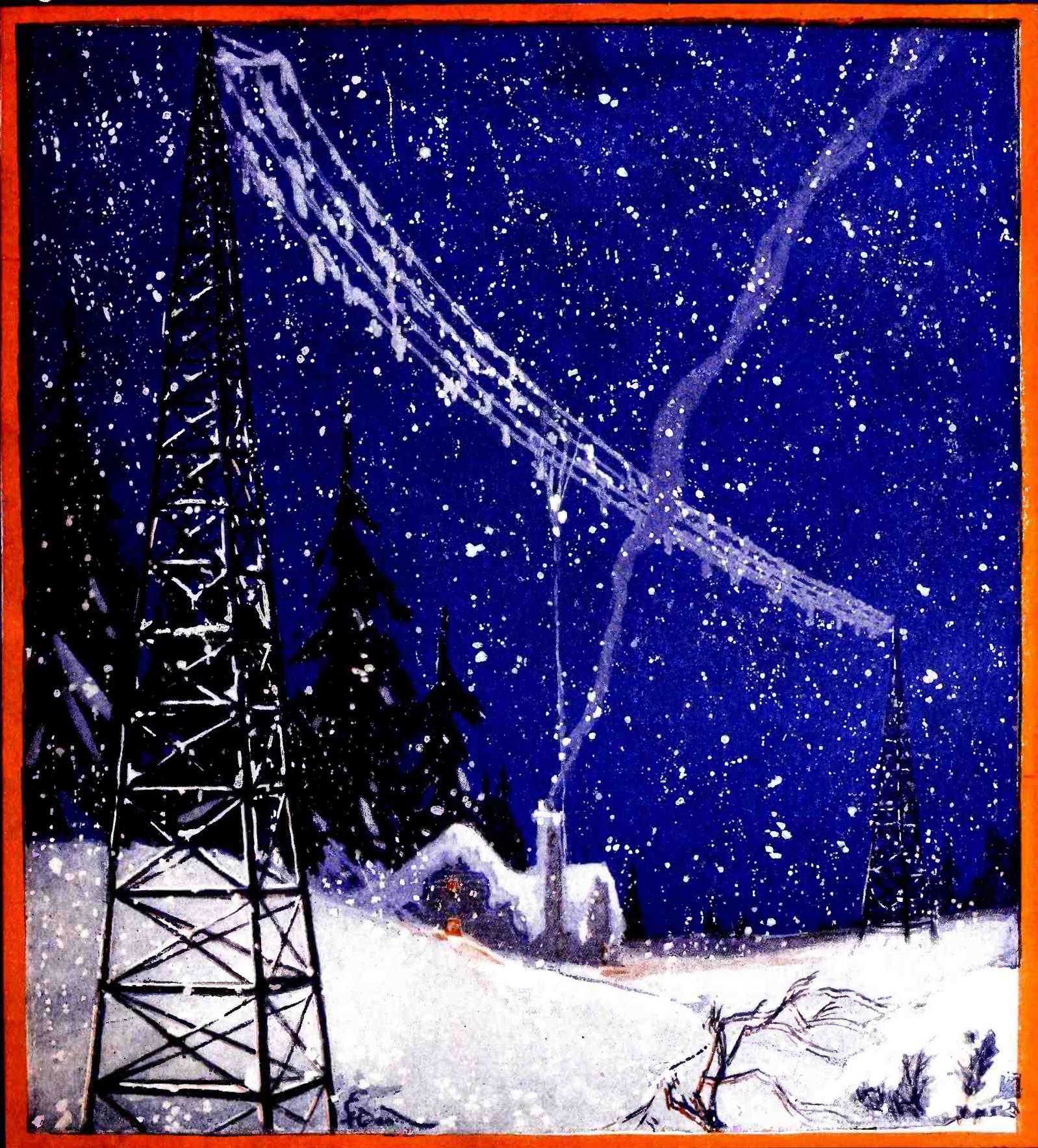


On the Air

A Magazine of Radio

December
1925

15 cents



In This Issue~What Does A Shadow Sound Like?

Send for this RADIO BOOK FREE

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Exclusive Radio Mail Order
House Will Send You This
Wonderful Book FREE!

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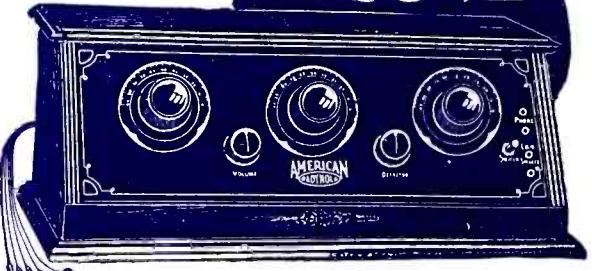
This set with all Accessories, Including the famous American Bell Loud Speaker with adjustable unit, 2-45 volt "B" batteries, one guaranteed 100 Ampere hour storage "A" battery, cable for battery connection, 5-201A tubes, Aerial and ground equipment, and everything complete ready to set up and operate.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

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1926 Catalog of RADIO BARGAINS Save $\frac{1}{3}$ to $\frac{1}{2}$

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\$57.95



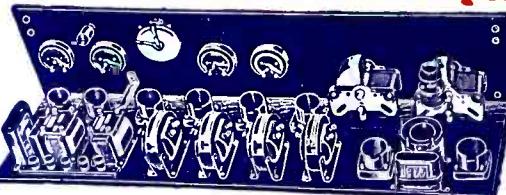
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Semi-Finished 8-Tube Super-Heterodyne

\$43.75

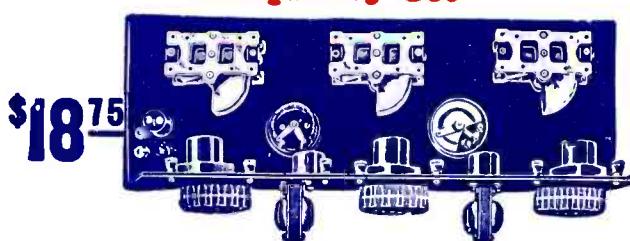


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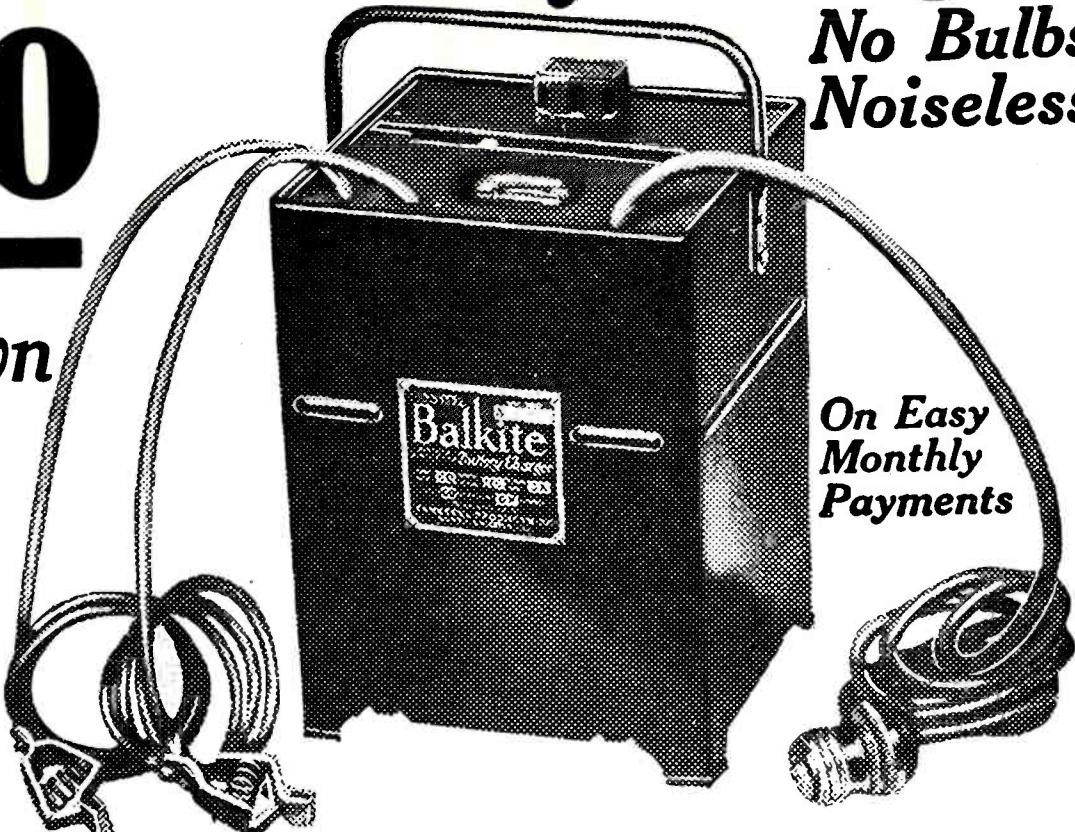
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On the Air

A MAGAZINE OF RADIO

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1925
Vol. 2, No. 4

December,
1925

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MONTHLY ROUND TABLE WITH THE EDITOR

THIS month we are inaugurating a monthly "Readers' Round Table"—an open forum wherein the ideas of "On the Air's" 100,000 readers may be discussed, perhaps passed upon, and otherwise brought before the public eye. The average reader would be greatly surprised on learning of what vast importance a concensus of reader-opinion can be. It is reader-opinion that makes a magazine, and it is this tremendous force that "On the Air" recognizes so conscientiously.

As evidence of our desire for something "different"—if there be such a thing, "On the Air" is going to inaugurate new features month by month. No two issues of this magazine are going to be alike. We don't want you to know exactly what's coming in every issue. We want you to open the cover of "On the Air" knowing that you're going to be agreeably surprised by the volume of interesting articles; by the newsy articles, and the scientific discussions.

YOU may discover a great deal of this new policy in this very issue, which is the result of a careful handpicking of boundless contributions. Every month we promise "Something New in Radio"—something really new, if not revolutionary. We have engineers searching everywhere for radio inventions and developments bearing semblance to the unusual. We will pick the best offered each month and publish it as our leading feature. In this issue, our first attempt at presenting "Something New in Radio" is to be found on page 7. If you have heard of it before, we offer no alibis. But we do claim that when we went to press with this issue, the announcement of "Something New" really was new. The great majority have not heard of it. And "On the Air" aims to please the great majority of American radio fans.

Are you with us? Will you participate in these open forums? We want your letters of approval, criticism, or impartial comment on this magazine, its policy, and general radio problems. Let us hear from you. Let this "Round Table" be a clearing house of radio ideas.

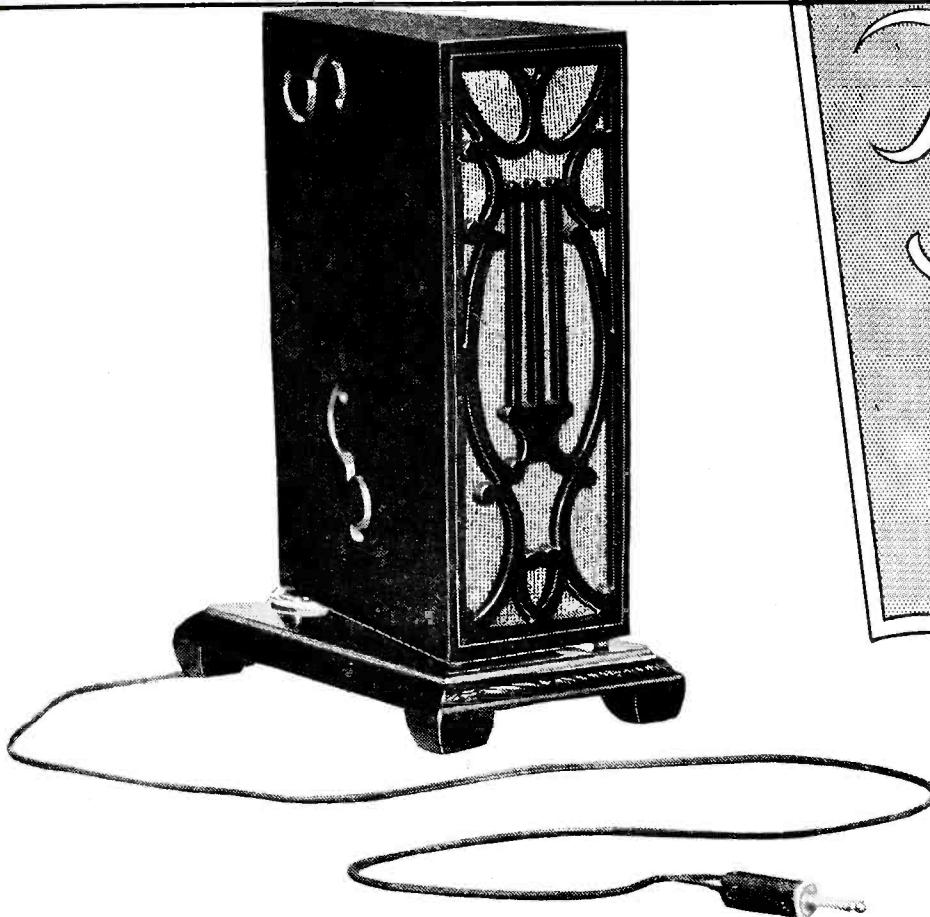
ON THE AIR, Monthly. Application made for transfer as second class matter from the Post Office at Chicago, Ill., to the post office at Mount Morris, Ill., under the act of March 3, 1879. Originally entered at the Chicago Post Office April 25, 1925. ISSUED MONTHLY, 15 cents a copy, \$1.50 a year in the 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 January issue close December 15. Issued on the 15th. Western Adv. Representatives, Rhodes & Leisenring, Bell Bldg., Chicago.

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(12-25)

EDITORIALS



IN HIS opening address before the National Radio Conference in Washington on November 9, the astute Secretary of Commerce, Herbert Hoover, strikes at the very heart of radio's greatest problem when he declares that, after all is said and done and all the surveys and investigations are turned in and locked up—that there are too many broadcasters.

That's all there is to it. There are too many stations on the air that don't amount to anything; too many that are engaged in the business of advertising their wares and not enough giving good programs. Secretary Hoover realizes this and promises stringent legislation to make it harder to get a broadcasting station into operation. When he accomplishes this, he will make the ether worth tuning into, without fear of being advertised to death or pestered with a lot of second-rate programs.

A few years ago radio legislation was looked upon with utter horror by persons who owned small stations and feared the influence of the so-called "radio trust" in national radio legislation. Today the Secretary of Commerce's proposal to make it a difficult feat to open a station does not seem to meet much opposition. The big stations that are really trying to give the listening public something worth listening to, welcome the proposal; for their programs, no matter how good, cannot be received properly if a lot of flivver stations are heterodyning on their wavelengths continuously.

Likewise the listeners are exasperated by the confusion of stations and the resultant interference. So, all in all, it appears that a congressional step toward clearing up the ether will be a step forward. No longer need we fear the "Big Four" of radio, for they have been put in their place. The "chain" of stations may always exist and hover above the independents like an ill-omen; but the local stations—the life of the prosperous community and the incentive toward good local programs, always will exist, although in a reduced number, to be sure. May Mr. Hoover hasten the day when we can tune in and get only those stations whose offerings are known to be excellent; those stations who have proven to the government that they are the fittest; and in radio, like everything else, only the fittest survive.

CHICAGO and New York are stirring themselves up in righteous indignation over the silent night problem. Chicago was so successful in shutting down all but one local station on Monday nights that New York, envious of the younger city's advance in the radio art, decided to try out the same scheme; and at this writing it is progressing rapidly and bidding fair to emulate Chicago's achievement.

However, whether it can be called an achievement is a pebble from another beach, metaphorically speaking. There are two sides to everything, and we should not condemn before we investigate. To the large body of fans throughout the country, silent night is a distant squabble of political forces in two big cities. When you get down to the bottom of it, this silent night question is nothing more than politics. In Chicago, politics were used, by means of the Broadcast Listeners' Association, to close down all but one station—WOK, which is still on the air and fighting for the principle that it deserves to stay on the air whenever it pleases, because of the large expenditure involved in erecting the station. The B. L. A. pulled the strings on the other stations, and they said, "If Station—shuts down, so will we." Just a case of mutual suspicion. It was finally accomplished, and now every station above 217 meters within about 40 miles of Chicago is silent Monday nights.

Whether New York will do the same thing, or politics will turn, like the proverbial worm, and prevent a silent night, remains to be seen. Anyway, we ask our readers to bear in mind that the silent nights of Chicago and New York are puny questions when we consider that millions of fans outside of those cities want good programs every night in the week, and they don't care about the problems of the city fans. True, the city fans are due some consideration, but why a complete shut-down? On some nights only the best sets can reach out for distance. That means to thousands of city listeners that a silent night is "Silent" to them in the city as well as everywhere else. The fans themselves, and not political bodies, should determine whether stations should stay on the air. Can't everyone get a square deal in this intricate game of broadcasting?

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Broadcast map.

Broadcasters alphabetically by cities.

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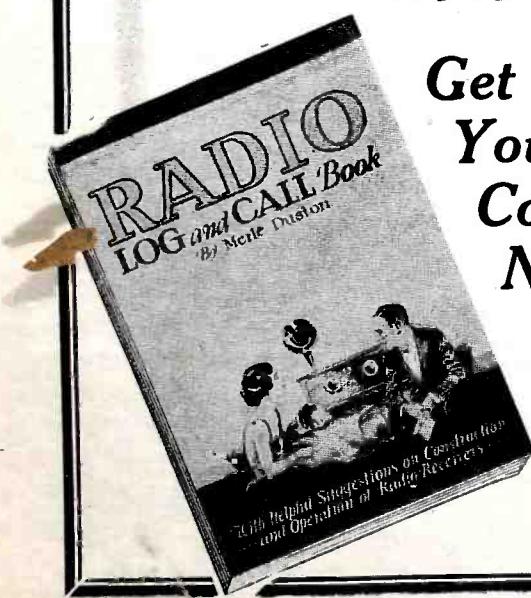
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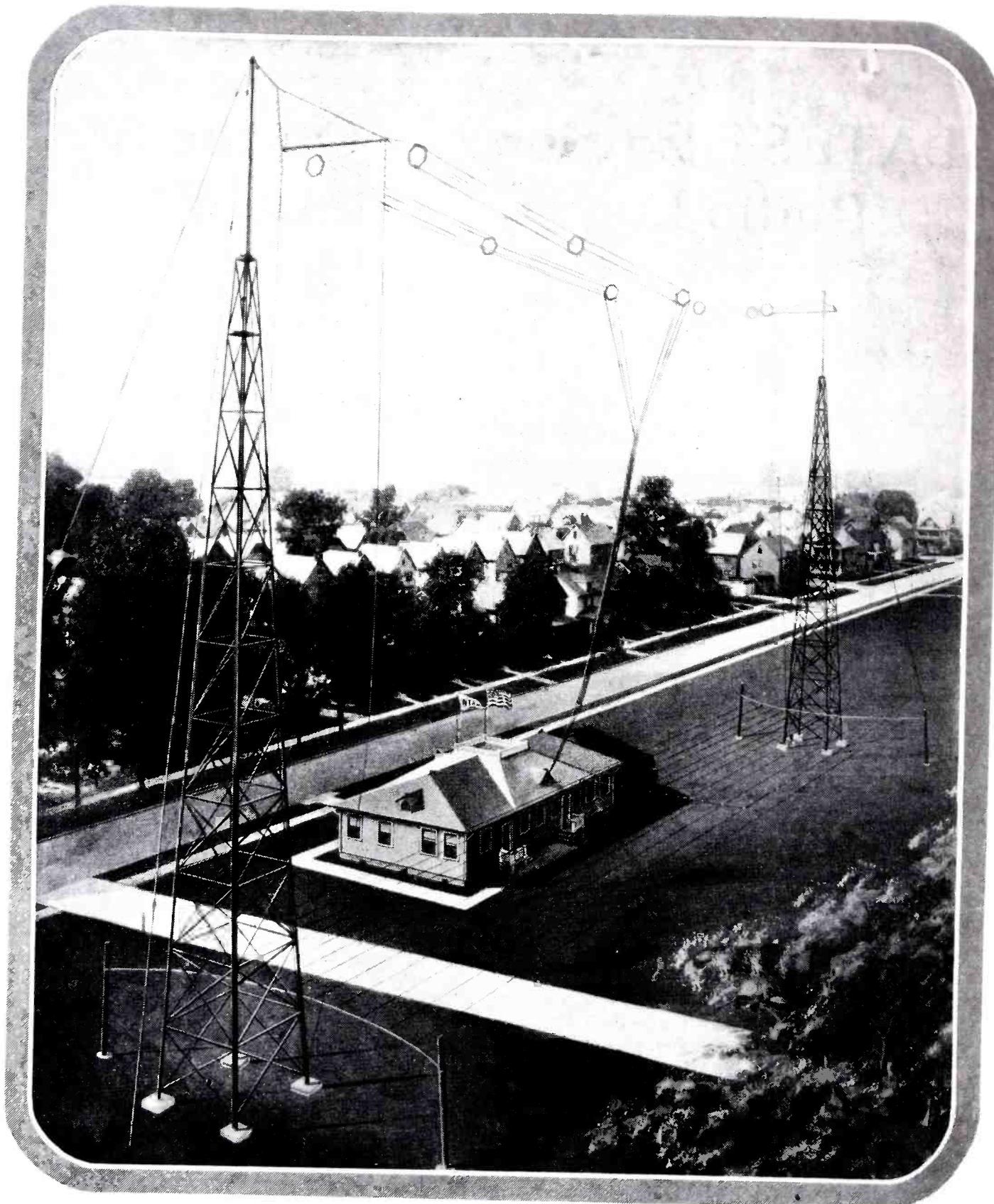
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Kimball Hall, Chicago, Ill.

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.....

(12-25)



PROMINENT among our big broadcasters is WTAM, Cleveland, shown above in the impressive bird's-eye-view. This station, operated by the Willard Storage Battery Co., is now broadcasting on about 3,500 watts power, although it is capable of increasing to 5,000 watts at any time. Its programs have been heard all over North America. The arrangement of towers and control house is the latest and most up-to-date in modern radio.

On the Air

A MAGAZINE OF RADIO

VOL. 2

DECEMBER, 1925

No. 4

HOW LOUD is LIGHT?

C SCIENTISTS' Latest Achievement is to Tell Us What a Shadow Sounds Like; New Contrivance, the Photo-Electric Cell, Does the "Trick."

C BRINGING the Stars to Earth" by Means of Radio Now a Practical Fact—Possibilities of New Discovery Practically Unlimited—Harnessing Solar System May Be one Outcome.

WHAT does a shadow sound like? How loud is a ray of light? How many stars would it take to produce a light equal to that of a 40 watt incandescent lamp?

You do not know, but you will soon be told all of these wonders, made possible by a new and unusual electrical contrivance.

We do not know just what light rays really are. Should we say they were ether waves, it would not mean much, for we know very little about the properties of the ether, and then, we are not so sure there really *is* any ether. We do know that we need light, and so far we have light; an abundance of it.

The total amount of sunlight and solar heat falling upon this old planet of ours is equivalent, in heat value, to the burning of about 1,750,000 tons of coal PER SECOND, from now on into eternity. But how much light value there is can only guess. Each star in the solar system supplies a certain amount of light, and so far we have had no way of measuring its value, until the advent of this new electrical wonder, the PHOTO-ELECTRIC cell.

With this cell, we will be able to measure the light, in units, of the most

By E. W. Fisher

Copyright: 1925

faint star in our solar system, record the reflecting properties of color, the shadow effect of vapors, and such.

We are one step closer to utilizing the

heat and light value of the sun, which, if possible to perfect, will remove the cause for worry about the world's coal and oil supply being exhausted. If we could collect and store only a small portion of this solar energy and convert it into electrical energy, Light, Heat and Power would become about the cheapest things in our daily necessities.

Unfortunately, this use has not as yet been perfected. However, with the aid of the photo-electric cell, a beam of sunlight can be transformed into electrical energy, an energy that can be measured as a flow of electric current. This alone is far in advance of Ben Franklin's spark from his kite, and it should not take as long to perfect or bring it up to a degree of perfection as it took to generate and harness the energy that caused these sparks, now known as electricity.

