly balanced without the use of fixed condensers, but with other makes of equipment it may be necessary to add bypass condensers across the audio transformer so that the set will function properly. This can be determined only by actual experiment with the parts selected.

A rheostat controls the radio frequency tube, while another rheostat controls both the reflex tube and the audio frequency tube. A battery cutout switch permits breaking the battery circuit without disturbing the adjustment of the rheostats. Tubes of the 201A type with 90 volts of "B" battery on the plate are required for the proper performance. Dry cell tubes will operate but with greatly reduce volume and distance, and the performance is so limited by these tubes that it is hardly worth while to use them except for use on strong local stations.

WJJD	Supreme Lodge, Loyal Order of Moose	Mooseheart, Ill.	303
WJR	Jewett Radio & Phonograph Co. and Detroit Free Press	Pontiac, Mich.	517
WJY	Radio Corp. of America	New York, N. Y.	405
WJZ	Radio Corp. of America	New York, N. Y.	455
WKAA	H. F. Paar	Cedar Rapids, Iowa	278
WKAD	Chas. Loeff (Crescent Park)	East Providence, R. I.	240
WKAF	WKAF Broadcasting Co.	Milwaukee, Wis.	261
WKAQ	Radio Corp. of Porto Rico	San Juan, P. R.	340
WKAR	Michigan Agriculture College	East Lansing, Mich.	285
WKAV	Laconia Radio Club	Laconia, N. H.	254
WKBB	Sanders Bros.	Joliet, Ill.	214
WKBE	K. & B. Electric Co.	Webster, Massachusetts	231
WKBF	Dutee Wilcox Flint	Cranston, Rhode Island	286
WKBG	C. L. Carrel, Portable	Chicago, Ill.	216
WKBK	Miss Shirley Katz	New York, N. Y.	210
WKY	Wky Radio Shop	Oklahoma City, Okla.	275
WLAG	Cutting & Washington Radio Corp.	Minneapolis, Minn.	417
WLAL	First Christian Church	Tulsa, Okla.	250
WLAP	Wm. V. Jordan	Louisville, Ky.	286
WLAQ	Arthur E. Shilling	Kalamazoo, Mich.	283
WLAX	Putnam Electric Co.	Greencastle, Ind.	231
WLB	University of Minnesota	Minneapolis, Minn.	278
WLBL	Wisconsin State Dept. of Markets	Stevens Point, Wis.	278
WLIB	Liberty Magazine	Chicago, Ill.	303
WLS	Sears, Roebuck & Co.	Chicago, Ill.	344
WLTS	Lane Technical High School	Chicago, Ill.	258
WLW	Crosley Mfg. Co.	Cincinnati, Ohio	422
WLWL	Missionary Society of St. Paul the Apostle	New York, N. Y.	288
WMAC	J. Edw. Page (Olive B. Meredith)	Casnovia, N. Y.	261
WMAF	Round Hills Radio Corp.	Dartmouth, Mass.	440
WMAK	Norton Laboratories	Lockport, N. Y.	273
WMAL	M. A. Lesse Optical Co.	Washington, D. C.	212
WMAN	First Baptist Church	Columbus, Ohio	286
WMAO	Chicago Daily News	Chicago, Ill.	447
WMAZ	Kingshighway Presbyterian Church	St. Louis, Mo.	280
WMBB	Mercer University	Macon, Ga.	261
WMBE	Trianon Ball Room	Chicago, Ill.	250
WMBF	Michigan Broadcasting Co.	Detroit, Mich.	256
WMC	Miami Beach Hotel	Miami Beach, Fla.	384
WMC	Commercial Appeal	Memphis, Tenn.	503
WMCA	Hotel McAlpin (Greenley Square Hotel Co.)	New York City	341
WMH	Ainsworth-Gates Radio Co.	Cincinnati, O.	321
WNAC	Shepard Stores	Boston, Mass.	284
WNAD	University of Oklahoma	Norman, Okla.	258
WNAL	Omaha Central High School	Omaha, Nebr.	255
WNAP	Wittenberg College	Springfield, Ohio	271
WNAR	First Christian Church	Butler, Mo.	230
WNAT	Lennig Brothers Co. (Frederick Lennig)	Philadelphia, Pa.	254
WNAZ	Dakota Radio Apparatus Co.	Yankton, S. Dak.	248
WNOX	Peoples & Tel. Co.	Knoxville, Tenn.	268
WNYC	Dept. of Plant and Structures	New York, N. Y.	526
WOAC	Page Organ Co.	Lima, Ohio	260