So, we see the day of wonders is not in the past; rather, it is before us, and this is but one step toward the finer things to come. The photo-electric cell, with its uses spread out to infinity, resembles our old

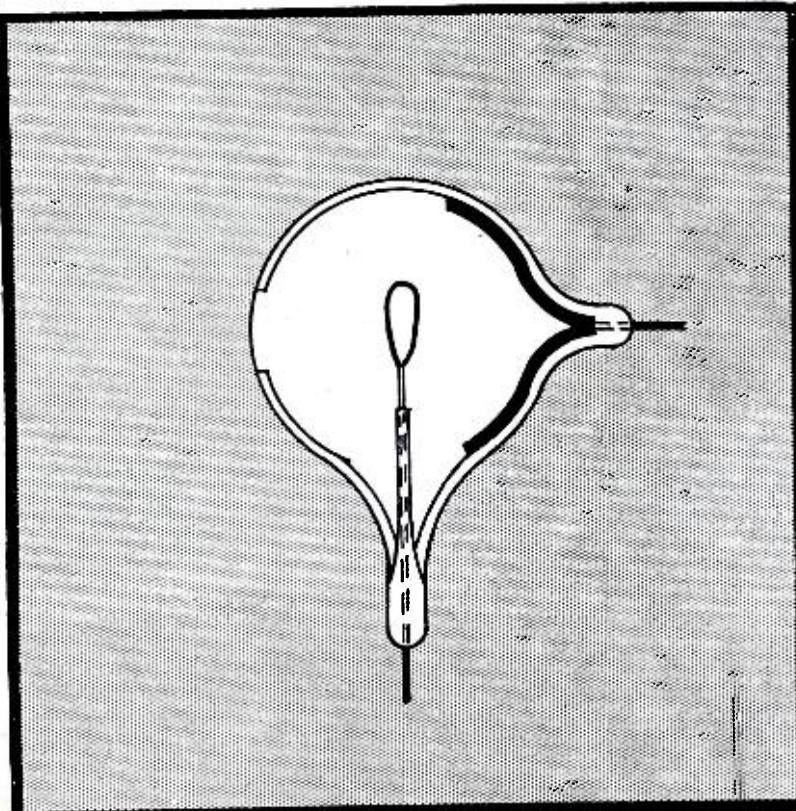


FIGURE 1

An artist's conception of the Photo-Electric cell, "the electric eye" that plays such an important part in the measurement of the stars and the reproducing of "shadow sounds," as explained in this unusual article.

friend the vacuum tube. It, too, is a vacuum tube, although it is constructed differently and has a much different purpose. Its functions are similar; yes, quite like the every day detector and amplifier tubes we are so familiar with.

Action of Light Beams

WHILE the vacuum tube converts very high frequency or radio frequency waves into audible frequency currents and amplifies them, or produces various frequencies of current as an oscillator, the photo-electric cell converts light rays into electrical energy that may be measured or amplified into sound producing energy, or to describe it a little more technically, a light beam, upon entering the photo-electric cell, starts off a stream of electrons, as the heated filament of a vacuum tube causes the electrons to flow through its grid element to its plate element. These electrons are collected on a similar plate element and may be amplified by use of other vacuum tube devices and accessories already at hand, to produce a corresponding electric signal, or even an audible signal corresponding to the intensity of the light ray.

The basic principle on which the photo-electric cell operates is not new, however. It was discovered some time back by a German scientist, but up to the present time it was not adapted to a practical unit. The theory is based upon the fact that certain metals have the property of giving or throwing off electrons when subjected to light, the volume of these electrons being proportional to the intensity of the light applied.

Under ordinary conditions, these electrons were dissipated into space and lost among the air atoms surround-

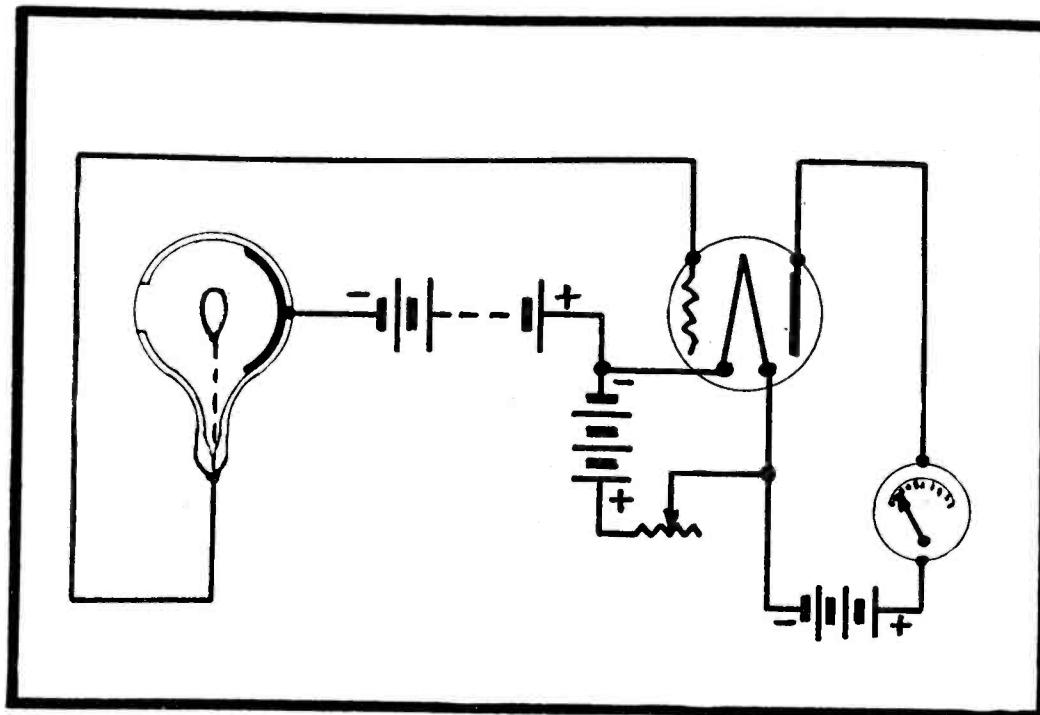


FIGURE 2
A view of the photo-electric cell connected in amplifier circuit to measure the intensity of light.

light value is varied. Thus, the photo-electric cell may be termed a generator of electrical energy, with its source of supply governed by light.

A recent demonstration of this wonderful cell recorded the change in light caused by cigarette smoke being blown in front of the cell and between the source of light supply. This slight shadow, coming across the plane of light, caused a bell to ring. Other experiments with the apparatus shown in the picture, produced equally as surprising results.

The light on the extreme right of the picture is an ordinary 75 watt lamp, which, for demonstration purposes, was considered the sun; next is the new photo electric cell, or eye, which causes a current to flow when subjected to light.

By means of relays and a step-up transformer, an electric circuit was closed, which in turn permitted current to flow to the light at the extreme left. This in turn acted upon a photo-electric cell, causing its electrons to flow in various volume corresponding to the intensity of the light and recording the slightest change, or shadow.

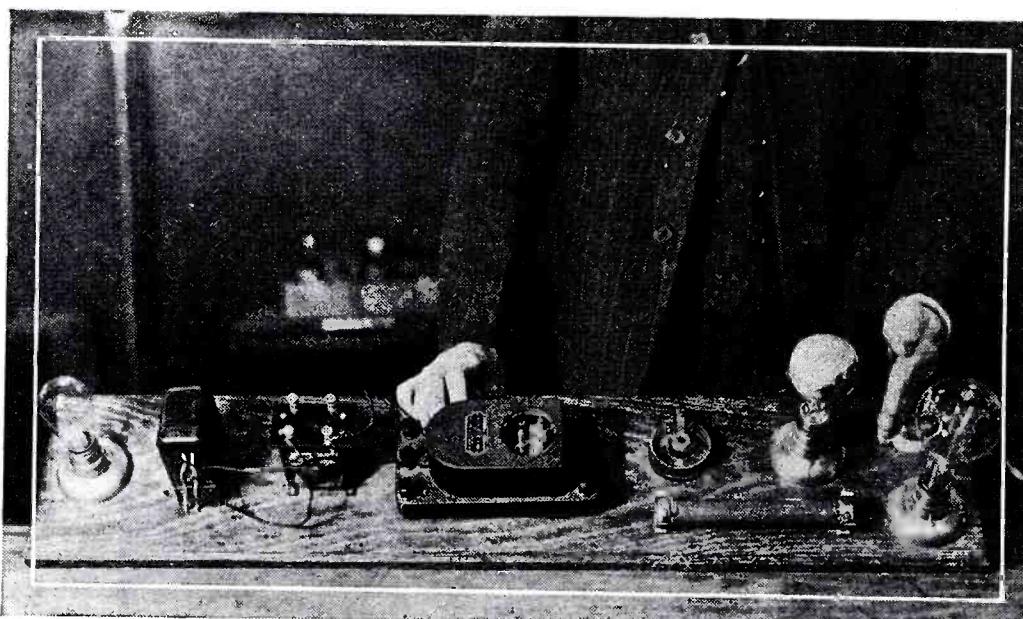


FIGURE 3
What does a shadow sound like? The latest in electrical contrivances, the "Photo-Electric Cell" will supply the answer. On the extreme right of the photograph is an ordinary 75 Watt bulb, which, for demonstration purposes, takes the place of the sun. Next is the new "Photo-Electric Cell" (really an improved vacuum tube, similar to the radio tube) which showers 40,000,000 electrons, when light falls on it. By means of relays and a step-up transformer an electrical circuit is closed, which, in turn permits current to flow to the light on the extreme left and this light operates on the "Photo-Electric Cell" causing it to release its torrents of electrons. In the demonstration, the smoke of a cigarette, coming across the plane of the light, caused a bell to ring and the slightest shadow causes the "Cell" to howl. V. K. Zworykin perfected the instrument which can be used to measure the light of the stars, and it is possible that it will be employed in radio to produce the super-sensitive microphone.

One of the Experiments

WHILE the above experiments were made to show the possible uses of

(Turn to page 62)

ing the metal. Upon closing this metal in a vacuum and inducing a plate element, the electrons emitted from this metal are collected, and like the vacuum tube, they produce a plate current that may be handled in the same manner. The plate current of this cell corresponds in value to the intensity of the light applied. These electrons will continue to flow as long as the light is applied and will vary in volume as the

Encircling the Globe with Short Waves

American Radio Genius Reaches Out to Wilds of Africa and to Distant Australia—Rebroadcasting Now a Common Practice

By R. H. HOPKINS

IT WAS night in the lonely bush country of South Africa, and a storm was coming up in the west. From out on the plains came the growls of the lion and the leopard as they fought for a carcass that had been poisoned by the men of the camp and left out in the bush to kill off the wild beasts that prowled around too close for the peace of mind of the men.

Suddenly the Kaffirs aroused as there was heard, from the engineers' quarters, the voice of a strange man singing a song in the language of the whites. How did this stranger enter the camp? The blacks had heard no one approach.

In a few seconds the song ceased, and then came the voice of a second strange man, this time speaking instead of singing. Then came the voice of still another stranger, but this time a woman, also singing, in the white man's language.

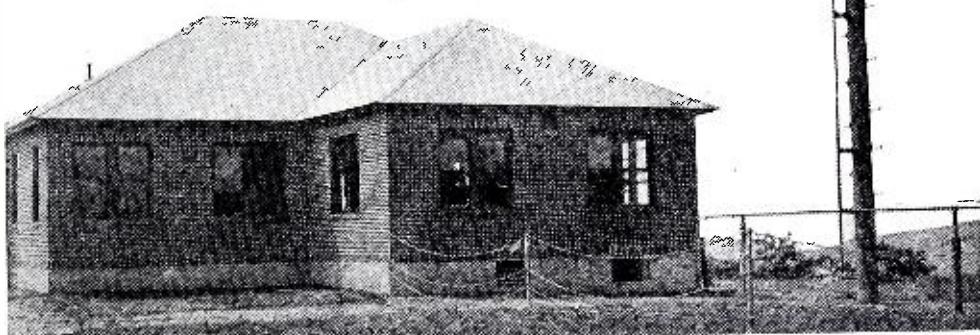
Ah! The master was entertaining a woman. But when and how did she arrive? Presently she stopped singing, and after a few words from one of the strange men, there arose the strains of a band like the blacks had heard in a city in the Transvaal country.

9,000 Miles Away!

SOME of the lady's notes and words made the Kaffirs believe that I was entertaining a white woman, and they still are searching for her in the camp, and will not be convinced that it was wireless," the master, Alfred Lewis, a resident of Johannesburg, stated later in describing the incident. For indeed it was wireless, a radio concert transmitted on the short wave from Pittsburgh, 9,000 miles away, picked up by Station JB at Johannesburg, and re-broadcast on the JB Broadcasting wavelength.

"Between the growls of the lions and leopards fighting for the poisoned carcass, the roar of the thunder and the unusually bad atmospherics, it was not quite clear to catch the lady's full voice," declared Mr. Lewis—for it was Summertime in the Transvaal and static or "atmospherics" are as bad during the Summertime in South Africa as they are in North America.

If the Kaffirs are not accustomed to hearing the Pittsburgh radio concerts, the white people are, for the South Africa stations have been relaying them periodically for more than a year. The relayed programs are transmitted on the short wave from Station



One of KDKA's short wave antennae, with the coil connecting the upper and the lower parts of the copper tuning, and a small counterpoise element at the lower end. Such equipment as the above, though quite simple, is responsible for the great distance achieved on short waves.

KDKA, as the short waves carry much farther than the long waves and are much less disturbed by static. These short wave programs have been heard in every civilized country of the globe, and relayed in many of them.

The carrying power of the short wave is demonstrated by the fact that transmissions to the American fleet in Australian waters, almost exactly half way around the world from Pittsburgh, were picked up daily in Australia during the entire visit of the fleet, the only trouble experienced being considerable interference in Australian cities caused by local amateurs tuning their oscillating receivers to catch the transmission direct instead of from the Australian stations which re-broadcast them.

Helping to Win a War

IN a Syrian village near Damascus, a small garrison of French soldiers was besieged by a superior force of Druse tribesmen during the recent uprising of this tribe. Although shut off from direct communication with the French army headquarters in this territory, the handful of soldiers had their spirit maintained by the music received on the short wave from Pittsburgh. The sense of isolation usually felt by besieged troops was totally absent, due to the contact with the outside world by means of the radio concerts, the commander, Captain Muller, reported, and the soldiers off duty danced to the music and were as gay as men could well be under such circumstances.

The radio heartened the men and kept up their morale, but the food gave out. The garrison was on the verge of surrendering, one night, when the soldiers were thrilled by hearing the martial air which the

French people recognize as the American national anthem. The song was "The Star Spangled Banner"; during the World War when the American troops and their songs were familiar in France, this song was used by the American Army as the country's national anthem, since the British national song, "God Save the King," had the same tune as "America."

By a queer twist of chance, "The Star Spangled Banner" was being sung in Pittsburgh on this particular night by a Turnverein male chorus during a program that was being given in celebration of the seventy-first anniversary of the Turnverein Society in America, an organization of American citizens of German extraction. The program was being broadcast from KDKA, and at the same time was being relayed on the short wave for re-broadcasting by the radio station in Stuttgart, Germany. The French garrison heard the song, and it brought back memories of the last year of the great war when the Americans and French fought side by side to smash the famous Hindenburg line.

The song gave new heart to the starving garrison, and in the morning the soldiers made a sortie and routed the tribesmen. That evening the siege was raised and the garrison saved when a Syrian general marched his troops into the town and relieved the French soldiers.

Radio Most Useful in Peace

THIS incident serves to illustrate the far reaching influence of the short wave transmissions from Pittsburgh, although it is in the realm of peace and international understanding that these transmissions are most felt. The Brazilians as a part of the latest celebration of their independence day heard a program from this station prepared in observance of the day, a program that included the overture from a Brazilian opera, and in which the announcements were made in their native tongue by a native of their country, as well as being made in English by the station's regular announcer. As part of the festivities on the occasion of the visit of the Prince of Wales to South Africa, greetings from Canada and the United States were relayed to the Prince in the southern continent.

While newspapermen from all parts of the British Empire were meeting at the third Imperial press conference in Melbourne, Australia, this autumn, greetings from American newspapermen were transmitted on this short wave from Pittsburgh to the conference.

Carlos Gartua of Madrid, and other wireless operators of Barcelona and other Spanish cities have received programs that had been broadcast in Spanish especially for South American countries.

Fred Morris Dearing, a Missourian who is United States Minister to Portugal, is helping the cause of mutual understanding and good will between Portugal and the United States by receiving the short wave programs from Pittsburgh and encouraging their being broadcast by the amateurs in Lisbon.

Harry I. Smith, inspector of

police at headquarters of the northwest district of British Guinea, using a circuit with but one tube, gets the short wave transmissions from both KDKA and the Westinghouse Station KFKX at Hastings, Neb.

In Varese, Italy, an army captain who because of ill health cannot sleep well, tunes in on the KDKA short wave programs to while away the wee sma' hours of the morning (programs beginning in Pittsburgh in the early evening are not heard in Europe until after midnight, due to the difference in time).

Rev. William H. Doke, pastor of the Troyeville Baptist church, Johannesburg, who was an electrical engineer before he went to Africa, has built a receiver that keeps him "constantly in touch with the American voice."

C. W. Biddulph listened to the station while at Gibraltar, and when his British army detachment was moved to Egypt, made for the station a comparative report of the short wave reception in these two places.

Charles DeBoer of Chicago learned from a brother in Bombay that radio operators in India were receiving the Pittsburgh transmissions, while a ship in Yokohama harbor received them.

Ships at Sea are Safe

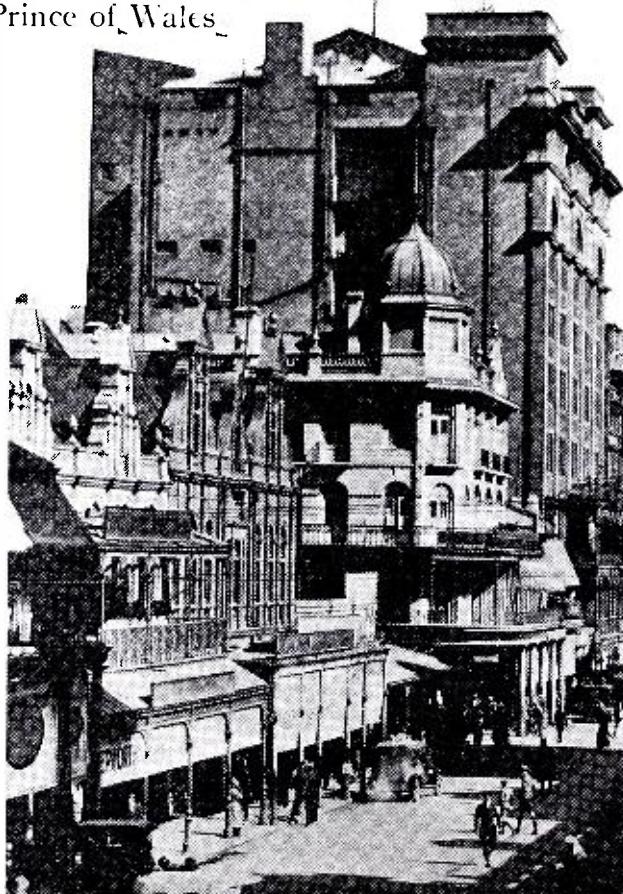
CAPTAIN J. E. Bernier of the Canadian Government Ship Arctic steered his course confidently through the ice in the polar seas this summer because he checked his course daily by the Arlington time signals relayed by the Pittsburgh station on the short wave. This ship is the one that established the "farthest north" reception when it received short wave messages from KDKA at Cape Sabine, north of Etah, Greenland, and within a dozen degrees of the North Pole.

Many of these people who hear the KDKA short wave programs in all parts of the world report to the station management the results of their reception under the varying conditions of season, weather and time of day, thus allowing the station engineers to check up the results obtained under different adjustments of antenna and transmitter, and different atmospheric conditions.

The building of this worldwide chain of observers was started when the station made arrangements with a company in Manchester, England, in 1923, to have the British company install an experimental receiving station to report on the short wave from KDKA. This was done to verify the belief of the station engineers that the short wave was much better for transmitting at long distances than the longer wavelength. The British periodicals carrying articles telling about the short wave reception in England were read by Britons in other parts of the world, and they also began receiving the station on the short wave-lengths.

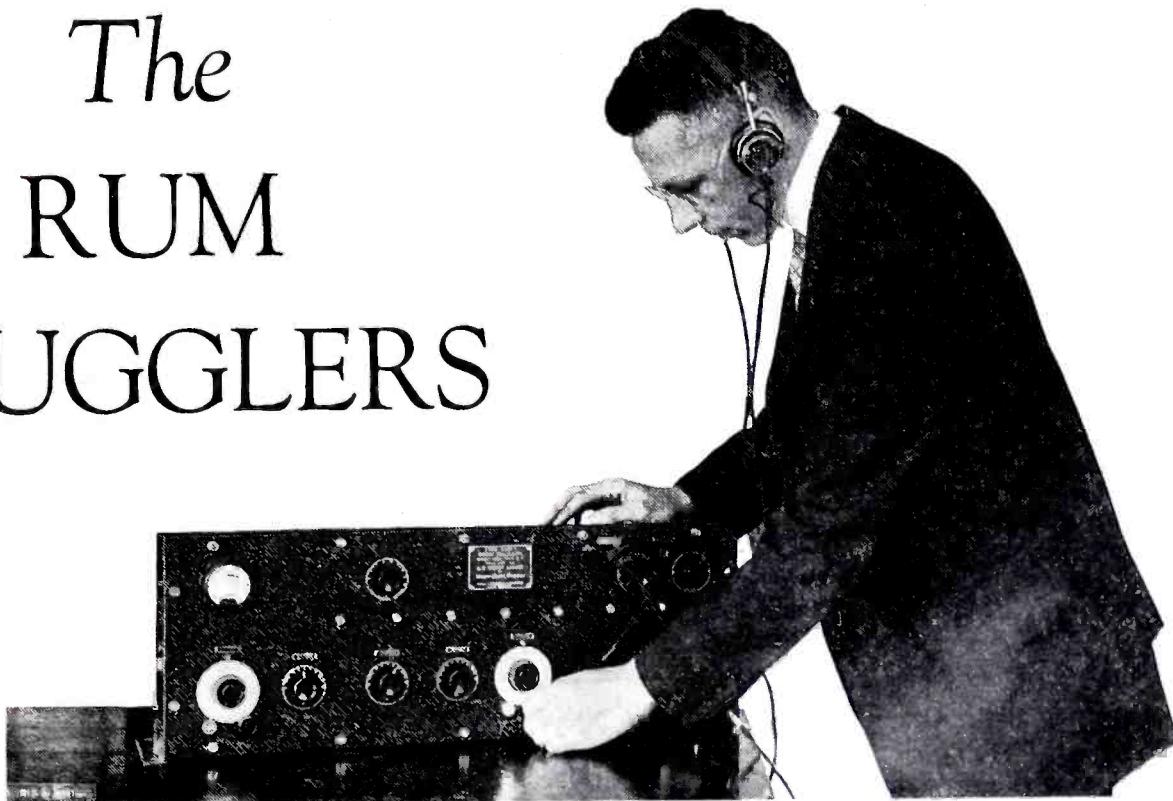
"I got on to the coil winding stunt and produced a set of rather ragtime coils," says William M. Todd, of Johannesburg, one of those who regularly

(Continued on page 64)



A view of Pritchard St., Johannesburg, South Africa, showing the antenna of Station JB, which regularly picks up KDKA's short wave programs and re-broadcasts them.

Now Uncle Sam is Using Radio to Nab The RUM SMUGGLERS



Lieut. E. M. Webster, director of Communications for the U. S. Coast Guard, is shown at the receiving set installed on all of Uncle Sam's rum chasers.

RUM-SMUGGLING ships, running in fleet formation, attempting to overpower and conquer an orphan rum chaser of the United States Coast Guard, would be foiled in their efforts nowadays. The installation of one hundred radio direction-finders on vessels of "Uncle Sam's Dry Navy" means that, in addition to existing facilities for radio communication, a method has been provided for locating the position of a Government patrol boat. Thus, a rum chaser in need of relief is not only enabled to broadcast distress signals but its exact location may be made known readily.

The wholesale equipment of 100 patrol boats with radio beacons is very significant. Recently, Colonel Lincoln Andrews, Assistant Secretary of the Treasury, under whose jurisdiction the prohibition enforcement unit operates, issued an ultimatum that illegal trafficking in intoxicating liquors must cease. Coast Guard rum chasers lately were equipped with the most efficient radio transmitters and receivers that skillful engineers could design; and, now with the installation of a radio direction-finding system, the completeness of communication facilities is manifest. It not only suggests the earnestness of the crusade against bootleggers but emphasizes the reliance placed in radio as an agency in suppressing their nefarious operations.

Official authorization to construct and install 100 radio direction-finders on Coast Guard boats at once is an order characterized by its magnitude as well as its novelty. Records fail to show where any Government bureau or commercial concern has ever installed so many radio beacons with a single stroke of the pen, as it were. Now, the placid waters of Chesapeake Bay, whose serenity is alone disturbed by the "Mayflower,"

By S. R. WINTERS

Presidential yacht, as it glides out to sea, or by boats of watermelons or fish coming into the wharves, is the scene of rum chasers docking here and there. Today, "CG 198" may be docked alongside the wharves in response to orders requiring the installation of a radio direction-finder. Tomorrow this unit of "Uncle Sam's Dry Navy" may be cruising down the Chesapeake Bay in search of a rum runner, while "CG 200," or some other patrol boat, docks in readiness for including a radio beacon among its communication facilities.