WOAE	Midland College	Fremont, Nebr.	280
WOAG	Apollo Theatre (Belvidere Amusement Co.)	Belvidere, Ill.	274
WOAI	Southern Equipment Co.	San Antonio, Texas	392
WOAN	Vaughn Conservatory of Music (James D. Vaughn)	Lawrenceburg, Tenn.	280
WOAO	Lyradion Mfg. Co.	Mishawaka, Ind.	369
WOAR	Lundskow, Henry P.	Kenosha, Wis.	225
WOAT	Boyd M. Hamp	Wilmington, Del.	360
WOAV	Pennsylvania National Guard, 2d Battalion, 112th Infantry	Erie, Pa.	242
WOAW	Woodman of the World	Omaha, Nebraska	526
WOAX	Franklyn J. Wolf	Trenton, N. J.	240
WOC	Palmer School of Chiropractic	Davenport, Iowa	484
WOCG	Triple Alliance Radio Station	Sycamore, Illinois	205
WOCL	Jotel Jamestown, Inc.	Jamestown, N. Y.	275
WODA	James K. O'Dea	Paterson, New Jersey	203
WOI	Iowa State College	Ames, Iowa	270
WOK	Neutrowound Radio Mfg. Co.	Homewood, Ill.	217
WOKO	Otto Baur	New York, N. Y.	233
WOO	John Wanamaker	Philadelphia, Pa.	509
WOQ	Unity School of Christianity	Kansas City, Mo.	278
WOR	L. Bamberger and Co.	Newark, N. J.	405
WORD	People's Pulpit Assn.	Batavia, Ill.	275
WOS	State Marketing Bureau	Jefferson City, Mo.	440
WOWL	Owl Battery Company	New Orleans, La.	270
WOWO	Main Auto Supply Co.	Fort Wayne, Ind.	227
WPAB	Pennsylvania State College	State College, Pa.	283
WPAC	Donaldson Radio Co.	Okmulgee, Okla.	360
WPAJ	Doolittle Radio Corp.	New Haven, Conn.	268
WPAK	North Dakota Agricultural College	Agricultural College, N. D.	283
WPAL	Superior Radio & Telephone Equipment Co.	Columbus, Ohio	286
WPDO	H. L. Turner	Buffalo, N. Y.	205
WPG	The Municipality of Atlantic City	Atlantic City, N. J.	300
WPRC	Wilson Printing & Radio Co.	Harrisburg, Pa.	216
WOAA	Horace A. Beale, Jr.	Parkersburg, Pa.	270
WOAC	E. B. Gish	Amarillo, Texas	234
WOAE	Moore Radio News Station (Edmund B. Moore)	Springfield, Vt.	275
WOAM	Electrical Equipment Co.	Miami, Fla.	283
WOAN	Scranton Times	Scranton, Pa.	280
WOAO	Calvary Baptist Church	New York, N. Y.	260
WOJ	Calumet Rainbo Broadcasting Co.	Chicago, Ill.	447
WRAF	The Radio Club (Inc.)	LaPorte, Ind.	224
WRAM	Lombard College	Galesburg, Ill.	244
WRAO	St. Louis Radio Service Co.	St. Louis, Mo.	263
WRAV	Antioch College	Yellow Springs, Ohio	242
WRAW	Avenue Radio Shop (Horace D. Good)	Reading, Pa.	238
WRAX	Flaxon's Garage	Gloucester City, N. J.	268
WRBC	Immanuel Lutheran Church	Valparaiso, Ind.	278
WRC	Radio Corp. of America	Washington, D. C.	468
WREO	Reo Motor Car Co.	Lansing, Mich.	286
WRHF	Washington Radio Hospital Fund	Washington, D. C.	256
WRHM	Rosedale Hospital, Inc.	Minneapolis, Minn.	252
WRK	Doron Bros.	Hamilton, Ohio	360
WRL	Union College	Schenectady, N. Y.	270
WRM	University of Illinois	Urbana, Ill.	273
WRMU	A. H. Grebe & Co., Inc., Motor Yacht "MU-1"	New York, N. Y.	236
WRNY	Experimenter Publishing Co.	New York, N. Y.	258
WRST	Radiotel Mfg. Co., Inc.	Bay Shore, N. Y.	216
WRW	Tarrytown Radio Res. Labs.	Tarrytown, N. Y.	273
WSAI	United States Playing Card Co.	Cincinnati, Ohio	325
WSAJ	Grove City College	Grove City, Pa.	258
WSAN	Allentown Call Publishing Co.	Allentown, Pa.	229
WSAP	Seventh Day Adventist Church	New York, N. Y.	263
WSAR	Daughy & Welch Electrical Co.	Fall River, Mass.	254
WSAZ	Chas. Electric Shop	Pomeroy, Ohio	258
WSB	Atlanta Journal	Atlanta, Ga.	428
WSBC	World Battery Co.	1219 S. Wabash Ave., Chicago, Ill.	210
WSBF	Stix-Baer-Fuller D. G. Co.	St. Louis, Mo.	275
WSKC	World's Star Knitting Co.	Bay City, Mich.	261
WSM	Nashville Life and Accident Ins. Co.	Nashville, Tenn.	283