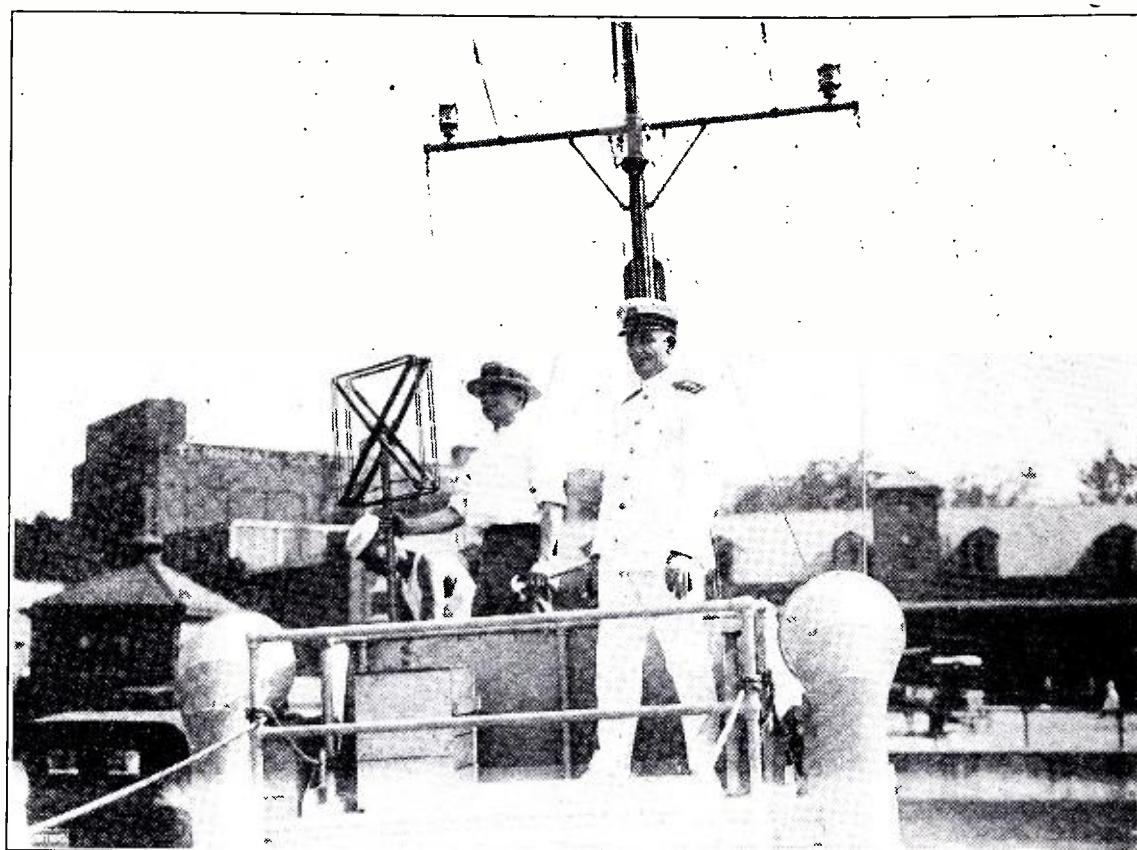
Many Obstacles Found

ENGINEERING difficulties were encountered in installing these direction-finders, both on account of employing short radio waves and in adjusting the direction-finders for use with the radio receiving sets previously installed on the Coast Guard boats. For instance, there was no precedent for utilizing short wavelengths or high frequencies in the operation of radio beacons. To illustrate: Radio beacons of the United States Lighthouse Service function on a wavelength of 1,000 meters, with a wavelength of 600 meters reserved for broadcasting distress signals. Notwithstanding this practice, Francis W. Dunmore of the Radio Laboratory of the Bureau of Standards

and W. W. Reynolds of the Coast Guard cooperatively devised a way for successfully operating a radio beacon on a wavelength of 143 meters. This radio service has never heretofore approached the lower limit of wave bands to such a degree.

This triumph to their credit, radio experts of the Bureau of Standards and the Coast Guard turned their attention to the obstacle of prop-

Radio Direction
Finders on U.S. "Dry
Navy" Used to Chart
the Exact Location
of Rum Runners

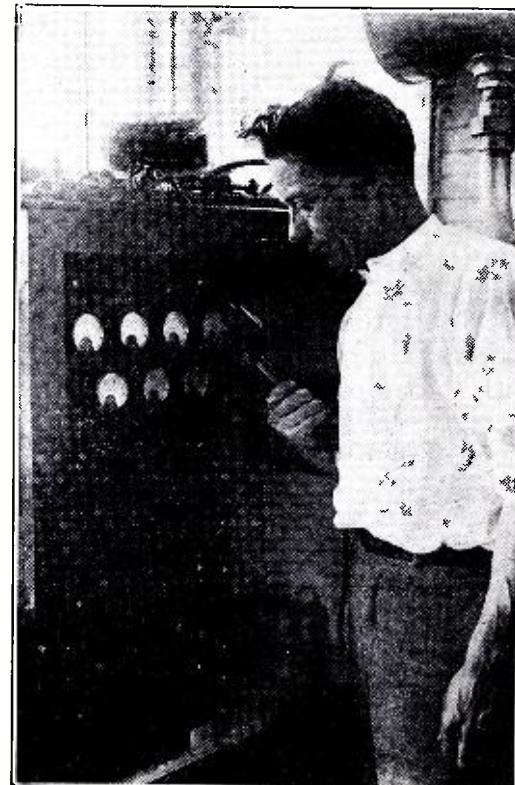


Installing a radio direction finder on a rum chaser. This coil of wire consists of four turns of ignition cable and is mounted above the pilot house. Capt. A. P. Lewis, Commanding Officer of Patrol Boat CG198, is shown at the right in the photo.

erly adjusting the direction-finder in relation to the radio receiving set previously installed. That is to say, the short-wave receiving equipment in use on these rum chasers not only functions at a fixed wave length but once this radio frequency is determined the receiving set is locked in position. This simplifies operation for untrained personnel. Despite obvious difficulties, the radio direction-finder has been installed and properly coupled to the radio receiving outfit without throwing out of adjustment the latter's operation on a fixed frequency or wavelength.

This accomplishment is made manifest, when we are told that in order to change over from voice or code reception to the direction-finding system it is only necessary to throw a switch. A reversal of this switch is quite as readily effected, thus again operating the radio receiver for receiving voice communication or the International Morse code.

The type of radio direction-finder used in "finding the rum runners" is extremely simple. It merely consists of four turns of ignition cable wound around a square frame, with 20 inches on each side. This coil of wire is supported a few feet above the pilot house by means of a metal rod. Wire leads extend from the coil or loop proper through this hollow rod down to the receiving set in the pilot's cabin. Quite as simple is the operation of this device for determining the position and correct course of a ship. The coil is revolved about its axis with relation to the maximum and minimum



This picture shows the actual installation of the 50-watt vacuum tube transmitter on "CG198," one of the rum chasers of the U. S. Coast Guard. Both voice and telegraphic signals are transmitted with this apparatus.

intensity of signal strength from a source of radio signals—a transmitting station on another ship, for instance. By revolving this coil the other essential parts of the direction-finding system is automatic, the bearings being read on a scale with reference to the ship's head.

Where Signals Come From

OBVIOUSLY, as hinted in the preceding paragraph, there must be a source of radio signals in order to operate this direction-finder—in other words, a transmitting station. The Lighthouse Service, for instance, maintains floating as well as stationary transmitting stations in the form of radio beacons. Similarly, the Coast Guard will utilize the transmitting equipment already in service on its approximately 250 patrol boats, cutters and destroyers for sending characteristic groups of dots, dashes and spaces that may be assigned

for its radio beacon service.

For instance, on the patrol boats and cutters are 50-watt vacuum-tube transmitters which are to be used for direction-finding work, as well as for other communication services. In addition to these broadcasting stations on board ships, the Coast Guard maintains about a dozen floating base radio stations along the coast of the Atlantic Ocean, so called because they are either anchored in water or tied alongside a dock. These, too, will be utilized, when necessary, in transmitting radio-telegraphic signals for the operation of direction-finding coils.

Thus, with the most elaborate radio direction-finding system ever installed, either by a Government bureau or private enterprise, the United States Coast Guard should be well equipped to cope with the subtle movements and any organized defiance of smuggler of contraband whiskey. And, what is of even more far-reaching significance, when all of the 250 vessels have been thus equipped, fog and adverse weather conditions will hold no terrors for these Government guardians of life and property. Radio beacons, unlike lighthouses and other means of visual signaling, are operative when most needed—in foggy or thick weather.

Uncle Sam was quick to realize the importance of radio in enforcing his laws. Naturally, rum-running is not the only field that calls for radio detection, but to date it has been used most effectively. And judging from the plans of Government officials in Washington, radio is going to play a great part.

Men Who are Making Radio History

CPart One: Dr. Irving Langmuir, Inventor of the Modern Vacuum Tube, Who is Responsible for Practical Radio as it is Today

ABASIC patent for the modern vacuum tube, used extensively in radio, X-ray work and in repeaters used in long distance telephony, has been granted the General Electric Company by the U. S. Patent Office. This tube was invented by Dr. Irving Langmuir, assistant director of the General Electric research laboratory, in 1912, but because of contests the patent was not granted until recently.

The tube is characterized by its hard, constant vacuum, by its freedom from visible discharge and other gaseous effects and by its steadiness and reliability in operation. It can be made in large sizes operating with 50,000 volts and upward, as well as in the smaller sizes such as are used in the ordinary home radio receiving sets.

Prior to Dr. Langmuir's invention, radio and X-ray tubes were of the soft variety; that is, they glowed and acted erratically and unreliably, except when used on exceedingly low voltages. Dr. Langmuir's invention, by removing this severe voltage restriction, has made possible practical radio as we know it today.

A Long Struggle

THE patent application has had an eventful career. Following his invention of the new tube in 1912, Dr. Langmuir spent months in thoroughly testing the invention. He filed his application in the patent office in Washington in 1913 and made the invention known to the world by papers read before scientific societies and by descriptions of the tube in scientific and popular publications. The new tubes were used for radio work by the French army early in the war and

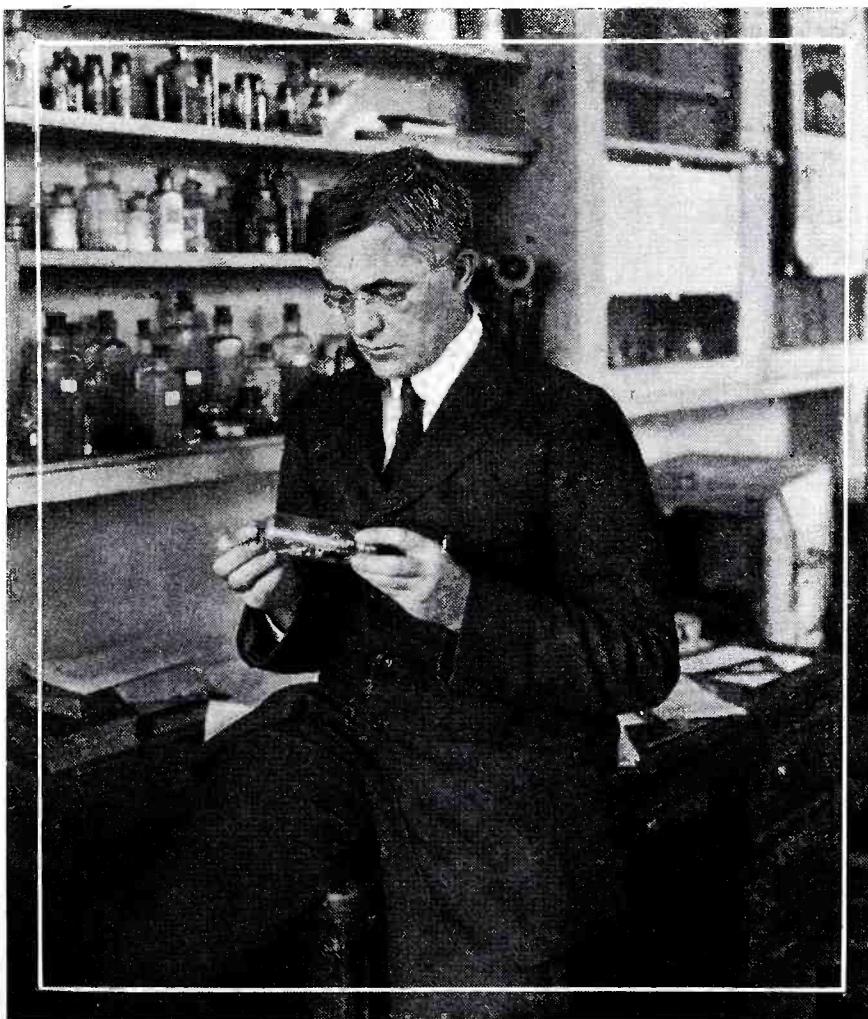
By W. T. MEENAM

were soon in regular use in radio and X-ray work in this country. The patent application, however, did not enjoy such immediate success. The Patent Office Examiner passed the application for issue in 1916, but this action was revoked before the patent was issued in order to permit another person who had in the meantime applied for a patent on this invention to contest Dr. Langmuir's right to a patent in what is called an interference proceeding.

On the declaration of the interference, Dr. Langmuir's opponent attempted to show that the invention was not patentable. On account of the unusual importance of the invention, the Patent Office departed from its usual practice and permitted elaborate testimony to be taken on the question of patentability, including even testimony, taken in England, on behalf of Langmuir's opponent, a world famous British scientist.

After the United States went into the War, the Secretary of the Navy requested the Commissioner of Patents to suspend proceedings because the full time of both parties was required upon war work of great importance to the Government. After the war, testimony was resumed, and the merit of the invention was eventually sustained by the Patent Office, after an attack for which there are few precedents in vigor or in skill. Thereupon the contest became one to determine whether Dr. Langmuir or the later applicant was the first inventor, and more testimony had to be taken by both parties to establish their dates of invention. The Examiner of Interferences adjudged Dr. Langmuir the first inventor. On appeal to the Examiners-in-Chief the decision was again in

(Continued on page 63.)



Dr. Irving Langmuir, assistant director of the General Electric Research Laboratories, holding his first three-element radio tube, upon which a basic patent has just been granted by the Government.

favor of Dr. Langmuir. On further appeal, the Assistant Commissioner held in favor of the later applicant. But on still further appeal to the Court of Appeals of the District of Columbia, the Assistant Commissioner was reversed and the Court, agreeing with the Examiner of Interferences and the Examiners-in-Chief, found that Dr. Langmuir was the prior inventor. The appeals, though diligently prosecuted, were not terminated until June of the present year.

Inventor of the Mazda Lamp

DR. LANGMUIR is a world-known scientist and inventor. Among a large number of other scientific and practical inventions made and patented by him, the best known is probably the Type C, or gas-filled, "Mazda" incandescent electric light.

The application of Dr. Langmuir's vacuum tube invention to X-ray tubes was the invention of Dr. William D. Coolidge, another world known scientist-inventor working in the research laboratory of the General Electric Company at Schenectady. The Coolidge X-ray tube, embodying the inventions of Dr. Langmuir and Dr. Coolidge, is now in operation in all hospitals and X-ray laboratories.

Dr. Irving Langmuir, who has offices as assistant director of the Research Laboratory of the General Electric Company in Schenectady, was born in Brooklyn, New York, January 31, 1881, the son of Charles and Sadie Langmuir. On his mother's side he is a direct descendant of the Mayflower, through the Lunt family.

As a man of science and a chemist of notable ability, Dr. Langmuir is internationally prominent. He is a natural born chemist and is among the few who have entered college, passing the entrance examinations [in this subject, without previous preparatory or high school training in it. At the age of seven years, Dr. Langmuir began the study of chemistry and when eleven years old had his own laboratory. To his oldest brother, Dr. A. C. Langmuir of New York, a chemist, he gives credit for his early interest in the subject, which had so far advanced when he entered high school that he had acquired all that might be learned in this field outside of college.

His early education was obtained in the public schools of Brooklyn, which he attended until June, 1892, when his parents went to Paris. There he studied under French teachers for three years. Returning to

the United States in the fall of 1895, he entered Chestnut Hill Academy at Philadelphia. The following year he returned to Brooklyn for study at Pratt Institute. On completing his course at this institute, he entered the School of Mines at Columbia University, from which he was graduated in 1903, with the degree of metallurgical engineer. On finishing his course at Columbia, he took up post graduate work at the University of Gottingen under Prof. Nernst, carrying out investigations on the kinetics of chemical reaction and on the dissociation of water, vapor and carbon dioxide. In January, 1906, the degrees of M. A. and PH.D. were awarded him by the University of Gottingen, his major subject having been physical chemistry.

Returning to America, Dr. Langmuir became instructor in chemistry at Stevens Institute of Technology, where he taught until July, 1909. At that time he entered the research laboratory of the General Electric Company.

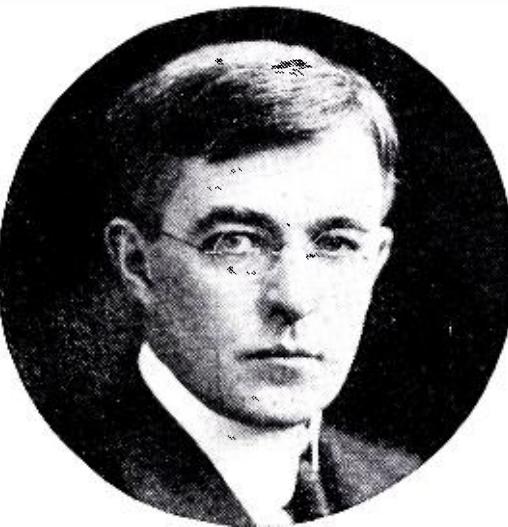
Helped Make X-Ray Tube

PROMINENT among his many notable achievements since joining that organization have been his invention of the nitrogen or gas-filled incandescent lamp; of the

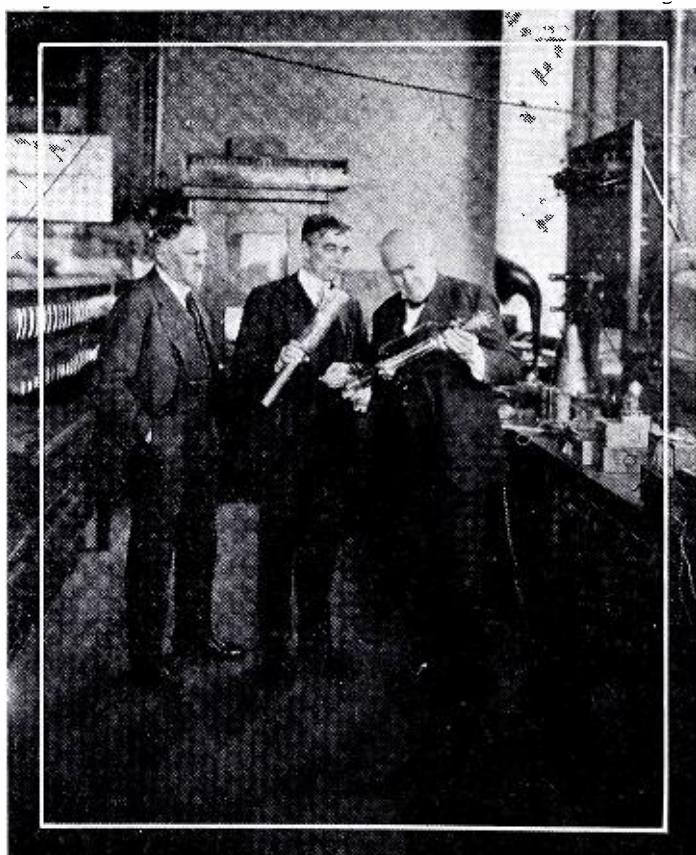
pliotron and kenotron, devices highly advantageous in radio and wireless telephony, and which are considered fundamental discoveries leading to the perfection of the Coolidge X-ray tube. Other inventions are the condensation or high vacuum mercury vapor pump; and a series of submarine detecting devices, particularly the K-Tube. With Dr. Coolidge he developed the C-Tube and various other submarine detectors.

Dr. Langmuir was presented the Hughes Medal in 1918, an award by the Royal Society of London for his "Research in Molecular Physics" and has twice been honored in being awarded the William H. Nichols Medal. The first was in March, 1915, for "Chemical Reactions at Low Pressures" and the second in 1920 for "Arrangement of Electrons in Atoms and Molecules." In the fall of 1920 he will be presented the Rumford Medal by the American Academy of Arts and Science for researches on thermionic currents.

He is a member of the National Academy of Sciences, a fellow of the American Academy of Arts and Sciences, a member of the council of the American Chemical Society, a member of the American Physical Society; a fellow of the American Association for Advancement of Sci-



A favorite portrait study of Dr. Langmuir, the noted inventor who is greatly responsible for up-to-date radio as we know it today.



In this photo are shown Dr. Langmuir, (center) and Thomas A. Edison, (right). Mr. Edison is holding a 5 KW pliotron and Dr. Langmuir holds a 20 KW water-cooled pliotron, giants of service in the broadcasting station of modern times.

► *(Turn to page 63)*

The Radio Hall of Fame



Gladys Baguill is an actress of much note, as well as a silver-voiced soprano. She possesses a soprano voice that, unusually enough, "takes" extremely well over the air. She claims allegiance to no one station, but favors them all with her charming renditions.

G. C. Arnoux, whose announcing name is GCA, is Director-Announcer of KTHS, Hot Springs, Ark. He is well known in radio, having served as announcer here and there for the past three years.



Tillie Urkov

Gaze at the meek visage above, gentle reader, and then be informed that you are sighing into the countenance of one of America's premier "jazz" artists—Tillie Urkov, who has a winning way of singing in contralto or soprano—as you wish. Her every appearance causes a deluge of requests.



Gilbert Jaffy, violinist of WOAW, at Omaha, Neb., is every inch a true artist. He takes his work seriously and loves it. Jazz has no place in his soul, and as a result he is a classic artist of the highest type. He performs from WOAW, in solos and with Brandeis' orchestra, five times a week.



Miss Deora Wolfe, shown above, is studio hostess and accompanist at WJR, the new Jewett radiophone. Extensive training in radio program work enables her to turn out unusual entertainment.



Mabel Swint Everm, program director and hostess of WF1, Philadelphia, is a graduate of the New England Conservatory of Boston and founder of the "Women's Symphony Orchestra."



Doris Claire Secord, the famous "story lady" of WOAW, Omaha. Miss Secord chose story telling as her radio profession when WOAW first went on the air, and she has been "at it" ever since.

Woman's Work in Radio

American Women are Finding More to Do in Radio Than in Any Other Modern Activity; a Few Examples

THERE is a great deal being said nowadays about woman's interest in radio, and it is being said as if woman's interest has but recently been aroused.

Salesmen and dealers are making the claim that it is a woman's influence which is solely responsible for the simplification and beautification of radio. This isn't true entirely. After an invention is well under way efforts are immediately made to improve it. Then follows the cry that the woman's influence is responsible for the finer features.

Take the automobile. The first cars that would go were ungainly and not the thing of beauty that they are today, and, while woman's influence has much to do with progress in all lines of endeavor, there isn't one man in sixty who is willing to own or drive a car that isn't good-looking and comfortable. The better the car looks, the more beautifully it is finished, the more smoothly it runs, the more a man likes it. So does a woman.

The same applies to radio. The better a receiver looks, the more easily it can be operated, the more the man and woman like it. There are very few either men or women who are content to have things in disorder

By E. J. CRAINE

or in a mess. Woman's interest in radio began when the first small boy got under her feet making a set in the cellar or mutilated the phonograph to get a part for the receiver he was building. A few women, a few men, looked upon the boy's activities as another one of the youthful nuisances that had to be endured—like teething. But the father and mother, who were really interested in the character development and growth of their son, were interested in this new thing which kept the boy at home and off the streets studying and experimenting.

The Real Test

MOTHER'S interest in radio was heightened when the youngster, long after he should have been in bed, came patterning down to the parlor, in pajamas and bare feet, with hair tousled and eyes aglow, and proclaimed that he had just heard the S. O. S. of a ship in distress, the signals at Arlington or some special news item. The next morning when this news was in the paper there was rejoicing at the breakfast table because the youngster had heard it hours before. There are very few mothers who wouldn't get a thrill out of the fact that their sons were able to achieve such wonderful

things. Almost all the present day men, prominent in radio, were, a few years ago, boys monkeying around the house building sets and begging or working for extra cash to get special parts. These youngsters are really the backbone of the radio industry. Their mothers, fathers, uncles, aunts and cousins all listened years ago to a strange language about meters, wavelengths, vibrations, transformers, condensers, grid leaks, amplifications, crystals, tubes and what not. That is the time woman became interested in radio and her interest has never lagged.

Recently an article appeared in one of the papers in which it said that women should not be the choosers of a radio receiver because she judges entirely by the outward appearance rather than by its performance. The young man who wrote the article must have lived on an isolated island somewhere or he never would have made such a statement. A trip to two or three radio sales rooms will show him that the woman, while she may not buy a set that doesn't harmonize with house furnishings, she won't even look at one which hasn't good tone qualities.

Many of the radio dealers have exchanged sets three or four times because the lady of the house objected to the squeals, howls or lack of pure tone reproduction. When she finds the set that gives the service which she knows it should, she will soon arrange it to conform with the furnishings of her home.

Women in Radio

RAUDIO is offering women greater opportunities than almost any other industry and considering its extreme youth there is probably a greater percentage of women in radio than in any other line of activity. In the factory, where nimble fingers are necessary for accuracy, women are employed in winding coils, assembling parts, soldering, varnishing and packing.

There are a number of women, editors of both newspapers and magazines. Despite its technical nature these women are proving their complete mastery of the subject of radio. One young editress, with bobbed head, can install any kind of a set from beginning to end and tell almost at a glance what is wrong with it if it doesn't work. One of the big newspapers in New York City has a woman in complete charge of its radio department and one of the large advertising agencies has a woman writing copy of radio ads. There are two women advertising managers, and another is a partner in the firm in which she is taking an active part.