Is this the way YOU Buy radio tubes?

After you have been victimized a few times you begin to realize that buying tubes is really a "blindfold" proposition.

If some one told you that disappointing purchases of vacuum tubes could be avoided — yes, actually *eliminated*, how readily you would welcome the suggestion!



How to avoid buying defective vacuum tubes

When you buy your tubes request the clerk to give you Musselman Certified Tubes and tell him to show you the guaranteed curve slip.

WHAT a simple request. It does not inconvenience the dealer because he is glad to be relieved of the responsibility assumed by our broad money-back guarantee. Yet think of what it means in satisfaction and assurance that you are getting an efficient tube!

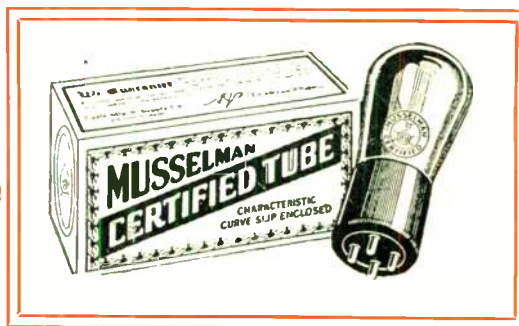
Why "take a chance" when you buy tubes? You don't buy shoes, hosiery or anything else without knowing what you purchase. Insist on knowing all the facts about the tubes you buy.

The Musselman Certified Tube is the first and only certified tube with a factory attached characteristic curve slip in its packing box. This slip gives exact individual data on Mutual Conductance, Plate Flow, Amplification Constant, and Output Impedance; a necessity for the discriminating radio fan.

It is significant that the Musselman tube must be more uniform, give longer service and greater satisfaction in order to support this rigid sales policy.



The Musselman Mogul. A better power tube for the last audio stage.
Price..... \$5



"The Tube with a Pedigree"

655 Machinery Hall

A. J. MUSSELMAN

Chicago, Illinois

Tell them you saw it advertised in *On the Air*.