Women are quick to see the unlimited possibilities of radio. When broadcasting became popular there was a great deal said against the woman as announcer or entertainer, contending that her voice hadn't sufficient carrying qualities and her throat couldn't stand the strain. Today many of the biggest stations have women giving out the programs and a

large proportion of the entertainers are women.

Radio was still very young when a woman in New York took the agency for its sale and established a splendid service department for her clients. One woman connected with a Jersey firm just returned from a coast to coast trip during which she sold a radio part,

and another woman literally went in the air, in a Curtiss plane in the interest of radio.

As a matter of fact, radio offers the modern women something more than just a mediocre opportunity. To the live-wire woman, radio offers unlimited possibilities in its hundreds of departments.



Charlotte Mayer, of WTAM, the Willard Storage Battery station at Cleveland, chose an entirely different angle in radio, preferring to entertain solely on WTAM's staff as a singer of "blues." As very few women have really mastered this art, Miss Mayer's success is doubly admirable.

your etherical audience, Judge?"
"Well, although I am an experienced public speaker I felt rather strange speaking into a tube suspended from an empty wall, but I could and did vision thousands of persons invisibly listening in, and that helped me—the first time."

"And, since then—?"

"Since then I have spoken from the platform of the Temple with up to five thousand people before me in the audience, and this I found made it more natural for me so that it comes easy now."

"What are your talking subjects, Judge?"

"Invariably my Radio talks are on 'The Cause and Cure of Crime,' and the prodigal sons and daughters that have come before me in the Criminal Court. I have come to regard Radio speaking as one of the most satisfactory experiences in life."

"Have you received any reports from your listeners-in?"

"Yes, while my visible audiences who can see and hear me are large, my invisible audiences are much larger, so I have received reports from them, many of them incarcerated in jails and penitentiaries, all over the United States and Canada."

"What is the general plea of many of these offender-writers?"

"That they are very young and inexperienced, and have found out the mistake they have made by discovering that 'Crime Never Pays.'"

"What is the average criminal-offender age?"

"Generally they are youthful, very youthful."

BILLY Jones and Ernest Hare Have so Much in Common that They Might Easily Be Twins; and Their Greatest Bond of Interest Lies in Their Radio Work from WEAF, New York, Where they Broadcast Under the Effective Name of the "Original Happiness Boys."

A Personal and Human-Interest Study of

The
**Jamous Pair of
"Radio Merrymakers"**

By GOLDA GOLDMAN

HAPPINESS is a rare quality. It is doubtful whether anyone could earn a more worth while title than to be called the "Happiness Boys." To say that they deserve that title is so much a matter of course today, that you would probably be more interested in knowing what they are like than in being told what they do. That, of course, you know for yourselves. You have ideas of what the boys look like. Billy Jones, round and fat and jolly, with a smile that won't come off; and Ernest Hare, the possessor of the most carefully brushed bald head in Flushing, and a college professor air, with spectacles and a quiet manner. Not that Billy has a more radiantly happy smile, for when Ernest beams at you, you have no doubt about the quality of his contributions to humor.

The two gentlemen, so different in appearance, have so many things in common that it is almost laughable. For instance, very early in their partnership, they discovered the amazing fact that their birthdays are on the same day. Then they found out that Billy's mother and Ernest's wife had the same maiden name. They weighed exactly the same, although Billy has far out-distanced Ernest at the present time; but they can still wear the same sized hats, collars, and coats. They measure the same height, so that the microphone is always exactly right for both.

And even their past histories are very similar. Before they went into the phonograph record business, which preceded their radio entertaining, both were on



From left to right, Billy Jones and Ernest Hare, the "Happiness Boys" who have their own way and are delighting the listeners at WEAF every Friday evening from 8:00 to 8:30. They have received requests from every part of the country.

the stage. Jones was in vaudeville for eight years and appeared on both the Keith and Orpheum circuit. Hare was with ten of the Winter Garden productions. His last show was with Al Jolson in "Sinbad," in which he under-studied the star. He played Jolson's part for almost over twelve weeks, a large part of that time in New York. They have done light opera, church singing, and concert work.

So great is the confidence of the Happiness Candy Company in the ability of Jones and Hare to represent them on the air, that they never ask the boys to submit their programs to them for supervision; this is left entirely in their hands, and it is amazing to note that since they started their programs in October of 1924, they have never repeated a joke. Many of their songs, however, have to be sung over and over again, to comply with the popular requests.

Almost eight hundred letters a week is the average they receive from people who never tire of their gay chatter and sprightly lyrics. Certain of their songs, as "You tell 'em in the high voice and I'll tell 'em in the low voice" have become radio classics. Every week they have a new opening verse of "How do you do."

Because of the tremendous popularity which the boys enjoy, it is probably safe to say that the Happiness Candy Company's slogan, "Happiness in Every Box," has been amplified by them to successfully mean, "Happiness in Every Home."

*Five Years an
Announcer, and*

NEVER LATE!

The Radio Announcer is in a Sense the Toastmaster of a Huge Meeting, Says N. W. Arlin, KDKA's Veteran Announcer, Who Typifies His Station's Ideals



By
Margie
Sander

Mr. Arlin, whose voice has traveled farther than any other announcer in the world, is here seen before one of KDKA's improved microphones.

FOR five years an announcer of radio programs, and never late to a single one, although they have been broadcast from four different studios and more than a half hundred "pick-up" points in Pittsburgh and adjacent territory—such is one of the records made by N. W. Arlin, world's pioneer announcer of Westinghouse Station KDKA, Pittsburgh.

But being on time is only one of the responsibilities of a radio announcer, Mr. Arlin declares.

"The growth of radio broadcasting and the publicity given to radio during the past five years have been so tremendous that the average person feels he is familiar with the various phases of broadcasting," Mr. Arlin says.

"Radio magazines have given the radio listener a technical knowledge of radio; pictures of studio life have given him an insight into the routine of program execution; photographs of artists have played a part in the impressions formed by the listener and the reception of the program has completed the picture for him. Little has he been concerned with the problems of transmission, program asking, program execution, maintaining schedule, and last, but not least, the problems confronting the radio announcer."

A Radio Toastmaster

THE radio announcer who is in charge of the execution of the program, is in a sense the toastmaster of a large meeting. His responsibilities, however, only begin there. First of all, he has always the responsibility of being on time. Maintaining a radio schedule may be likened to maintaining that of a railroad; yet more people are affected. The popularity of a station depends in a surprisingly large measure upon its dependability in adhering to schedule. And so the announcer's first duty is to be on time. It matters not if the train is late, the traffic is jammed, or a street car breaks down."

Whether the fates conspire to keep the announcer

from "making his program," that is, arriving on time, or whether, on the contrary, they help him to arrive on time, or whether they merely put obstacles in his path and then snatch them away at the last moment, Mr. Arlin has not decided. The only point in this connection on which he is clear is that the problem of arriving at the studio or "pick-up" point is one of the things that makes the life of the announcer an interesting one.

One midsummer's day Mr. Arlin was scheduled to arrive at the Pittsburgh Post Studio in time to broadcast the baseball scores at a certain hour. He boarded a street car near his home in a Pittsburgh suburb in plenty of time to arrive at the studio. The trolley car broke down on the way in, and as it was certain it could not be repaired quickly enough to allow Mr. Arlin to reach the studio on scheduled time, he hurried to the nearest telephone and called a taxicab.

By the time the cab arrived, it was seen the driver could not make the four miles to the studio in time for Mr. Arlin to go on the air at the scheduled hour. A mile away, however, was the Pittsburgh Athletic Association, from which a dinner concert was to be broadcast by KDKA within a short time. If the KDKA operator already had arrived there, Mr. Arlin reflected, this operator could "set up" the wire circuit to the station so that the ball scores could be broadcast from there. The taxi driver was directed to speed to the Athletic Association, where the operator was quickly located. Mr. Arlin called the *Post* by telephone, got the baseball scores, and put them on the air at the stroke of the hour.

Some Heavy Responsibilities

WHEN the announcer has arrived at the point from which the program is to be broadcast, he has lived up to but one of his responsibilities, Mr. Arlin says. At the studio he may find the soprano soloist who is to sing is in a huff because a soprano from another city

(Continued on page 63)

MISS ELENA MUNSTER has been tightly named the "Southern Nightingale" by an admiring radio audience. Her voice is undisputedly one of the most heavenly coloratura sopranos that has ever been broadcast over radio stations WEAF, WJZ and WHN all New York stations, or WBAP and WFAA, Texas stations.

Miss Munster says probably as many of her New York friends will remember her by the nicknames of "You-All-Down-Yonder" and "Texas Outfit" as by her real name.

It was while booked as a regular feature from a certain New York station which supposedly presented the same artist not more than once a day, that Miss Munster was forced to live a Dr. Jekyll and Mr. Hyde existence. There is where she was presented as "Texas Outfit" on matinee performances and became as popular under that name as under the name of Elena Munster.

A Busy Girl Was She

IN THE Summer of 1924 Miss Munster returned to her home in Dallas from New York where, besides broadcasting, she had played an engagement with Watson, Berlin and Snyder, at the same time studying with Umberto Pasini. Therefore, WFAA and WBAP fans have been the lucky ones the past year. The winter months of 1924-25 have also found her playing engagements at the Melba and Palace theatres of Dallas, Texas, her home town and making regular radio appearances also.

There are few radio performers who arrange their programs as painstakingly as she does. Her mail is not only a source of delight and pleasure but is a great help to her in making up her radio programs. She judges by her mail and wires just what kind of programs are preferred by her audiences.

When asked what kind of songs she judged the most popular over radio, Miss Munster answered, "I find the semi-classical and popular numbers are a toss-up. If there is any difference at all, it is in favor of the semi-classical songs.

"Which songs do I sing most? I try to include the numbers that I have had the most request for on a previous program and that nearly always includes 'Carry Me Back to Old Virginny,' 'The World Is Waiting for the Sunrise,'



Miss Elena Munster, radio songstress from WBAP, Dallas, Texas, who spends hours daily with her "fan mail," from which she chooses her programs.

The South's Radio "NIGHTINGALE"

*The Listener's Way
Down in Texas Think Miss
Elena Munster's
Songs Are Inspirational*

'Love Sends a Little Gift of Roses' and 'Mighty Lak a Rose.' A popular number that never fails to bring applause is 'Home Wrecker Blues.'

By the way, in mentioning "Home Wrecker Blues" I imagine some of you are wondering what became of its author and Miss Munster's accompanist, Jimmie Burnett. Well, I wondered about that myself, so I did some investigating on my own and this is what I found out: Jimmie's real girl lived in Dallas but he had several scattered around at various points he called his "radio girls." You know how things like that happen. One night he went to Fort Worth to appear on a radio program. Unwittingly he selected a very, very, sentimental ballad to dedicate to one of his radio girls, and it did not occur to him that his girl at home might be

listening in but she was. Jimmie has not been heard over the radio since that night. I would not say that is the reason but I will leave it to you to guess.

Making Others Happy

TO CONTINUE with Miss Munster, we find her graciousness to be unequaled when it comes to singing for benefits of any kind, especially anything in connection with orphaned children. She says she is always happy when she can sing to make others happy, but to sing for these little children is the most joyful thing she does.

Miss Munster explained her feelings the first time she made a radio appearance as being hard to describe.

"I did not have stage fright, and I was not nervous. It is hard to say just how I did feel. Ridiculous as it may sound, it occurred to me that I was in a box singing at my own funeral. It was only a short time though until I was as comfortable facing the microphone as I am now when facing my audience."

When asked if she never did any thing but work it was a treat to hear her laugh at the question even if I did not know what she was laughing about. She laughs as merrily and beautifully as she sings. She said, "Swimming is as much a part of me as singing. I dance, ride horse back

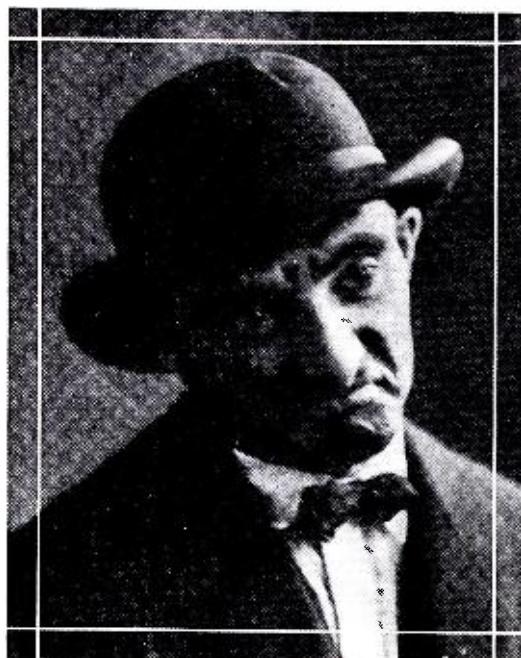
and motor. I find time for at least one of these every day. I get arrested too. I have a mania for driving fast and just seems that I can not resist a long level stretch of country road.

"I think I must have inherited this vice from some far away ancestor as I did my voice from my mother and father who were both singers. I have not had to work hard to sing. It seems as if I have just always been able to sing without trying very hard."

There are many girls in radio, like Miss Munster, who delight in pleasing their vast audiences, because they know their offerings are sincere and are received as such. Miss Munster does not think of pecuniary benefit; rather, she believes radio is the nearest one can come to romance in the money-earning world.

"Radio brings money," she says, "but the money comes without your asking for it if you apply yourself the right way and choose broadcasting as a career instead of a business."

As Told By
LERA McGINTY



The Hebrew above is none other than Tommy Creighton, noted radio monologuist who appears exclusively on the popular programs from WBCN. Besides being a radio star, Tommy is a world war "vet" and personal friend of several Kings and Queens.

LISTENERS throughout the country will be able to make further observations on super-power, its advantages or disadvantages. WGY, the General Electric Company's eastern station, has been authorized by the Department of Commerce to use 50 KW on its antenna, twice a week for regular broadcasting. This authorization is granted subject to withdrawal if high power causes interference.

WGY is the first station in the country to use super-power in regular broadcasting and it was the first station in the world to broadcast on 50 KW. The regular programs of Saturday and Sunday evenings were broadcast on super-power beginning October 3.

Tests on high power through WGY have heretofore been made under the worst possible atmospheric conditions. The first series of tests were conducted in July, the second in August and the third were completed last month. It is expected that with the cooler weather of the fall season greater distance will be possible and the effects of increased energy will be more pronounced generally.

Since the initial tests many changes have been made in the transmitter and with the tests just completed an entirely new antenna system was used. Other changes will probably be made from time to time to transmitter and antenna as the engineers, aided by the observations of fans, find that transmission can be improved.

Super-power is only one phase of extensive developmental work in transmission which is being carried out by the General Electric engineers at the developmental laboratory. At this great laboratory covering fifty-four acres of ground, engineers and research men are working on problems which it is hoped will result in improved transmission and ultimately

Studio Gossip

By ALLISON BUDLONG

in greater enjoyment of broadcast programs by the listeners.

Simultaneously with the work on super-power engineers are experimenting with short and long waves. Transmitters and antenna systems have been devised for broadcasting on 20 meters and 40 meters. There is another transmitter for 109 meter signals and a fourth for 1560. All programs of WGY except noon and evening market reports and Sunday services are broadcast on all these wavelengths and reports are received from special stations throughout the country.

Looks Like We're Going Down

The Flatbush Radio Laboratories of Brooklyn have been licensed to broadcast on a wavelength of 205 meters. Warner Brothers have installed a broadcast station on a 210 meter wave in their theatre at Broadway and 52nd Street, New York. Both stations are a bit low for the ordinary broadcast receiving set. The assignments by the Department of Commerce indicate that the author of the synchrophase type circuit was on the right track when he devised an automatic wavelength range extension which provides complete tuning range from 150 to 550 meters. The ultimate extension of the broadcast range to 150 meters is only a matter of months. The impending Hoover conference is expected to act on this important point.

Jazz is jungle music, releasing savage emotions—

Jazz promotes self expression and awakens higher ideals—

Such conflicting opinions as these, now pouring into KOA at Denver, disclose, it is said, the extent of a widening breach between jazz and the classical following announcement that the Rocky Mountain broadcasting station is arranging a musical battle between exponents of the two schools.

"Jazz stimulates unwholesome reactions, is subject to sinful interpretations and should be ruled out," declares Dr. David H. Fouse, prominent western cleric, as spokesman for the anti-jazz camp. "It appeals to the baser tastes."

While admitting that a "tin-can" tempo with its wash-boiler effects has a demoralizing influence and appeals to animal instincts, Dr. Rolland M. Shreves, vice-president of the Central Vocational College of Denver asserts that well-modulated jazz is desirable.

"It arouses a sense of harmony and



Mary E. Newsom, soprano, on the broadcasts from KGO, General Electric Pacific Coast Studio, Oakland, California, Saturday evenings, about 9:00 P. M., Pacific Time.

balance, enables men to gain a new appreciation of their individual capacities and awakens higher ideals," he emphasizes. "Music of this type causes listeners to feel complete adjustment to life."

Broadcast listeners from coast to coast are to judge KOA's novel musical struggle and are to be given opportunity to vote their choice. These votes will be compiled by states and sexes.

Returns from every state in the United States and from every province in Canada were received in the "engineering test" conducted by Radio Station WOK, Chicago. The test was held for the purpose of determining as nearly as possible the power of the station's low wavelength of 217.3 meters, while broadcasting on its authorized power of 5,000 watts. Radio fans were asked to cooperate in the test, and in order to stimulate interest, a prize was offered to the fans of each state and of each Canadian province.

The farthest south from which a report came is Balboa, in the Panama Canal zone. Writing from the city J. Jorgenson, P. O. Box 884, Balboa, declared that he and his family greatly enjoy WOK's programs, which, he said, are "coming in fine." The farthest northwest from which a letter was received was from James H. F. Lacey, at Fort Fraser, Northern British Columbia, not far from the Southern boundary of Alaska. A wireless from a private yacht in the Pacific ocean, 1,000 miles off San Francisco, also contained valuable data. In addition to letters and telegrams from all parts of the United States, hundreds of communications came from various points throughout Canada.

When the "high" and "low" pressure map, which is to be plotted from the information received from the fans who co-operated in the test, is completed, it will show exactly how Radio Station WOK is coming in all parts of the North American continent.

A Musical Director at 15!



By
A. C. E. Schonemann

J. BODEWALT LAMPE has studied with America's foremost musicians, and knows whereof he speaks. After studying "fan mail" from all parts of the country for many months, he comes to the following conclusions:

"The demand for jazzed-up melodies has fallen off; the slapstick of the old bands, where every man was a law unto himself, is no longer popular. The tendency is to play music so that the good in it will predominate rather than anything that is suggestive."

*And He Affirms that
Jazz is Dying Out
in the Best Reg-
ulated Sta-
tions!*

J. Bodewalt Lampe, who, perhaps, has studied radio programs and radio music more than any other American impresario. He believes radio music has a wonderful future in America, and in this story he gives his personal views on the subject.

SOME years ago a boy in 'teens who was directing the orchestra in the Grand Opera House in Minneapolis was asked to make an orchestral arrangement of the score of "LaFransa," preparatory to its premier. The boy not only made the complete transcription but he directed the orchestra at its initial presentation. Following the first act, the composer, Willard Patton, introduced the young conductor-arranger from the stage, pointing out that the boy's contribution to the success of the opera, while notable, was secondary when measured with his youth—he was fifteen—and his knowledge of music.

For nearly two score years J. Bodewalt Lampe, who was the boy in the incident related, has wielded the baton of the conductor, the pen of the composer and the bow of the violinist. Intimate association with his triumvirate of baton, pen and bow call for versatility as well as musical background. In the case of Lampe, he was a violinist, arranger and director of a theater orchestra at fifteen; in the field of composition he has written overtures, sacred songs, marches and many descriptive and eccentric numbers and as a conductor he has been identified with the Corrine Opera Company, the Court Street Theater, Buffalo and Lampe's Concert Band.

Lampe was born and raised in a musical environment. Back of J. Bodewalt was one, Christian, a bandmaster who flourished in his native land—Denmark—and later, took up band work in this country. Preceding Christian was Mathis, a flute and trombone player of Copenhagen, and another generation back on the

paternal side a fourth Lampe played contra-bassoon and was a contemporary of Handel.

Formerly with Remick

J. BODEWALT LAMPE became director of Station WMBB, the "World's Most Beautiful Ballroom," at the Trianon early in 1925. Since the Trianon was opened several years ago in Chicago, Lampe has been musical director, coming from New York where he was managing editor of the arranging staff of Jerome H. Remick the music publisher.

Lampe's first work in radio took place in the fall of 1922 at Station WEAF, New York, when Vincent Lopez and his orchestra began to broadcast programs from the Grill in the Pennsylvania Hotel. The Lopez orchestra was among the first in the country to send out regular programs via radio. While the initial presentations from the Grill suffered from interference and the fact that certain instruments were at variance with one another, Lampe discovered that clarity of tone and elimination of heavy combinations of instruments was imperative to success in broadcasting.

"The original combination used by Lopez at Station WEAF consisted of nine men," said Lampe in discussing his work in New York. "We learned by experimenting that we could use more effectively twelve men and that the results in broadcasting were especially encouraging when the men played from manuscript rather than 'ad lib' wherein the music was played according to the desires of individual musicians.

"At WMBB we have found that care must be exercised in preparing arrangements so that instruments may be grouped properly. The radio as well as the phonograph both show up discrepancies in music that emphasize the need of careful scoring. The demand for popular music and semi-classical resolves itself into a question of the young generation, which prefers the modern syncopated dance forms, whereas the older people favor the classical and sentimental music.

"The demand for jazzed-up melodies has fallen off; the slapstick of the old bands where every man was a law unto himself is no longer popular. The tendency is to play music so that the good in it will predominate rather than anything that is suggestive. The music that is beautiful and delightful to the ears as well as our emotional natures will react accordingly upon an audience whether it be in a concert hall or a ballroom.

"Musical form in the United States is an interesting study. Ragtime gave us syncopation. We have found a comic side to our music. The American musician doesn't accept a number and play it according to manuscript; he improvises and presents his own conception. The cabaret and cafe orchestras of Europe play the music as written; they have little success with our music because they do not inject their ideas into a number. The American anticipates his interpretation of a song. There are certain characteristics that are peculiar to our music and we are developing an idiom. The masters wrote music that was inspired by love, birds, flowers, animals, death and similar subjects; it was based on an expression of their emotional natures or founded on an event or attribute of life. The American composer has put humor into his music; the singer and instru-

mentalist go a step further and utilize their ideas."

Programs Must Be Varied

TURNING to the subject of drafting programs, Mr. Lampe drew a fine distinction between the two schedules that are provided weekly from WMBB. The early evening group brings before the microphone a galaxy of vocal and instrumental artists who sing and play musical numbers that are popular because the passing years has given them an ever increasing hold on public affections. The series that follows later in the evening consists of special arrangements of popular songs for dance orchestra, monologues and character sketches and vocal and instrumental numbers.

"We are on the air every night, Tuesday to Sunday—Monday is silent night in Chicago—and present a seven to eight o'clock program, also, a nine o'clock to eleven o'clock schedule," said Mr. Lampe, referring to the subject of routine work at WMBB. "Tuesday we have a general semi-classical program; Wednesday,

grand opera including selections and arias; Thursday, national folk songs; Friday, home songs; Saturday, semi-classical and Sunday, Sabbath songs.

"Del Lampe and the Trianon Ballroom Orchestra, the Woodlawn Theater Orchestra, the Trianon Ensemble and the Trianon Syncopators are regular features; the individual artists provide solos on the saxophone, trombone, marimba, trumpet and piano. The men and women who take part on our programs are selected after auditions and our schedules are made up in advance so as to insure balance, variety and a proper understanding of just what each artist or group is to do.

"There are compensations to broadcasting as well as trying moments. The letters we receive serve as a barometer of public opinion. Our listeners seem to prefer programs made up of good music and presented by capable artists. They want songs in English, even the arias from grand opera. Opinion seems to favor the artists both individually and collectively, who have the ability to interpret the best music according to the highest standards and yet versatile to the point of doing a simple and plaintive number as it should be done."

When radio's mission was advanced as a subject for discussion, Mr. Lampe unhesitatingly answered the query with the word, "Service." To give the great army of dial twisters what they want is a Herculean assignment, he admits, and yet a willingness to meet the issue and do all that is possible under existing conditions is half of the battle.

"We make an earnest effort to cooperate with the fans of WMBB in their likes and dislikes," said Lampe. "If they cannot tune out our station, we have sent a complaint man to assist them in bringing about a proper adjustment so that they can pick up the stations they desire."

Mr. Lampe completed arrangements some time ago whereby Walter Ford's Inter-Collegiates alternate with Del Lampe and the Trianon Ballroom Orchestra in broadcasting programs Saturday and Sunday of each week. A Sunday feature was added October eighteen when church services were broadcast from the Fifth Church of Christ Scientist, Chicago.

SOME LAMPE VIEWS:

"The main reason Europeans cannot play American music effectively is because they do not inject their own ideas into a number. It is American ability to do this that makes American musicians so clever."



"Behind the Mike"

with Jack Nelson

THE first thing I'd like to do this month is to broadcast a big hearty Christmas greeting to the readers of "On the Air," and may your New Year be one of superpower on a good wavelength.

Also, best wishes are in store for the management of "On the Air" in taking over the publication of "Better Radio"—looks like the new year will be full of "Better Radio" for all of us.

C. A. E., of Portsmouth, N. H., wrote me and asked, "Is it true that the microphone exaggerates all sounds? I mean in the sense of changing a singer's voice and not of amplifying it?" The point involved is one of the first for a studio director to learn when listening to the "try-out." At the average station auditions are held before artists are booked on a program, of course, and this is done by having the singer in the studio and the director in another room listening to a loud speaker reproducing that voice. Some experienced studio directors can tell with fair accuracy without hearing the voice being tried-out over the loud speaker or headphones, which to the inexperienced listener is uncanny. This ability, however, is not infallible, because the voice with the mike is a tricky thing. I don't quite understand what you ask, C. A. E., about exaggerating "all sounds," but perhaps I will answer the question in your mind when I say that the microphone will absolutely exaggerate inaccuracy. The slightest variation from pitch will be noticed immediately by the average listener when the same inaccuracy in a concert hall would be hard for an experienced critic to detect. The singers most susceptible to such microphone tricks are those who sing with a tremolo in their voices. A tremolo to a radio director means that method of singing whereby the voice in sustaining a note of music will waver on and off the actual note. On the stage, at times, it is effective, but on the radio as a rule it is discord, because the "width" of the "tremolo," if I may call it that, is exaggerated to the extent of the singer's wavering between the actual note and the next one higher, and sometimes even the next whole step (from do to re, or on the piano the equivalent of C to D.) This is perhaps the greatest danger when considering a Coloratura Soprano for a radio presentation. If I haven't taken your question right, C. A. E., please write again.

I wrote letters to some of my friends when I first started this page and here are a few replies:

Rex Willets, formerly of WOS and WOC and now the manager of WRNY in New York, wrote me and said he liked very much the personal touch on this page, but he added further, "Incidentally, when you wrote us for a personal touch for your column, we at first thought it might be a ten spot you wanted." Sounds as though there was a possibility there, so I think I will write Rex for \$20.

Miss Judith Waller, probably the only woman director of a large station—WMAQ, at Chicago—wrote me thus: "If in the course of twenty-four busy hours I can find a few minutes to send you the 'news,' you can be sure I will be more than glad to do so as we will be exceedingly glad to be represented in 'On The Air.' How in the world you can find time to undertake it is past my power of comprehension. But do not give up hope and maybe I will come across." In sending me the "news" she mentions, she, of course, did not mean the "Daily News." If I didn't know Miss Waller so well, I might think that what she really meant to say about my undertaking was something like this, "Why in the world don't you do your own directing job well, and stop this attempting to be literary?" This is with all due respect to trade associations of Funeral Directors.

Johnny Johnstone, Publicity Director of WEAF, New York, sent me this, which will probably be a shock to some announcers and radio stars, "The pulchritudinous attainments of radio broadcasters are not very high in the opinion of a woman in Belstville, Md., according to a letter received from her by Arthur Bagley, who broadcasts the 'Health Exercises' every morning through WEAF, WEEI and WCAP. 'After the exercises', she writes, 'I rest by listening to the pianist, and I certainly do enjoy his music, but don't send me his photo, as I am so disappointed when I see the pictures of the announcers and broadcasters!'" I understand it all except "pulchritudinous." Are you disappointed in pictures of radio people? Do you think their voices belie their personalities? I have an interesting story about this very thing for next month's issue of "On The Air."

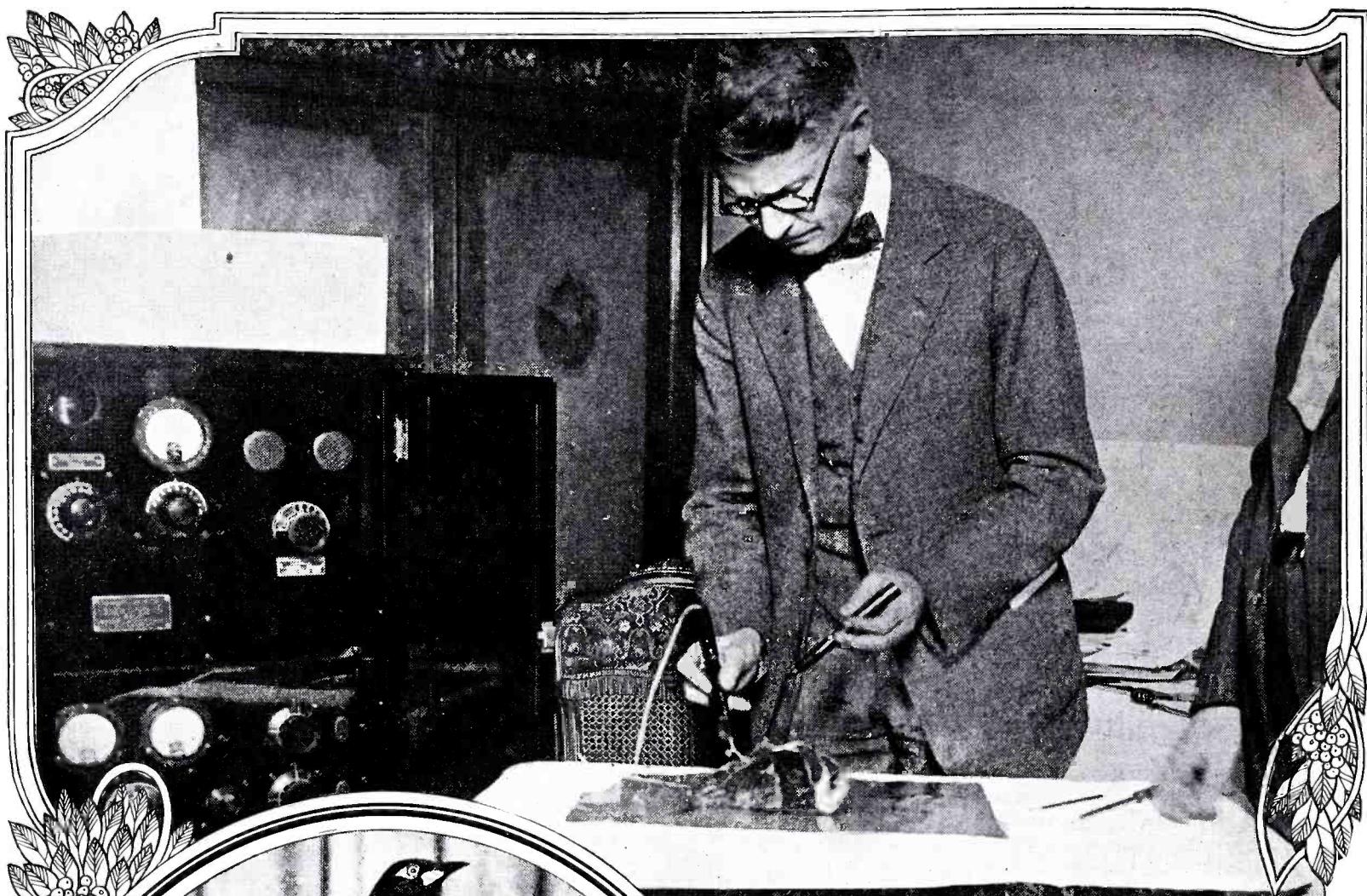
George D. Hay, the "Solemn Old Judge" of WLS, Chicago, replied, "You might mention that I am now studying, by correspondence, how to be a millionaire, and am not getting very far." Too bad, Judge, too bad—thought you'd have your diploma by this time, with Ford and Glen singing at the graduation exercises.

And talking about the Judge, we in Chicago regretted very much to hear that Hay is leaving to take up his duties as Director of WSM in Nashville, Tenn. I should say that in the past tense because by the time this is in print he will be there. Those of us at Chicago stations hate like the dickens to have George leave, but we congratulate him on his new appointment and hope he will continue his great success there. George, you know, was formerly at WMC, Memphis, and maybe it's that southern fascination that lures him away. More power to you, Judge, and best wishes. WLS is a charter member of the Chicago Broadcasters Association, and "Ed" Bill, Director, and the Judge were delegates from that station, and both were very instrumental in forming and developing that co-operative Association. Sometime I'd like to tell you all about said Association and tell some of the things they're doing for the good of radio in Chicago, the middle west, and even the whole country. Chicago loses a good man in Hay, and we must congratulate Nashville on the acquiring of "His Honor, the Judge."

One thing just leads to another. I was talking about the south, and that, of course, brings to mind the recent visit in the Chicago region of Lamdin Kay, the "Little Colonel" of WSB, Atlanta. There is an old timer for you, and a regular boy. He has deservedly one of the biggest names on the air and yet is a small man in size. I had a good talk with him, when it developed that we were both Sigma Nu's, and from there we went to Friars'. We exchanged the gossip and scandal and bouquets.

Another wandering announcer in the recent past was Wedgwood Howell, of KNX, "The Voice of Hollywood." It seems strange of course to know that Hollywood has a voice when ordinarily the word "Hollywood" suggests something to look at and nothing to hear. Wedgwood is an announcer and entertainer at KNX and described movie actors and actresses to the fans of WHAR in Atlantic City. Mrs. Dennison of WHAR tells me that he is a splendid entertainer and possesses a most pleasing personality.

I mentioned Hollywood, and that perfume reminds me of "Hollywood" McCosker of WOR at Newark. A stepping boy is "Holly" and in a letter the other day he told me, "Everything is just about the same on Broadway, (Turn to page 57)



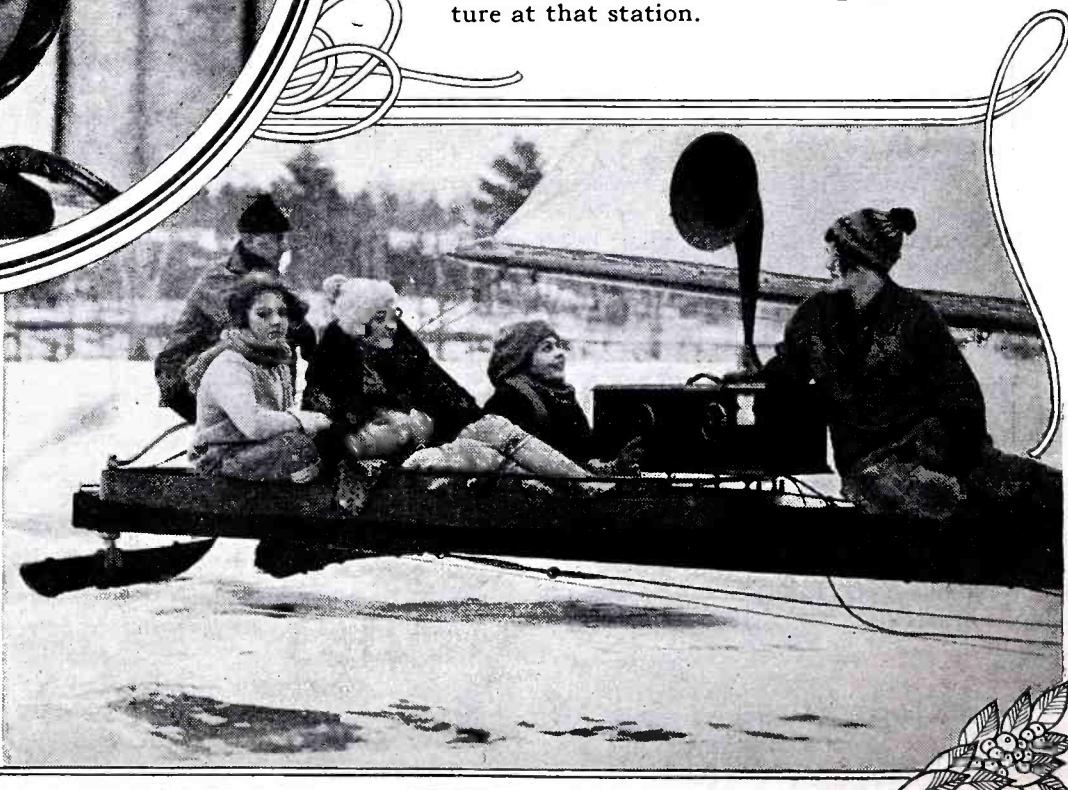
(U. and U. Photo)

Radio knife demonstrated before scientists. Before a gathering of eminent X-ray specialists, Dr. A. Mutscheller of New York recently demonstrated the original "Endotherm" or radio knife. This unique instrument is energized by a powerful high frequency current and is used in treating cancers and other growths.

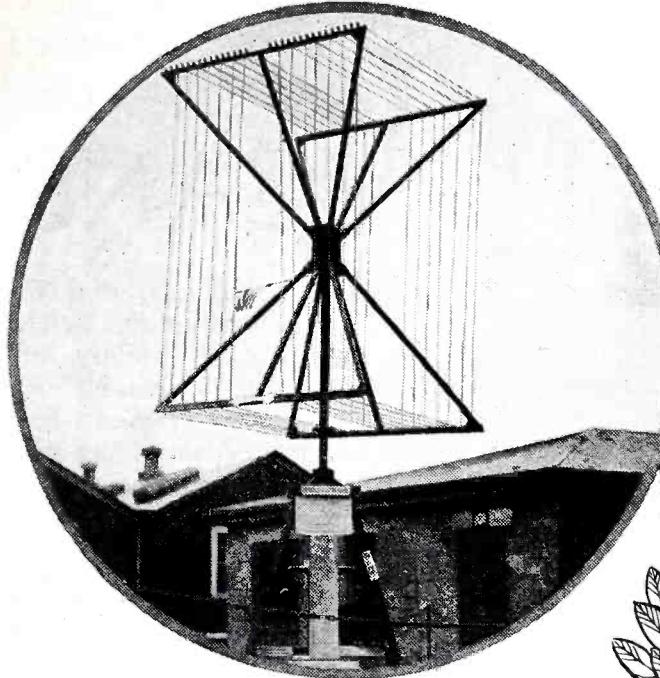


(Kadel and Herbert)

High notes—high speed—and low temperature. All are combined, as demonstrated in the photo at the right, by help of the radio. DeWolf Barton of Cambridge, Mass., installs a radio on his ice yacht and takes a fair quartette along for a musical spin over Lake Placid in the Adirondacks. It's all right, they report, except when the yacht threatens to tip.



(Kadel and Herbert)



(Kudel and Herbert)

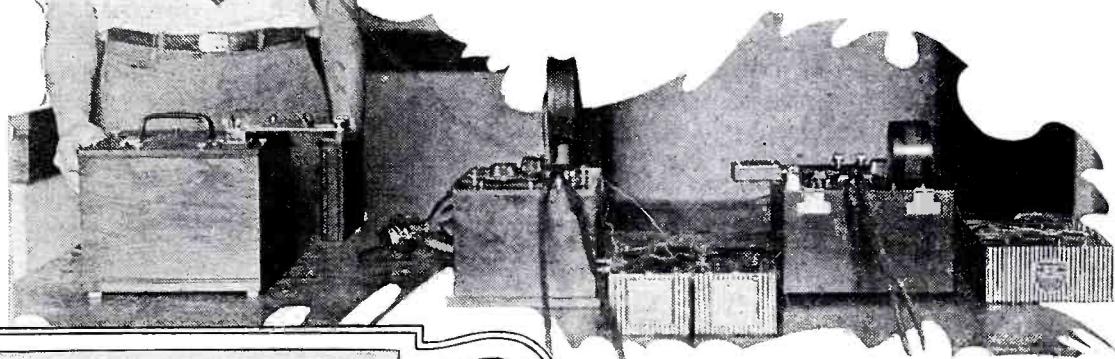
Radio compass aids in making reckonings at sea. The odd looking instrument shown above is a radio compass, located in the Charleston Navy Yard, Mass. Its most important duty is to aid Navy vessels to make their reckonings while at sea. By means of such signals units, Uncle Sam's sea forces are enabled to compute their exact location mathematically.

Directional bearings are carried on with a wavelength of 800 meters exclusively. In order to hear this type of signal, a receiver must be used that is designed for precision, and that responds to the wavelength. Bearings are most accurate when two readings are obtained, one from each compass station.



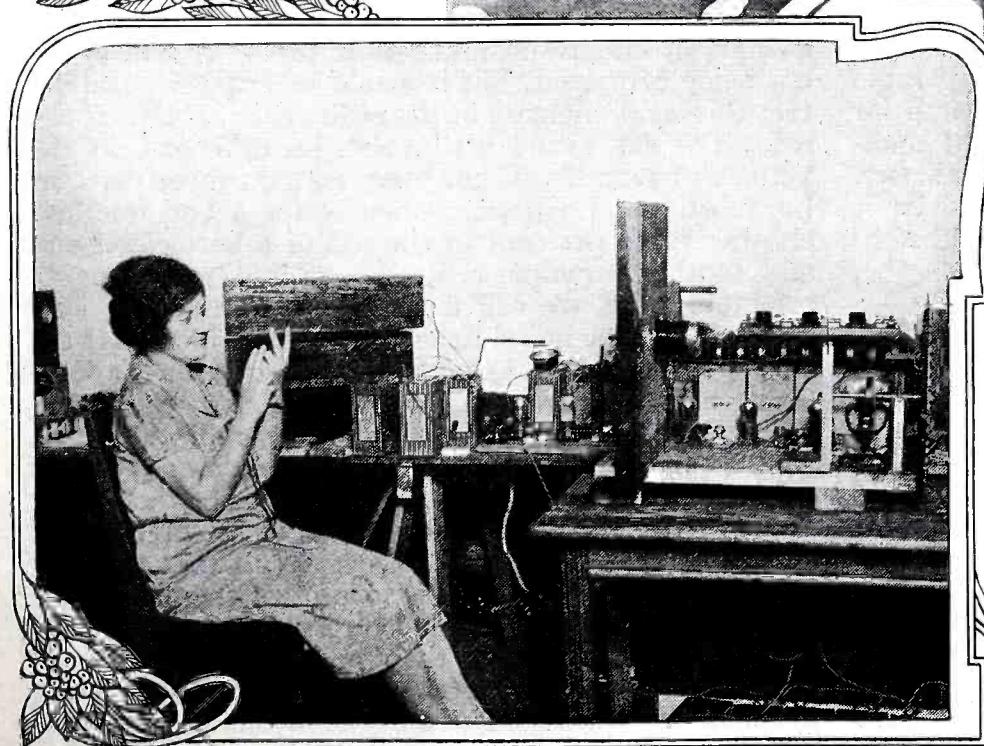
(Photo from Int'l.)

A miniature broadcasting station at home, is the achievement of E. W. Edwards, a Cincinnati youth. Assisted by a companion worker, he constructed this miniature station in the basement of his home, and it has been on the air with successful test programs. They plan to broadcast regularly very soon, on a 200 meter wave.



(U and U.)

Keeping radio frequencies constant is now done by means of the Piezo oscillator outfit, the new radio instrument described in the October ON THE AIR. H. B. DeGroot of the Bureau of Standards is shown calibrating a wavemeter with one of the Piezo outfits.



(U and U.)

Deaf and dumb will soon have radio talks, according to C. Francis Jenkins, noted inventor of "Radio movies." The picture at the left was taken in his laboratory at Washington, and the apparatus he plans to use to enable the deaf and dumb to see and hear over radio is essentially the same as his movie broadcasting outfit.

"LOW-LOSS" and

*Enlightenment on an
Abused Topic*

By Andrew Kramer

WHAT IT MEANS

IN THIS AGE when a man's social standing is largely determined by the number of tubes in his radio set, hardly a day goes by without somebody disturbing my peace of mind or otherwise calm demeanor with an inane account of his latest exploits in the realm of "Lo-Loss" receiver construction.

"Why, you ought to see it," some bird will rave, "it's a peach. Built it

all myself with only the best 'Lo-Loss' parts—brand new Chloroform tuner, plush-mounted sockets, new 'Lo-Loss' hair pin type grid leak and hypersensitive dials. Bought all the parts new. Of course, I had a couple of old parts from my other set and I put them in too. The Bakelite end-plates on the old condenser had melted where I used the soldering iron but a good coat of shellac made them look like new."

"It must be a peach," I comment with a trace of sarcasm, still thinking of the melted Bakelite end-plates. "I suppose you have the outfit mounted on glass, pole-type insulators—"

"Oh, no," interrupts the "Lo-Loss" fiend before I can continue; "you see, the whole outfit sets right in a polished cedar chest. My sister's friend gave it to her thinking they might get married, but it seems he got interested in radio so that put an end to the wedding bells, and sis, having no more use for the hope chest gave it to me and believe me, it makes a swell radio cabinet. Of course, the box was somewhat small for all my parts but by crowding them together I managed to get everything in except the grid condenser. I hung that on the outside but my brother Jim tore it off. You see, Jim thought it was a price tag and before I could stop him he had jerked it off."

The Climax—Exit!

AT THIS point, as a rule, I can stand it no longer and I usually do one of two things to end the agony. I either take my paper weight, sneak up behind and brain the fellow or else open the window and throw him out.

Many people do not seem to realize that the term "low-loss" does not refer to a particular type of construction, either of a part or a radio set as a whole, but to a principle—a mark of quality, that appears when the designer understands what he is doing. There were low loss tuners before the days of air spaced coils and metal end-plate condensers. To be sure, they were not called by the name but care was taken in their con-

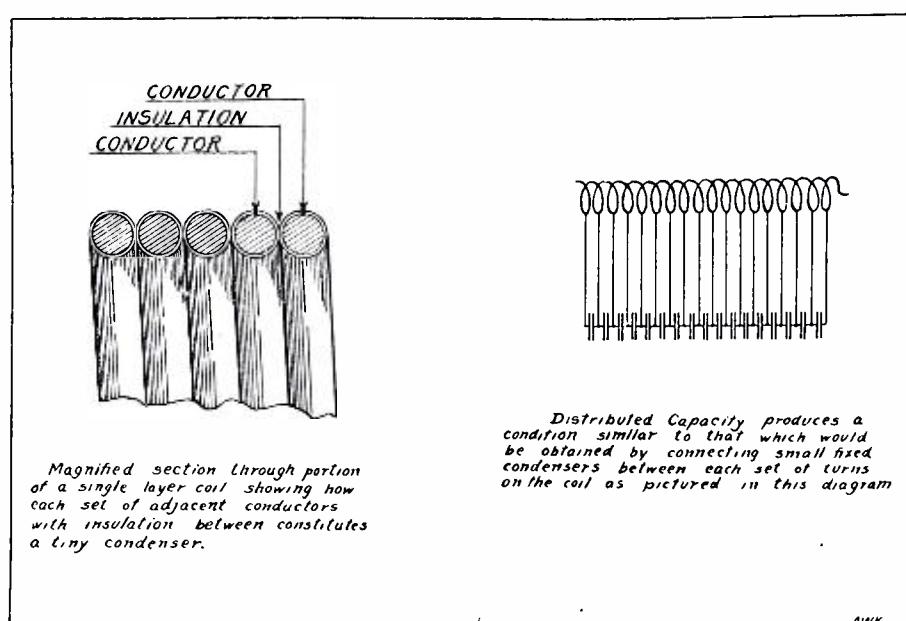


Fig. 1. This diagram shows the cause of distributed capacity, as explained comprehensively by Mr. Kramer in this article.

struction and in comparison with other tuners of that period they were efficient. Indeed, had the adjective been invented they would have been worthy of the name "low-loss."

True, with the type of parts available today it is far easier to build an efficient radio receiver than it was in the days of wooden variometers and moulded-mud end-plates, but it is also an easy matter to take a

group of highly efficient modern parts and build them up into an inefficient receiver.

A perfectly good tuner, for instance, can be rendered inefficient by placing it in too close proximity to other equipment or by crowding it into a small cabinet or even placing it too near the panel. If you can't fit the tuner into your cabinet without the aid of a shoe horn, buy a new cabinet. Unless certain principles are adhered to in the construction of a set, all the advantages of modern low-loss parts may be lost.

Low-loss as used in connection with radio receivers means merely that every possible precaution has been taken to make the set efficient. The efficiency gained in any single part by incorporating low-loss principles in its construction is usually small and cannot be detected except by laboratory measurement. The substitution of a low-loss part, say a condenser, for one not so efficient may result in a gain of three per cent in the efficiency of the set, but it would be impossible to detect this small increase in the ordinary operation of the set. The ear would distinguish no difference in the volume of sound. If, however, we gain three per cent by substituting a good condenser for a bad one and another three per cent in the use of a better coil and still another three per cent or even less by improving something else, we will find in the end that the sum total of all these individual changes have increased the efficiency of the set 25 or 30 per cent, and this is appreciable to the ear, and well worth while.

The most important part of any radio receiver, whether it be a single tuner of 1921 design or the most modern super-het available, is that part of the circuit between the aerial binding post and grid of the first tube. For this is the part of the circuit that the tiny impulse from the antenna or loop must travel unaided by anything except its own electromotive force. If the resistance of this part of the circuit is high, or if easy avenues of escape are present, the extremely minute bit of energy which constitutes the incoming signal will be lost before it reaches the detector tube. And if it

Basic Principles of Low Loss Design to be Found Between Aerial Binding Post and Detector Grid

doesn't reach the grid of the detector, it is obvious that we can not hope to detect it. It is evident, therefore, that too much attention cannot be given to this part of the circuit and it is here that the principles of low loss construction must be applied.

The amount of current flowing in this portion of the circuit is sometimes inconceivably minute. With a good detector the amount of energy dissipation in the grid circuit necessary

to produce an audible signal in the receiver is 3 trillionths of a watt. Just what this means may be illustrated by the following comparison. Suppose the energy expended by an ordinary house fly in climbing two feet up a window pane were converted into electricity. If this electrical energy was then impressed upon the grid of a good detector tube and allowed to dissipate at a rate just sufficient to put an audible signal into the receiver, it would operate this tube continuously for 65 years! Or expressing it another way, if the energy were used up in a number of tubes, it would operate 2 billion tubes for one second.