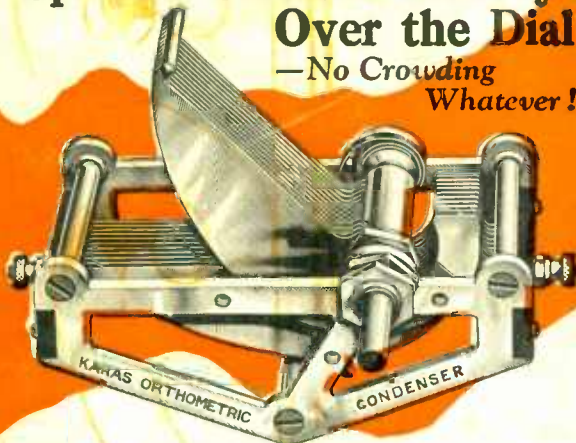
No matter what circuit— Far, Far Better Results with

KARAS

Orthometric Condensers and Harmonik Transformers

KARAS instruments have been tested and recommended by leading technical editors for use in all types of sets from the most elaborate supers to the simplest low loss 3-tube receivers. The most exacting home set builders, the country over, demand Karas Transformers and Condensers—and will use nothing else. Nothing can take the place of these scientifically designed, precision instruments. Use them in your next set—or improve your present set by installing them. It's easy to do—the results will be worth many times the cost.

**Spreads Stations Evenly
Over the Dial**
—No Crowding
Whatever!



The Karas Orthometric Condenser positively separates all adjoining wavelengths by EQUAL distances on the dial—giving you full benefit of the 10 Kilocycle frequency separation fixed by the government. Ordinary condensers jam 70 of the 100 Government allotted wavelengths into the first 30 points on the dial—even straight-line-wavelength condensers crowd 57 of them below 30. But with Karas Orthometrics, each point on the dial corresponds to one of the 100 allotted wavelengths. The result is marvelous simplicity in tuning—and better, clearer reception—all side bands without interference.



**For Long Distance
with Big Volume and
Keen Musical Quality**

Karas Harmoniks deliver perfect music with loads of volume from stations one to two thousand miles distant. DX broadcasting becomes really enjoyable. "Fishing" for distant stations is only a matter of finding programs you want to hear—not straining to catch only the bare announcement and making up a list of call letters.

Even from far away points, Karas Harmoniks bring out full, round musical tones. All the vital harmonics and rich overtones are fully retained. Low bass notes pour forth, rich, sweet, sonorous. If you want music like this, you must have Karas Harmoniks in your set. Get a pair TODAY!

Karas Electric Co.,
4045 N. Rockwell St., Chicago

Please ship me the instruments checked below. I will pay the postman prices listed; plus postage upon delivery. It is understood that I have the privilege of returning these goods, for full refund, within 30 days, if they do not prove entirely satisfactory.

.....Karas Harmonik Audio Transformers. (\$7.00 each)

.....Karas Orthometric Condensers: Size.....
(23 plate \$7 ea.; 17 plate \$6.75 ea.; 11 plate \$6.50)

Name.....

Address.....
If you send cash with order, we'll send package postpaid

Brings in KDKA at 53

Not at 17—or 28, but at 53 where it belongs, leaving lots of room for the 52 wavelengths that must come in below it. The Karas Orthometric is a "precision job"—entirely of brass. Every joint soldered. Plates patent-leveled and securely bridged.

If your dealer is out of Karas Instruments

Order Direct on This Coupon

Most good dealers everywhere sell Karas parts. If your dealer happens to be one who doesn't, we will supply you direct at no trouble on your part—on our 30-day money back guarantee. Just fill in and mail this coupon at once. Send no money. You can pay the postman on delivery.

KARAS ELECTRIC CO., 4045 North Rockwell Street
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