During the past year there have appeared in the show cases and on the counters of our radio emporiums, an entirely new crop of tuners, tuners which would have shocked our sense of modesty had they blossomed forth in the wooden variometer days, for these new-fangled things are shamelessly bare. Wound on all but nothing, their bare convolutions held together by invisible cement, these new creations represent the opposite extreme from the ponderous affairs

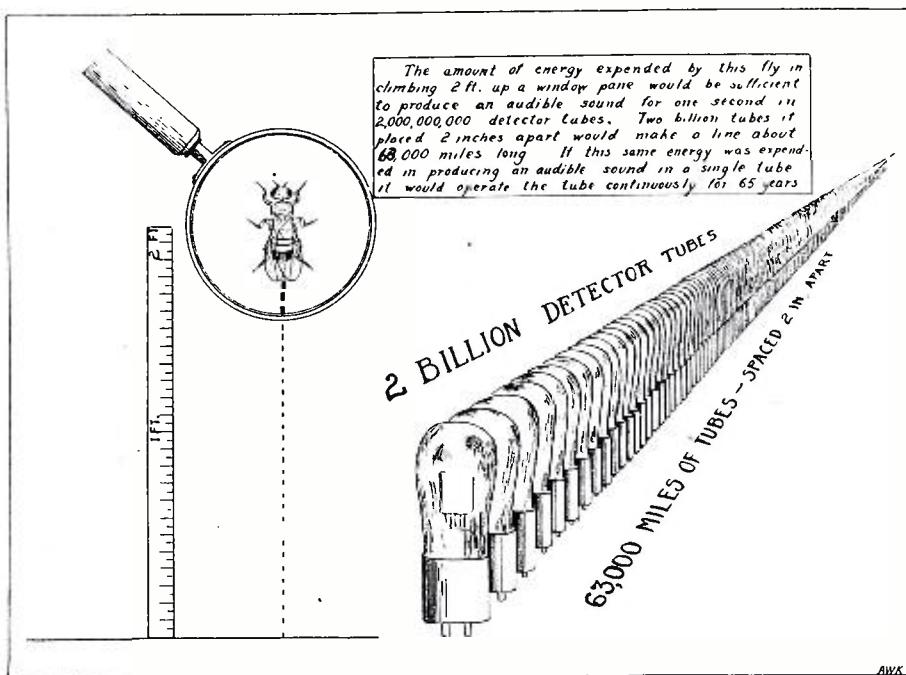


Fig. 2. The current flowing in the grid circuit is sometimes inconceivably small. This shows how the amount of work done by the ordinary house fly in climbing a distance of 2 feet compares with the energy necessary to actuate a modern detector tube.

what is desired in a tuner before he buys one.

What makes a good tuner? A tuner usually consists of one or more coils so arranged that radio frequency currents flowing in one coil will set up radio frequency currents in other coils by magnetic induction, and provided with a means of varying the natural period of at least one of the circuits. Coils therefore are essential in a tuner.

Now a good coil for radio purposes, in spite of its apparent simplicity, is one of the most difficult things to make and it has taken some twenty years of experience and research in radio to evolve the present day coils.

The two important things to be desired in any coil used for radio purposes are low resistance and low distributed capacity.

Now low resistance in radio has a somewhat different meaning than it has in ordinary electrical work, where it is only necessary to consider the ohmic resistance of the conductor itself. In radio work resistance is due to several different things besides the ohmic resistance of the conductor. For one thing, we will find that the

(Cont. on page 56)

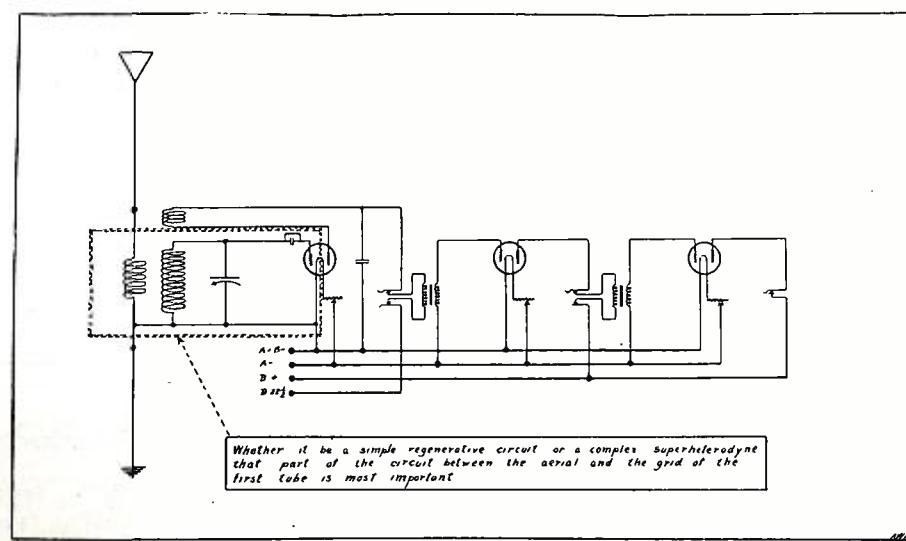


Fig. 3. A 3-tube regenerative circuit showing the most important part enclosed by dotted rectangle.

of 1921 and '22.

Studying the Tuner

STRIPPED of everything but their inductance and in some even this seems to be lacking, most of these new tuners are good and are constructed in accordance with principles brought to light by the amateurs in short wave work during the past two years. Yet there are some not so good as others and it is well for the purchaser to know something about

Matched Stages Insure Successful Performance in the

Matched Stage SUPER-HETERODYNE

By H. G. SILBERSDORFF

(Continued from the November Issue)

THE wavelength of 3400 meters was selected by the engineer who designed these transformers because this wavelength, which is equivalent to 88,000 cycles, offers the least trouble from harmonics, which will be experienced in any receiving set of this nature.

The potentiometer, or losser, as it is sometimes called in the parlance of the experimenter, is used in the average set to prevent oscillation by decreasing the sensitivity. However, in this set it does not act as a losser, but purely as a desirable and useful control of the grid voltage for the R. F. tubes, consequently affording an ideal means of varying the volume of the signal.

The intermediate stages in *this set will not oscillate*, regardless of the position you place the arm of the potentiometer. Greater clarity and much less tube noises are obtained, and together with the fact that the grid voltage can be controlled conveniently to that point on the negative side, which gives best results, a greater reduction in B battery consumption is obtained. This is a very desirable feature in receivers of this type, in fact, with the potentiometer on the negative side, the set only draws from 8 to 10 milliamperes. This is less than some 3 tube sets draw.

The input transformer in this set does not require any matched condensers; in fact, this unit is practically identical with the R. F. transformers, because each of the latter constitutes its own filter system. In the average superheterodyne, the input transformer is of first importance, being more sharply tuned than the intermediates. This is necessary, due to the fact that the ordinary inter-

mediate transformer has no sharp resonance peak and this defect must be offset by the aid of an input unit, tuned by means of a matched condenser. A very crude method, to say the least.

For those desiring to use an antenna, the Victoreen type No. 160 Antenna coupler is available and makes an admirable unit. The increase in volume, due to the use of an antenna over the loop is not great; however, it has in some instances, a decided advantage, as when the loop would be somewhat inconvenient, due to directional properties. The Victoreen oscillator coil, No. 150, the 3 R. F. transformers No. 170, and the input transformer No. 175, are all matched as far as size and color scheme is concerned and because of this, when assembled into a set, make an arrangement which is sure to please the constructor, who takes pride in having the best in appearance, as well as the best in results.

Oscillator Easily Adjusted

The oscillator coil requires absolutely no adjustment. It is very small and neat and it is neither necessary nor advisable to shield any part of this set, eliminating a tedious and complicated operation, which used to be considered a necessity in the building of superheterodyne receivers.

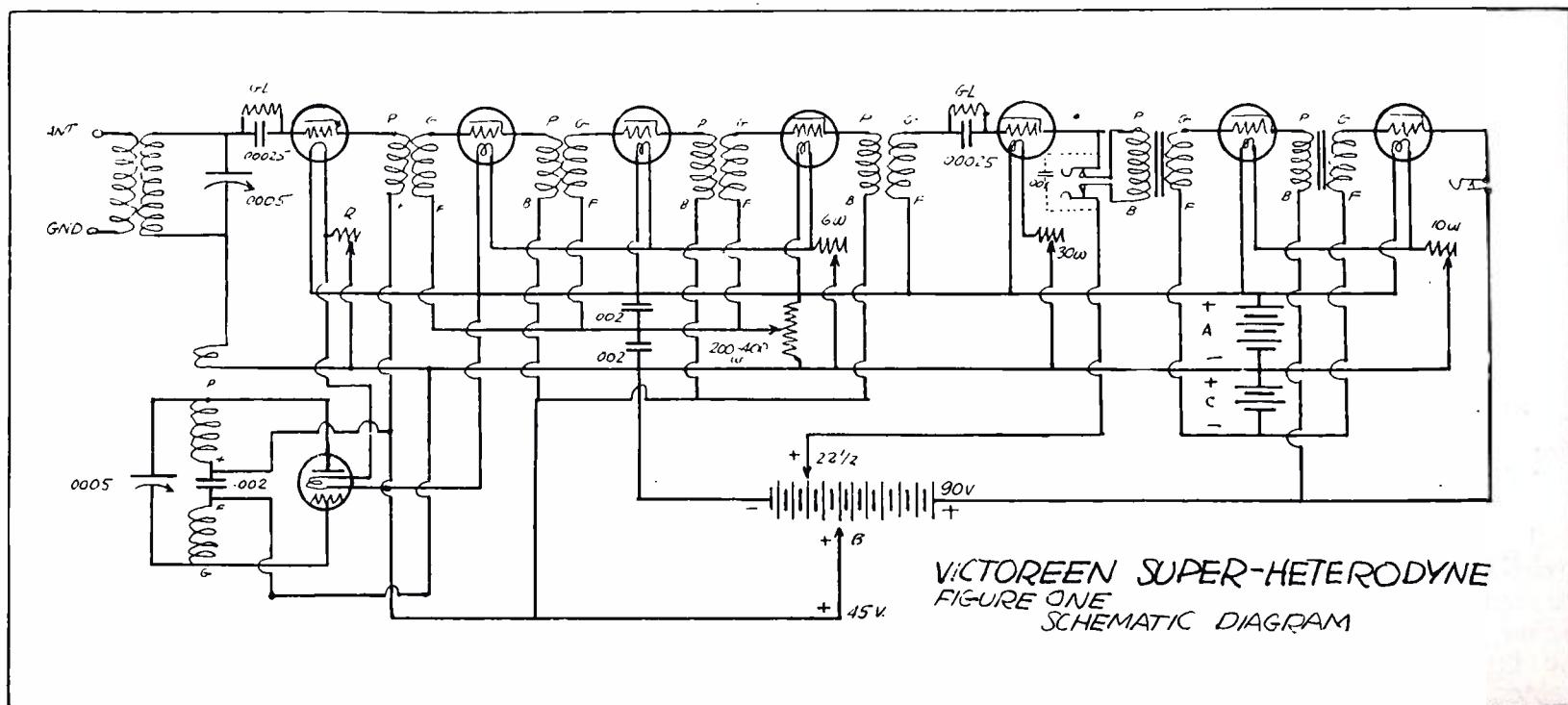
The manufacturer has informed me that a special oscillator coil will be available, should there be a change made in the present broadcasting wavelengths. This special coil will be easily and quickly installed, permitting the tuning in of any broadcasting station by means of a small switch.

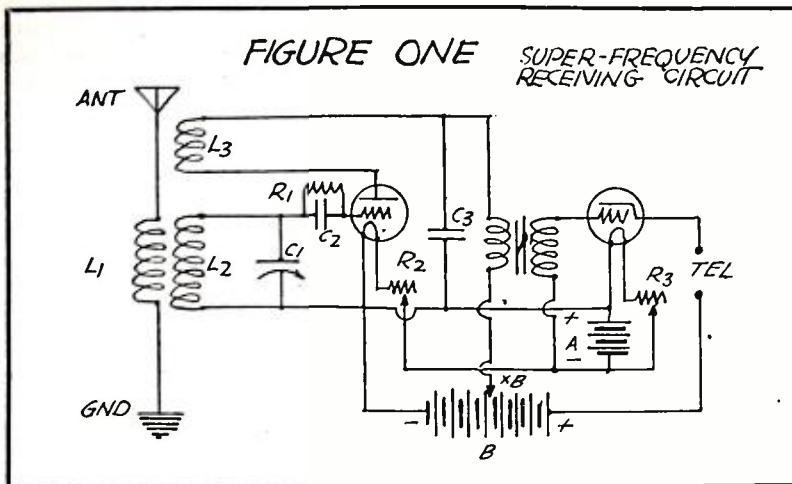
While the set can be operated with a single rheostat for all tubes—providing it was made to carry the load,—four, at least, are recommended. A 30 ohm rheostat for the oscillator tube, a 30 ohm rheostat for the first detector, a 6 ohm rheostat for the 3 R. F. tubes and another 6 ohm rheostat for the 2nd detector and two stages of audio. These resistances are suitable for the standard 201A type tubes and this arrangement will give all the finer adjustments that are ever required on the most critical of long distance signals. A 400 ohm potentiometer, that is smooth in its operation, should also be mounted in a convenient position.

The blueprint of the panel can be used as a template for spotting centers of all panel instruments. The holes for the mounting screws must be determined by the particular units used. After the panel is completely drilled and instruments mounted on the baseboard, we are ready for the wiring. This should be done in a systematic manner, starting with the filament leads. Use No. 14 square bus bar, keeping leads as short as possible. While the exact angle of the transformer is not important it is well to mount them approximately the same as shown in the blueprint, thereby obtaining a minimum of coupling effect between stages. When "A" battery leads are complete, continue with remaining leads as shown in blueprint. It might be well to mark off each line on the blue print as the wire is connected, with a colored marking pencil.

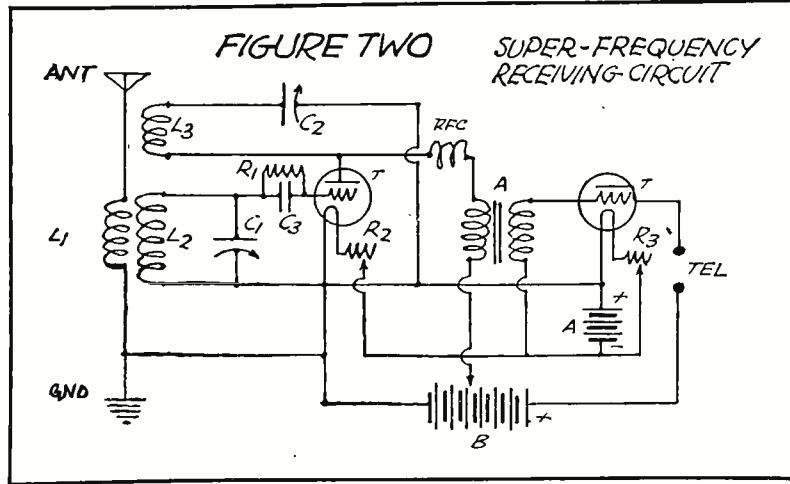
The polarity of the "pick up coil," (the two terminal posts on the back of the

(Continued on page 60)





*Fig. 1
The one tube low wave diagram of 1924 consisted of the circuit illustrated above.*



*Fig. 2
This is the 1925 circuit developed during the late summer and early fall radio season.*

Reviewing the Trend of Circuit Design

An Analysis of Receiving Systems Popularized During the Past Year

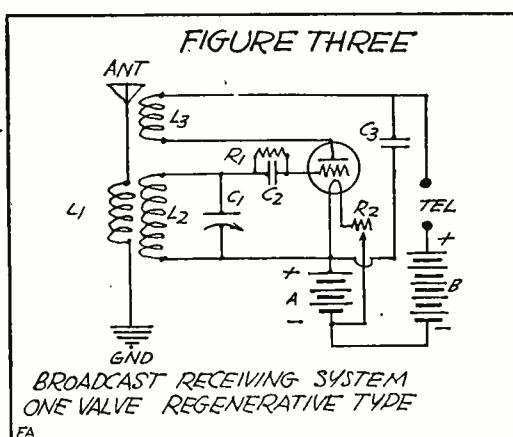
By FELIX ANDERSON

Technical Editor

IT IS interesting to note that the year of 1925 has, just like 1924, produced no radical changes in circuit design. The basic oldtime circuits still are popular with new embellishments, and brought up to the minute with more efficient apparatus and devices. It is true that new permutations and arrangements of circuits have taken place and more effective connections have been evolved, but in general, the basic principles remain the same.

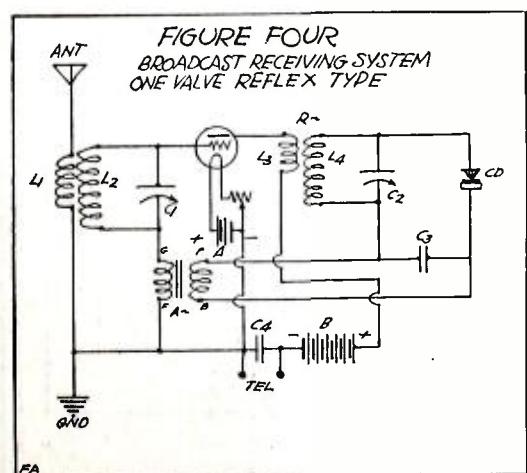
In classifying the so-called "standard" circuits (made standard by popular usage) we find that developments have occurred in each and every department of the radio profession. The amateurs have transferred their activities to lower waves, and have been redesigning their receiving systems in order to accommodate the great necessity for precision that higher frequencies demand. This in turn has a decided effect on broadcast listening apparatus, since broadcast engineers

seem to rely on the amateur experimenters to make new finds in the high frequency work. The refinements necessary in the low wave work invariably can be applied to the broadcast receiving system with good results, and so we find that experimental activities carried on by the amateur have a decided effect on broadcast apparatus.



*Fig. 3
The simple regenerative broadcast receiver illustrated above is the logical contender for the title of "standard" one longer.*

Back early in 1924, the downward movement had just taken place in citizen radio, and at that time it was thought that the most effective circuit to use was that illustrated in Figure 1. In this circuit L1 consists of an untuned antenna coil of from 3 to 6 turns wound to a diameter of about 2 1-2 inches. The secondary coil L2, is wound to suit the tuning condenser C1. In general practice this value is L2 a coil of 45 turns for 200 meters, 25 turns for 80, 12 turns for 40 and about 5 turns for 20. All these coils should be wound to a diameter of about 3 1-2 inches with number 16 or 18 DCC wire. Space winding is also recommended.



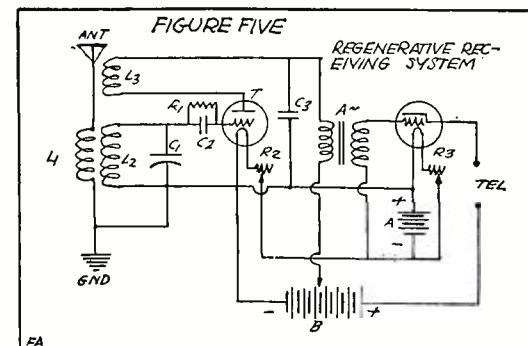
*Fig. 4
This single tube reflex is no slouch when it comes to volume on locals. It often operates a loud speaker with but one tube.*

These coils are to be used with a .000055 mfd. condenser, which consists of two stator and 1 rotor plates (C2). The tickler coil L3 is also interchangeable and has a 15 turn 2 1-2 inch coil of No. 22 wire for the 80 and 200 meter bands, and an 8 turn coil for the 20 and 40 meter bands.

At best, however, these values are approximate only. The actual wavelength range of each coil will vary in each case by several meters, and it is recommended that anyone trying out the circuit use the cut and try method—that is to wind the coils too large and then prune them down till they cover the band you seek. The rest of the apparatus for this circuit is C2, .00025 mfd., C3, .001 mfd. R1 variable grid leak, R2 and R3 depending upon the tubes you use. A high ratio transformer should be used if code work is to be the object of the set. Otherwise use one of the broadcast type.

Limitations

THIS circuit, however, has limitations. When changing from one band to another, much difficulty will be encountered with mountings and mechanical



*Fig. 5
While there really is no standard "two" tube receiver, we pick this one because it is the most efficient.*

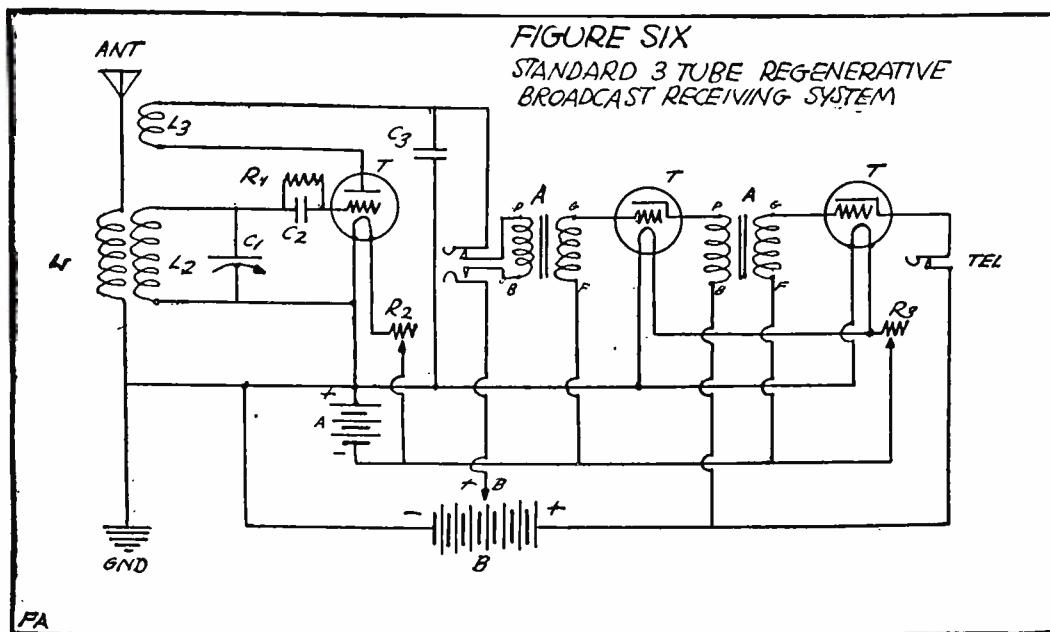


Fig. 6

The three tube regenerative is the runner up for the title of "standard" in the three tube class.

structure, and hence the 1925 circuit using the Weageant system of feedback control found favor. This circuit requires no movable tickler since the regeneration is controlled by electrostatic means. In this case the coils remain the same as for Figure 1, and the circuit specifications and values are identical with the exception of C_2 which is a 7 plate or 11 plate. (It is not critical.) RFC is a radio frequency choke of about 250 turns wound on a tube one inch in diameter, and placed well away and at right angles to the other apparatus. The circuit shown (Figure 2) represents the latest in short wave receiving systems. Undoubtedly it will present itself in broadcast work because of its minimum of moving parts.

The Broadcast Set

The circuit shown in Figure 2 can be used for broadcast work to good advantage by changing the coil values as follows: L_1 from 10 to 20 turns, depending upon length of antenna. L_3 35 turns. Both of these coils are wound to a diameter of 2 1-2 inches with No. 22 DCC, preferably space wound. They are placed in inductive relation to coil L_2 , which should have 50 turns of No. 18 DCC wire space wound to a diameter of 3 1-2 inches. C_1 is a .0005 mfd. Amsco SLF Condenser. C_2 likewise is of .0005 mfd. capacity. The RFC may be omitted in most cases, but should trouble be encountered due to the impedance of A being too low, a set of headphones may be inserted in series with the plate lead. A is a 2:1 Thordarson Super audio transformer.

The Standard Broadcast Receiver

THE standard one tube broadcast receiver is illustrated in Figure 3. The parts have the following values: L_1 , 10 to 20 turns of No. 22 DCC wire 2 1-2 inches in diameter, depending upon antenna length. L_2 , 50 turns of No. 18 space wound to a diameter of 3 1-2 inches using DCC wire. L_3 is 2 1-2 inches in diameter and has 40 to 45 turns of No. 22 DCC. All coils are placed in inductive

relation to L_2 , and L_3 is mounted so as to rotate. C_1 is a .0005 mfd. Amsco SLF Condenser. C_2 , a .00025 mfd. fixed mica condenser, C_3 is .002 fixed mica,

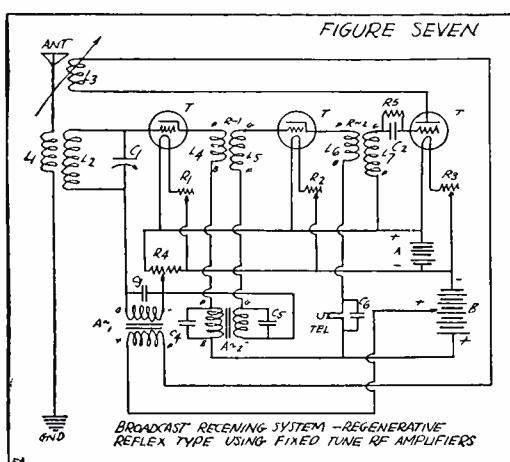


Fig. 7
This illustrates a popular type of three tube regenerative reflex that bids for the title "standard." It is one of the most extensively manufactured sets now in use.

R_1 is a 3 megohm grid leak, and R_2 is a rheostat to suit the tube used. The A and B batteries are of course governed by the type of tube.

The preceding three circuits, Figures 1, 2 and 3, have become so popular and "standard" that regular tuning units have been made up to obviate the necessity of the enthusiast constructing his own. About the only thing to be cautious about is to make sure that you get a unit that matches the condenser. If you fail to do this trouble will be encountered in covering the wave band you seek to reach.

The One Tube Reflex

WHILE I personally don't believe in reflexing, I am obliged to include the one tube reflex in my review because of its great popularity, especially on the east coast. This reflex circuit Figure 4 is widely famed for its simplicity and exceptional volume. As to range it does not compare favorably with Figure 3 since it does not include (or is not supposed to include) regeneration.

In the circuit, L_1 is a 10 turn coil wound directly over L_2 which is 50 turns on a 3 1-2 inch tube using No. 20 DCC wire. This winding should be wound on one end of the coil, preferably the one connecting to the rotor plates of C_1 which is a .0005 SLF type. Both coils are wound in the same direction. L_3 is a 20 turn coil wound on a former 3 inches in diameter with No. 22 DCC wire, and slipped inside of the former of coil L_4 which is 50 turns of No. 22 DCC wound on a 3 1-2 inch form. The condenser C_2 is also a .0005 SLF type. C_3 is a .002 mfd. fixed. CD is the crystal detector and C_4 is a .002 mfd. fixed. A is a low ratio audio transformer. The remainder of the diagram is self explanatory.

The Two Tube Standard

AFTER extensive research, I find that the most successful two tube affair now in use is the circuit shown in Figure 5. For broadcast work the specifications are the same as given for Figure 3, with the exception that a stage of audio frequency has been added to boost the signals for loudspeaker reception. The coils and condensers remain the same.

The Three Tube Standard

The most popular three tube broadcast receiver, (and because of this popularity

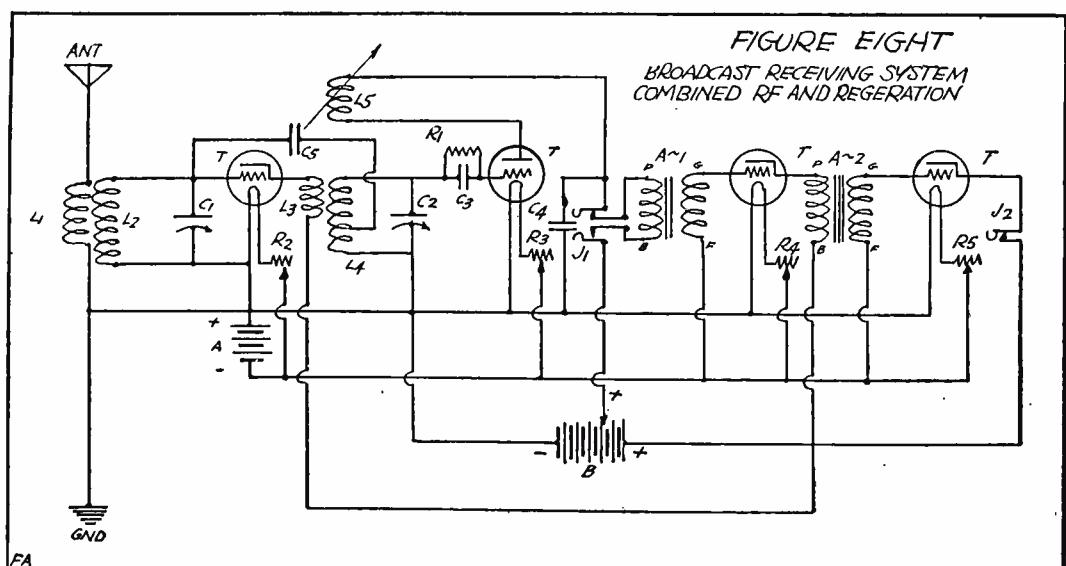


Fig. 8
The four tube Browning-Drake is the easy victor for the title "Four Tube Standard." Results prove that.

the "standard" three tube receiver) is the one shown in Figure 6. Tube for tube, I believe this circuit will give better results than any circuit yet devised. Readers who wish to learn more about this circuit are advised to write for the September 1925 issue of ON THE AIR. In this issue a complete description was printed and the constructional details were profusely illustrated with clear cuts.

The Three Tube Reflex

THE three tube reflex circuit illustrated in Figure 7 is an unusual type, and incorporates a circuit very much like that of the Crosley Trirdyn circuit. It combines reflexing comprising RF and AF with the same tubes and also has regeneration which boosts the signal to a marked extent. L_1 is a coil of 15 turns on a 3 1-2 inch tube wound with No. 22 DCC wire. One-half inch away and on the same tube, coil L_2 is started which consists of 50 turns of No. 22 DCC. Both coils are wound in the same direction. L_3 is a 40 turn tickler coil, mounted in inductive relation to L_2 and is variable by a dial on the panel. It has No. 24 DCC wire and is on a former 2 1-2 inches in diameter. L_4 and L_5 are fixed tune RF transformers of the Acme type and L_6 and L_7 are the primary and secondary of similar transformer. A_1 and A_2 are audio transformers of low ratio. C_1 is a .0005 mfd. Amsco SLF condenser, C_2 is a .00025 mfd. fixed mica grid condenser, C_3 , C_4 and C_5 are .0015 mfd. fixed mica bypass condensers. C_6 is a .001 fixed mica telephone condenser. R_1 , R_2 and R_3 are rheostats to suit the tube used. R_5 is the conventional grid leak of 3 megohms (or variable) and R_4 is a 200 to 400 ohm non-inductive potentiometer. In this circuit, the storage battery type of tube is advisable due to the heavy duty they are subjected to.

The Four Tube Receiver

In Figure 8 the four tube Standard receiver is illustrated, chosen because results show that it is probably the most consistent performer with four tubes. The details of this set were also published

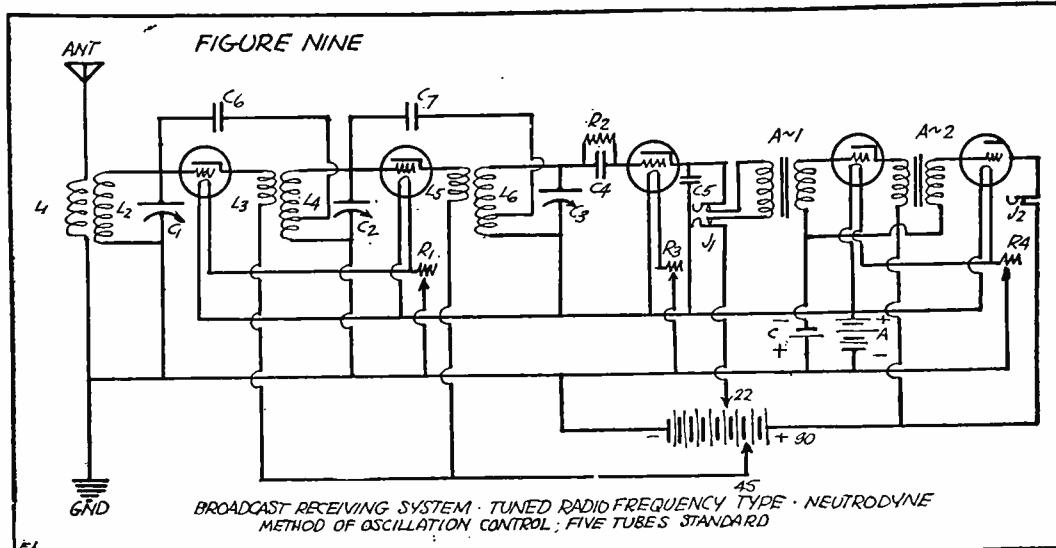


Fig. 9
If you are a Neut fan, here is the circuit you'll swear by. The honors for five tube divide evenly between Neutrodyne and Straight Tuned RF.

in the September 1925 issue of ON THE AIR so a review is unnecessary on the circuit details. There are several complete kits now on the market for this

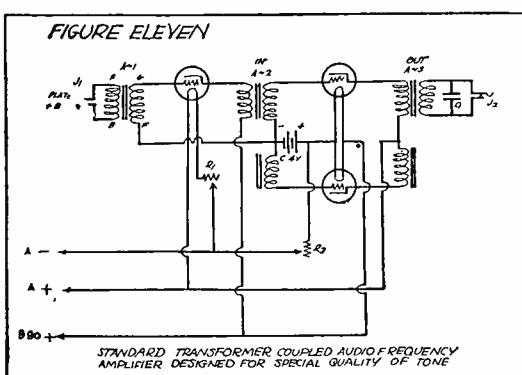


Fig. 11
The six or seven tube sets now in use usually consist of a basic detector circuit or combination RF and detector circuit with an affair like this tacked on the end.

receiver, and the names can be had by writing this magazine.

The Five Tube Standard Circuit

Figures 9 and 10 show two types of five tube systems now in general use. In the past few months the circuit shown in

Figure 10 has shown a decided increase in popularity due to the advent of better apparatus, which obviates the necessity of neutralizing the RF stages.

The standard Neutrodyne system of Figure 9 is familiar to most everyone by now. L_1 is the primary of the input coupler and has 10 turns of No. 22 DCC wire wound over one end of L_2 the secondary coil, which has 50 turns of No. 22 DCC. L_3 is a 20 turn No. 22 DCC coil wound one half inch away from L_4 (on the same coil former) which is like L_2 a 50 turn No. 22 DCC inductance. L_5 and L_6 are identical to L_3 and L_4 respectively. All coils are wound in the same direction and use a tube 3 1/2 inches in diameter. C_1 , C_2 and C_3 are .0005 mfd. SLF type variable condensers. R_2 is 3 megohms, R_1 , R_3 and R_4 are rheostats to suit the tubes used. C_4 is .00025 fixed. C_5 is a .0015 fixed. A_1 and A_2 audio transformers of 2:1 ratio. C is a C battery of 4 1/2 volts. C_6 and C_7 are the neutralizing capacities which balance the RF stages and keep them from oscillating. This balance also includes varying the number of turns on coils L_3 and L_6 until the greatest amplification and least noise are obtained.

The Five Tube Toroid Circuit

WITH the advent of the toroid coils we find that circuit Figure 10 is rapidly gaining in favor. The unique construction of the coils (see Radio Operator 39736 article in this issue) keep the set up to snuff as regards amplification without any of the annoying squeals usually present in RF receivers. L_1 , L_2 , L_3 , L_4 , L_5 and L_6 are the primaries and secondaries of the toroid coils, while C_1 , C_2 , and C_3 are variable condensers, of the SLF type of a size to suit the coil you choose. R_1 is the usual grid leak with C_4 the grid condenser .00025 mfd. capacity. C_5 is a .0015 mfd. fixed, C_6 and C_7 are .002 mfd. bypass condensers. The remainder of the diagram is identical with Figure 9.

Six and Seven Tube Receivers

No standards can really be given for receivers of this number of tubes. Most of the six or seven tube receivers consist

(Continued on page 42)

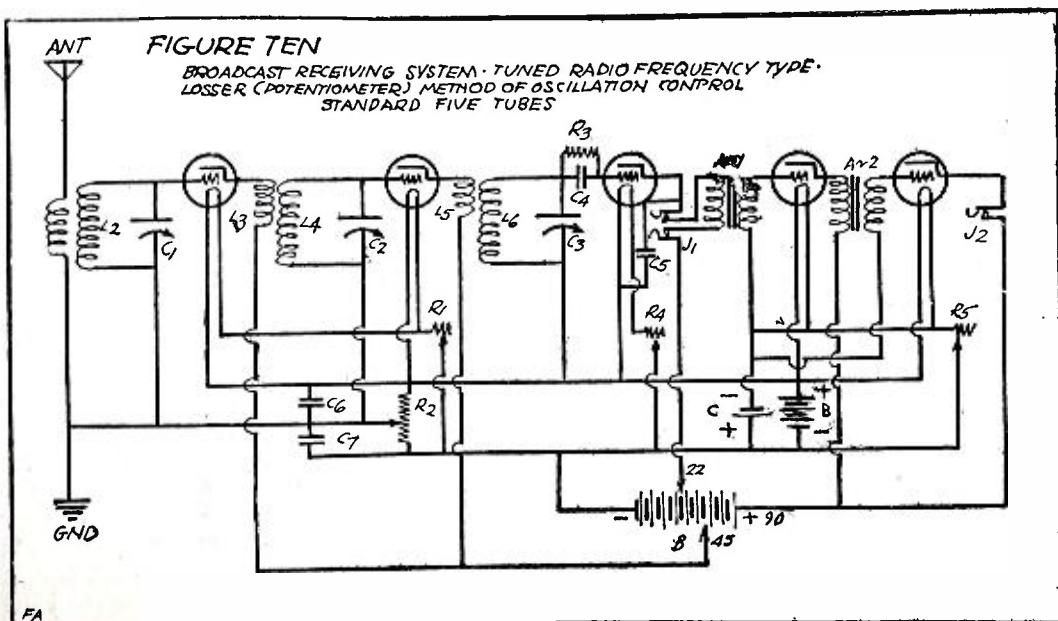


Fig. 10
The Toroid Coil Circuit shown above is making an excellent showing. As we go to press it looks like it will supplant the neutrodyne in popularity.

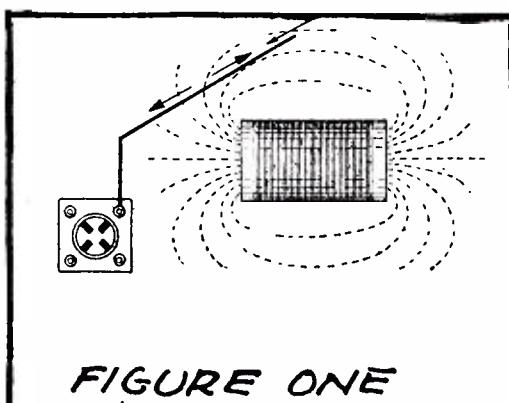


FIGURE ONE

Figure 1. The dotted lines represent the lines of force or the field of electro-magnetic energy around a coil of the cylindrical type. When these lines of force cut through a metallic object, such as a wire or plate, the wire absorbs energy, and acquires currents identical to that existing in the coil. This is one of the chief causes of noise and oscillation in present day receivers.

The TOROID Coil

By
RADIO OPERATOR
39,736

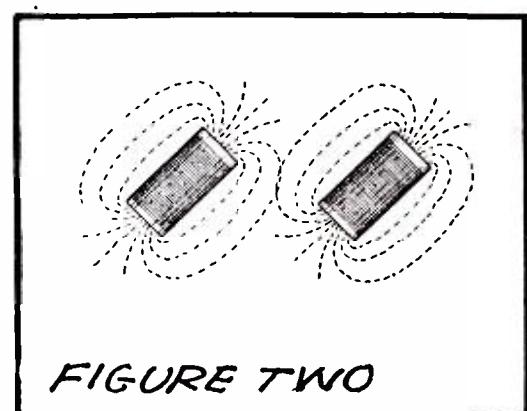


FIGURE TWO

Figure 2. Up till now, the method employed to reduce this nuisance has been to mount the coils at individual angles, which minimize the interactive tendency. Neutrodynes and cascade RF amplifiers have been relying on this method for their effectiveness.

A Decided Step Toward Inductance Perfection

Electricity is an unforeseen force, one that we cannot measure or judge with our senses. We assume that current flows along the path of wire conductors where we wish it to go, but find that also it has an influence around the wires. We call this phenomena the Electro-magnetic field of a wire.

Around every wire carrying an electric current there is a field of magnetic lines of force. This makes possible our motors and transformers; indeed, our whole electrical world hinges on this one characteristic of electricity. When the wires carry alternating current, or high frequency alternating current (the latter being the one most extensively used in radio) this field of force builds up and collapses each time the current reverses direction or changes voltage.

The Cause of Intercoupling

Whenever another wire lies in the path of this field of force, so that it is cut by this rapidly changing field, a similar current is induced in the wire cutting the field. This current is of the same character as that in the first wire, and is parasitic, in that it acquires energy from it. We make very good use of this action in radio by transferring current from one circuit to another, through the aid of transformers, and in tuning where coils are placed so that their magnetic fields interact and transfer energy from one to the other.

In some parts of our receivers, however, this action is very undesirable, and introduces complications and limitations that make the receiver unstable in operation, and destroy the tone quality of the signals. To eliminate much of this interaction of the magnetic fields, it is com-

mon practice to mount the coils so that the lines of force will cut each other as little as possible, and thus confine the current to each coil. This is the method employed in neutrodyne receivers and in tuned radio frequency amplifiers, to reduce the probability of electro-magnetic interference. We are all acquainted with the customary procedure of mounting the coils at a certain angle to offset this limitation. Figure 2 is an apt illustration, showing how the lines of force are so spread that the two inductances have the least effect upon one another.

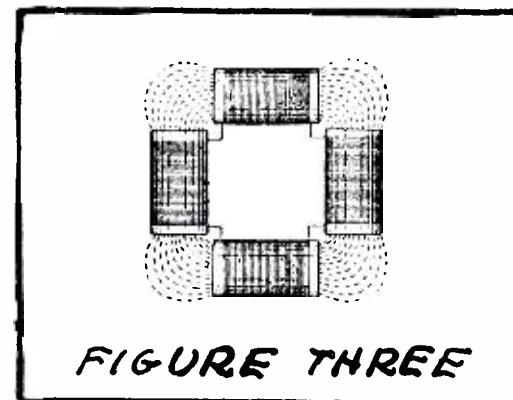


FIGURE THREE

Figure 3. The coil can be split in four sections and arranged in a square as illustrated above to eliminate strays. This represents a distinct improvement over the angle method, but introduces many mechanical limitations which tend to decrease its popularity.

Another Way to Avoid Interaction

By dividing the coil up into four sections as illustrated in Figure 3, and mounting these at right angles to each other as shown, the path of these lines of force are fairly well confined to the inside of the coils. The stray tendency still remains as shown by the way in which the field spreads out at the open ends of the four sections of the coil.

The Toroid Coil

The toroid coil carries this idea still further by making a complete closed path of the coil, confining the magnetic field to the inside of the coil, thereby eliminating stray buildup action between the coil itself and adjoining wires. In this way it makes it possible to disregard to a much greater extent the precautions of coil mounting. With the coil of toroid design it is only necessary to observe a few of the vital electro-mechanical requirements as regards symmetry and basic electrical action.

The advent of these toroid coils makes it possible to mount inductances closer

together, and makes balancing capacities of resistances designed to eliminate interactive effects unnecessary. The use of reactance or resistance in the circuit tends to limit or decrease its efficiency, and brings down the amount of energy in the circuit to a point where it will not oscillate. The use of coils of toroid design removes the basic cause of oscillation by virtue of its restricted field and minimum of intercoupling tendency.

The volume of the circuit using coils of this design is correspondingly greater, and distortion is practically eliminated.

There are many good examples of toroid inductances now on the market, of low loss construction and excellent design. Most of them are designed to cover the existing wave bands with a .00035 mfd. or .0003 mfd. condenser, which shows a decided improvement in inductance manufacture. The reason for this is that the toroid coil because of its unique design permits the use of more wire and gives a correspondingly greater value of inductance. In radio, it is generally accepted that the best procedure to follow is to use the greatest possible amount of inductance permissible with the lowest value of maximum capacity to vary the wavelength of a circuit. The reason given for this choice is that the inductance delivers a much greater voltage variation than the condenser system, with a comparatively greater per cent of signal strength per stage. Always remember—use a good coil, the largest you can to cover a given wave band with a certain condenser.

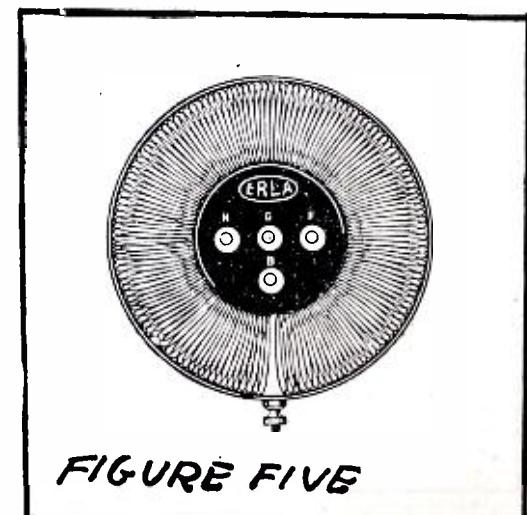


FIGURE FIVE

Figure 5. The Erla Circloid coil is an excellent example of the present day efficient toroid inductance. They have applied to it the novel name, "Circloid" inductance.

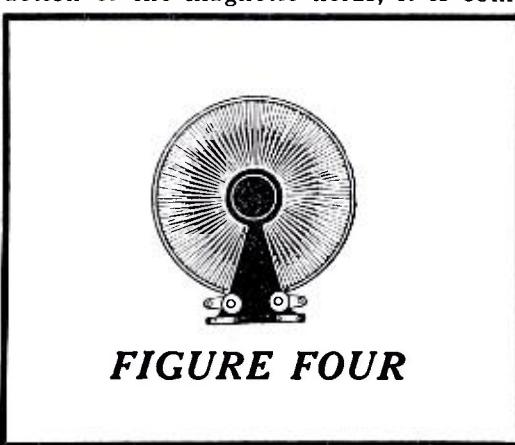
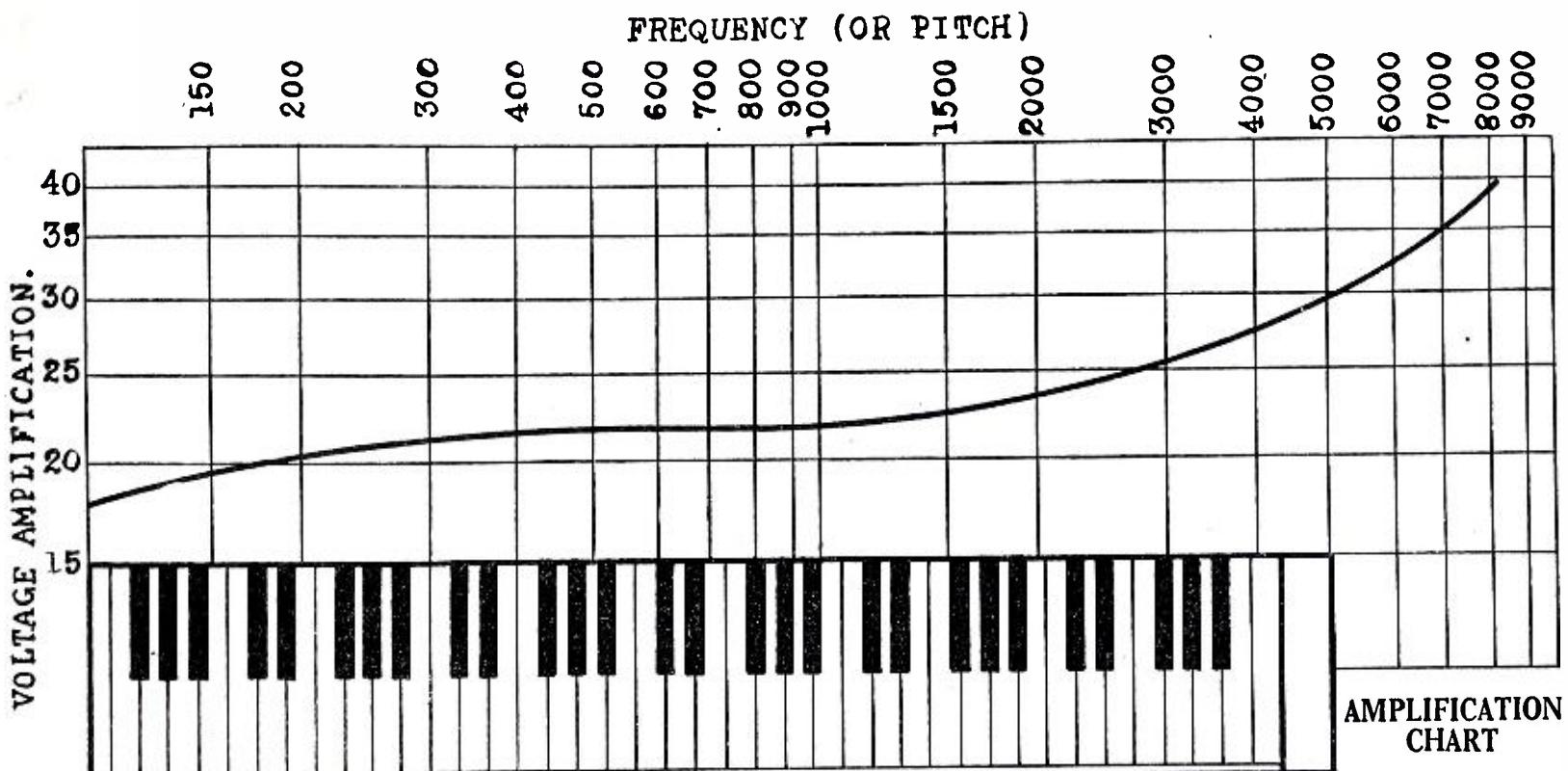


FIGURE FOUR

Figure 4. The solution! The toroid coil combines the virtues of restricted field, greater inductance, mechanical strength and efficiency. They are undoubtedly going to become popular.



The above graph shows the amplification characteristics of an efficient audio transformer. The piano key board is shown to give a comparison of the tone or pitch of sound-producing frequencies, as indicated by the vertical lines of the chart. A receiver using audio transformers having a characteristic close to the above will faithfully reproduce signals with minimum distortion.

How Can We Standardize Radio Receivers?

"Certified Radio Sets" Only Way to Assure Listener of Getting Square Deal

THE ever-present questions, "What set shall I buy?" and "How do I know it is all that you claim it to be?" present the greatest problem for the prospective broadcast listener, and for the radio dealer as well. No one seems to give a satisfactory answer and no one seems to get down to any standard method of comparison. Not because "It can't be done," but more for the reason that the consumer does not demand it.

Take yourself, for instance; you are either contemplating the purchase of your first radio receiver, or maybe you have a receiver now and wish to get a better one. You read the million and one radio advertisements, offering sets of all descriptions, at prices ranging from the "Come-ons" of the so-called radio "gyp" dealers, to the regular merchandising prices of the reliable dealer and manufacturer. There is a flowery description of the set, its beauty, its performance and low up-keep cost, its trade-in value at the end of a year, should you desire to get a more up to date one, ad infinitum.

Only Experience Teaches

HOW true all of this is you do not know. There is only one way you can find out; buy one and try it. Should you be disappointed or cheated, your only recourse is to sell it to someone else, take your loss and go out and try another one.

Of course, we do not mean to say that this is true of all radio sets and dealers. A great many manufacturers; in fact, all of the reliable manufacturers, put the very best material obtainable into their receivers and they are truly quality merchandise. Their advertisements are usually true. You can rely upon what they claim,

By H. FRANK HOPKINS

but, upon the other hand, you have the dishonest dealer and manufacturer who advertises an inferior product at an attractive price,

using the same type of advertisement and the same type of sales talk as the reliable dealer and manufacturer.

Radio is often compared to the automobile industry, in that it presents a seasonable demand, yearly or improved models, variation of performance, and such.

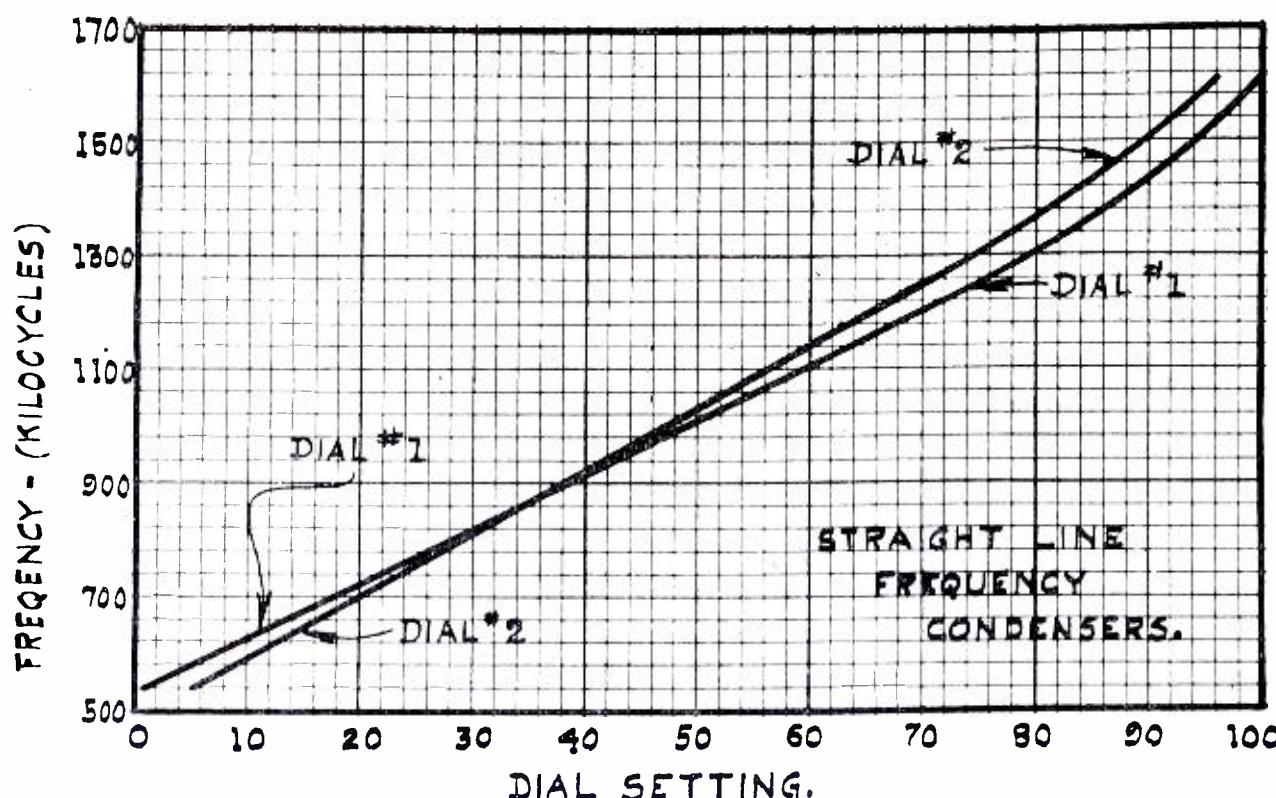
It is far from being similar. First, because anyone with a small outlay of capital can assemble a receiving set, clothe it in a beautiful cabinet and offer it for sale. In appearance, it looks like the best of them, but it is no more a good, reliable piece of merchandise than a 1910 automobile chassis with a Rolls Royce body.

Such a radio set, with its attractive advertising, its silvery-tongued salesmen and a volume of testimonials as to its performance, looks to the prospective customer as good as the reliable manufacturer's product, and the price is usually just a little more attractive than the good set. But how do you know it is inferior? You don't.

Automobiles and Radio

IN THE second place, one can compare the automobile, as it is constantly before the public. The inferior car is short-lived. It attracts attention by its defects; its inferiority stands out like a sore spot. But the radio set is tucked away in your home where no one sees it except your own family and immediate friends. Should it prove defective or inferior, none but these few will profit by the knowledge gained at your expense.

Should these defects and the inferiority of a certain



The chart at the left shows the difference in dial readings of two dials in a receiving set. At 540 kilocycles the first dial was set at 1 and the second at 5, showing that the tuning units were fairly well matched. Should this chart show the dial's settings farther apart, they would not be so well matched. The units in an efficient receiver should be matched for best efficiency.

type or make of receiver become broadcast to the public, all that the dishonest dealer or manufacturer has to do is change its trade name, clothe it in a slightly different cabinet and continue to do his business, unhampered by the bad reputation of his former set.

After trying two or three of these sets, you get skeptical and discouraged, and say, "They are all alike," and in doing so, you condemn the reliable dealer and manufacturer unjustly. The man who puts the best material obtainable into his product and spends a great amount of money to give you the best possible, is the one who is hurt. He has an honest policy and will not change the name and appearance of his set. He has to overcome this feeling of mistrust caused by such competitors. You too, are out considerable. Why? Because you do not demand proof of the inside.

You would not go into a grocery store and buy a can of preserves because it had an attractive label on the outside, or was a little more cheap. You buy such merchandise on the strength of what is inside of the can. The label and price are secondary to your requirements. So, in the purchase of a radio set, you should demand an accounting of what is inside, not blindly take it home because it has a beautiful cabinet and is a little cheaper than the next one. The inside is what gives you the satisfaction and the return on the investment.

After reading the above, you are thinking "all very well; it is right, but how am I going to know? I'm not a radio engineer." Yet you have the power of finding out; you can shape the policy of the dealer and manufacturer by demanding an accounting, by telling him that you want to know what you are getting for your money. You want this information from a reliable source, not from the tongue of a salesman. The reliable manufacturer will be only too glad to get the chance of showing what is inside. He is proud of his product and that from which it is built. The dishonest manufacturer or dealer will offer a few excuses; he will say that it is unnecessary; he does not want you to know too much, because he knows you would not buy his product if you knew what it was made of.

There is a way out, an easy one, too, that would not work a hardship on the manufacturer or the dealer, and yet give proof to the consumer or prospective broadcast listener of what is inside. As a chain is only as

good as the links of which it is composed, so a receiving set is only as good as the parts of which it is made. If good transformers, good coils, good condensers, rheostats, jacks, sockets, panel material and such, are used the result will be a good receiver and by its purchase, you will get a dollar's worth of value for each dollar you put into it. In other words, you would be purchasing a certified radio set.

How To Certify the Set

IN GIVING this certificate or rating, some unbiased organization would have to be resorted to; some known group of engineers, who would examine the daily run of the manufacturer, test each type of apparatus used, see that the circuit had the latest improvements, see that the standard of workmanship was high, and test one of each day's run for performance. This would show that the set was made as advertised. This group of engineers would give a certificate stating that the receiver in question was all that it should be.

The engineer would have each part charted. That is, each part would have been tested and a curve showing its performance would be made. These curves or charts could then be compared with the curves or charts of other receivers, and from the data so compiled one would be able to know that he was getting the best that his money could buy. In that way, radio receivers could be rated so that a prospective purchaser would be able to pick the receiver best suited for his use, his location and his pocket-book.

Such rating and charting would not confuse the most inexperienced layman, because he can visualize what he can see. He would be able to determine whether the reproduction obtained with a particular set was what he desired.

The transformers would be charted to show their amplification qualities at various voice or note frequencies. From this, a comparison could be made with an ideal chart, one that would show what perfection would require. If the chart was close to that, the transformers in that particular set would reproduce the received signal with as little distortion as possible.

A chart of the audibility qualities of the receiver would show the sensitivity or the amplification power of the complete unit, whether sufficient volume was possible with a given current in the antenna system, and so on.

BY CHARTING the intermediate transformers or the filter values of the radio frequency coils, one would have a visual outline of the pulling power an the input value of the signal that was finally rectified and amplified at audible frequencies by the audio transformers. The charting of the condensers would show the spacing of the stations over the tuning range of the controls, whether they were all crowded together and required very fine tuning, or whether they were spaced out so that they would not require vernier adjustment and would be easy to tune.

There are numerous other charts that could be made showing the qualities and the ease of operation of a receiver. It would be up to the general public to determine just how simple they would require them. In the charts accompanying this article, one can see how this could be done so that the layman would understand, and be able to choose his set without guess-work.

If a system such as this were followed, the dishonest dealer and manufacturer would soon find out that he had to show some bona-fide certificate or rating for each receiver he advertised for sale and that it would be useless for him to try to market an inferior product. Thus, he would either revert to selling reliable merchandise or go out of business. The listener would be the one to benefit, and he would then have the way paved to stabilize and standardize the radio industry to the ultimate benefit of the entire public at large.

A Real Guarantee

IN addition, the manufacturer of inferior parts would soon find it hard to dispose of his product to reliable set manufacturers because they could not show a good performance chart for that particular piece, which would reduce the rating of the completed receiver. Thus, each manufacturer would be obliged to turn out reliable merchandise, both electrically and mechanically, or revert to selling his output to the set manufacturer who did not care to rate his receiver, or to those who were putting whatever was cheap into the set, as that type of receiver would not be in demand. The market for cheap, inferior parts would drop off so that they would either revert to making a reliable product, or go out of business.

The big question, "How do I know it's Good?" Best Answered by Proof of Set's Merit

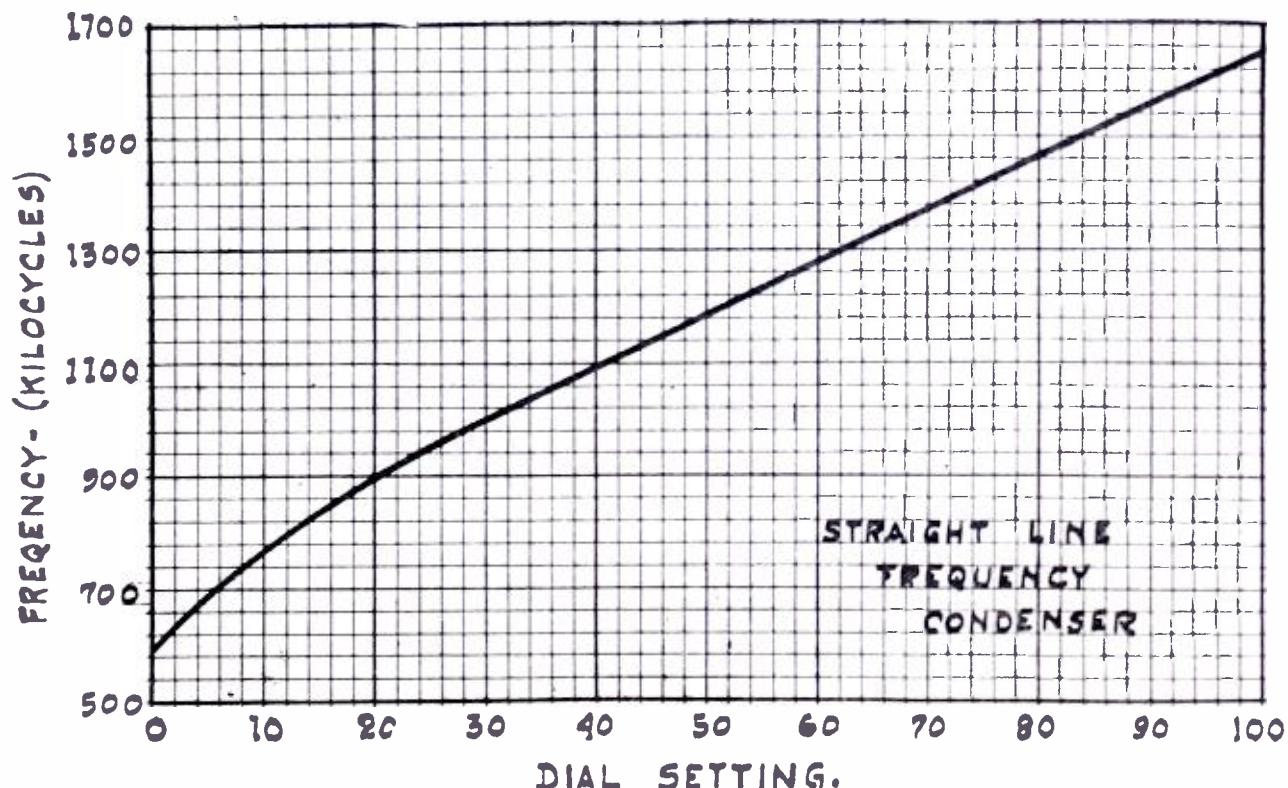
As soon as the manufacturer of a receiver is convinced that this rating, or certification of his product is inspiring confidence in his make or brand, he would strive to obtain parts that would do justice to any receiver, and you, as the prospective customer, would be able to determine just what you were getting, by direct comparison and from reliable, unbiased information.

When the practice of publishing the "inside story" of radio receivers becomes popular, or in demand, the reliable product would stand out alone above the others. It would gain public favor upon its merits alone, not its price, appearance or promise. A complete list of radio receiver specifications could be made, similar to those now in use by the automobile industry or the electric motor trade. This list would show from actual test, the selectivity, sensitivity, tone quality, power consumption, number of tubes, etc., enabling the prospective purchaser to make comparisons and pick as he desired.

This comparison would not be difficult as the whole thing compares to the selection of an automobile, in that the selectivity is like the ease of operation, the sensitivity like the range of speed, the tone quality, like the riding qualities, the power, or battery consumption like the miles per gallon of gasoline and oil, and the number of tubes like the number of cylinders of the motor. You could then obtain an idea of the most practical radio receiver to fit your pocketbook, your use and your location, just as you would pick your family car or a truck for your business.

Armed with this knowledge, you could go to your dealer and ask to be shown that receiver, or a receiver of equal rating, without relying upon his sales talk to put over an unknown set, or your inexperience or lack of technical knowledge to judge just the set for your home.

Expressions of opinion and observation by ON THE AIR readers is solicited upon the subjects discussed in the foregoing article. This magazine intends that further discussion of this nature shall appear from time to time, and will appreciate the cooperation of its readers to the end that the information given may be general in character.



On the Aerials

Better Community Antenna Systems

CRISS-CROSSED webs of unsightly aerials, especially on big apartment houses, where each tenant seems trying to outdo his neighbor, are unnecessary and out of date, according to the new radio specialist—the installation man.

In nearly every large city the sky line is made hideous today by the multitudinous antennas running at every conceivable angle, their poles pointing to every known star, and their owners constantly complaining of interference and poor reception. Some apartment roofs look as if a convention of drunken fishermen was gathered atop the building; their poles held at divergent angles, their lines tangled, and their resultant fishing poor indeed. In such communities the radio fishing is indeed poor.

Recently I met in Washington, a young radio engineer, who is perhaps going to be the Isaac Walton or at least the mentor of these aerial fishermen. He is E. L. Hardisty, who specializes on aerial installation. Where he has installed his standard, systematic system of group aerials in communities thick with fans, reception is greatly improved, and the house tops are freed from the ugly appearance of hetero-genius antennas.

His plan is simple, inexpensive, practical, and not yet patented. When an apartment owner calls on him to clean up his roof, Mr. Hardisty measures it up, counts or ascertains the aerials needed, buys a few heavy planks, several lengths of piping, some elbows and sockets, and goes to work.

Most of you can recall the equipment installed on the tops of apartments a few years ago for the convenience of the tenants when drying the weekly wash. Hardisty's method is to build a frame work or rack for aerials, similar to the old clothes line racks.

At each end of the roof, and set back a few feet from the street side, he erects two horizontal pipes about 70 feet apart. The pipes are held up by stanchions braced or guyed so that they neither wobble or bend. They are ten or twelve feet above the roof. The bases are fixed to heavy timbers fastened to the roof, or built in when possible. Along the two horizontal pipes, he attached the individuals about four feet apart, although this distance may be decreased if more aerials are desired. The wires are all

parallel, but the lengths may of course be varied when placing the insulators. From the nearer end of the aerial, the leads go down to the apartments below, first being attached to insulated brackets to keep them from touching the gutters or cornices.

He varies his methods to fit a particular type of roof. In the several buildings so equipped great satisfaction is reported from the tenants and owners. One apartment provides aerials for forty families, all of whom express delight. Even interference from radiating regenerative sets is no worse with such aerial facilities than it is in other homes in the immediate neighborhood. In principle and practice the method of supplying a number of tenants with outdoor aerials is even better than it is in theory, Mr. Hardisty says, which is interesting, in view of the fact we have long thought parallel antennas in close proximity would not be satisfactory.

London Fan Reports New Radio System

A BRITISH radio fan, living in London, wants proof that radiophone reception can be had without the necessity of a receiver. Two-way communication is possible with a single set, he says. This can be done, he insists, since he has seen it demonstrated, but his friends won't believe him, and he seeks confirmation in the States.

My correspondent from London, says, in part, that it is possible for a party with a transmitting and receiving set to pick up another person's voice on his receiver, and talk to him over his transmitter, although the owner of the voice has no receiving set. If the conversation is continued, the original speaker can hear the second party as long as he remains within range of the set, he continues. Detailing the high points of the test, the Londoner explains that the owner of the "two-way" set, as he calls it, got his wife to pick up his voice on the receiver and speak to him; this was perhaps while he was broadcasting from some station. He was able to hear his wife, so the story goes, which made a two-way conversation with only one set. Next the experimenter called on the fan being quoted, bringing the voice of his wife with him, as it were. At the fan's home, the sound of the wife's voice was transferred in some way to the fan, who heard her plainly, he says, without any receiving set. It was neces-

sary, he reports, for this woman to keep up a constant conversation with her husband while he was coming to the house. Strangely enough, the voice of the fan was reported as audible to the visitor's wife, as soon as he began speaking.

It appears that by this unique method, only one two-way set was required, once communication was established, which method, if perfected, would certainly interest radio engineers in all lands and eliminate one end of all commercial circuits. But, just as the friends of my correspondent doubted his observations, it is not believed many can accept the story in this country.

Enamel Aerial Wire

Enamelled wire has been proven by many tests to be the best for use in building aerials. Bare wire becomes coated with soot, which causes certain electrical losses, and fabric covered wires absorb moisture that also causes losses. The wire used should be of the best grade copper. Stranded wire of the same size as ordinary round wire is theoretically better, but in actual receiving practice it is hard to tell its superiority.

Head-Phone Ohms

Many people have the mistaken notion that the resistance of head-phones is a measure of their quality. Actually, radio head-phones of 2500 ohms resistance may be much better than others of 5000 ohms resistance. The resistance is determined by the length, size, and kind of wire used in their construction. Their performance is a matter of proper engineering design and the use of good materials.

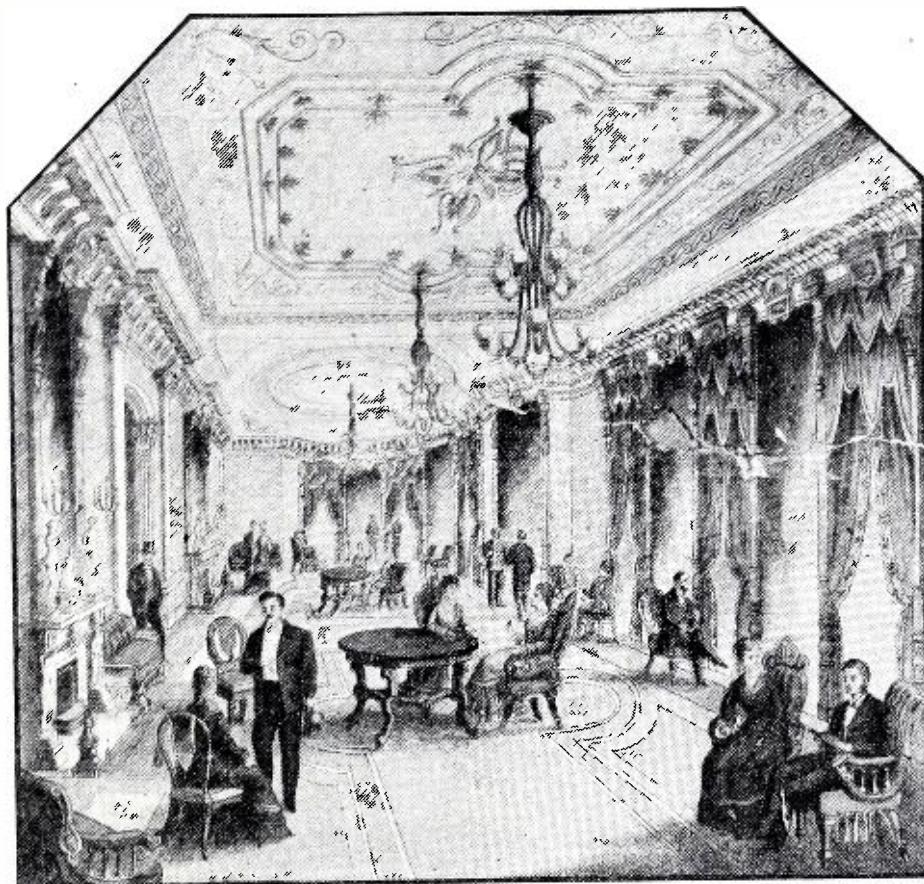
Entertainment For Sick

By running a wire from the receiving set to head-phones in another room, it is possible for persons some distance from the set to enjoy concerts. When confined to bed by illness or permanent injury, this is an excellent means of bringing entertainment to their bed-side.

Connect in Series

Several speakers may be used at one time by connecting them in a series. In this way dance music may be received sufficiently loud to be heard all over a dance hall of considerable size.





At the left is an original architect's drawing made in 1871, for the old Palmer House. It is one of the many priceless exhibits to be displayed in the new studio of WJJD, Mooseheart, Ill.

Now Comes the "Ultra-Modern" Radio Studio

*Ideal Appointments for Broadcast Rooms Contained in the Luxurious New Palmer House Rooms of WJJD,
To be Opened Late in December*

WHAT is claimed to be ideal appointments for radio broadcasting will be put into operation on December 21st, when the first section of the new Palmer House in Chicago is formally opened. This will be the largest hotel in the world, having 3,000 guest rooms.

On the twenty-fourth floor will be the eight-room radio suite of WJJD, the Loyal Order of Moose Station at Mooseheart, Illinois.

It occupies on this floor the space equivalent to twelve guest rooms and is the first radio studio to be incorporated in the original plans of a large building. Most radio studios have been fitted into the space available in the buildings in which they are located and consequently cannot be perfectly suitable for the function they perform. Either the studios are not the right size or shape, or the control operator is not properly located or adjoining office space is not handy or sufficient space cannot be had for the proper reception of artists and guests, or something is wrong.

The WJJD radio suite, however, is said to be perfectly planned and the furnishings are most comfortable and homelike.

Some of the features it includes are as follows:

Two studios, so that there will be no delays when presenting a program. An

instrumental trio or orchestra can finish playing in one studio and a singer will be all set up in the other one with his music on the piano rack and his accompanist all set to go on the flash of the red light signal. This double arrangement also permits a brief rehearsal so that the pianist will be able to run over a few bars of the introduction of the music and be familiar with the notes and the tempo desired by the soloist.

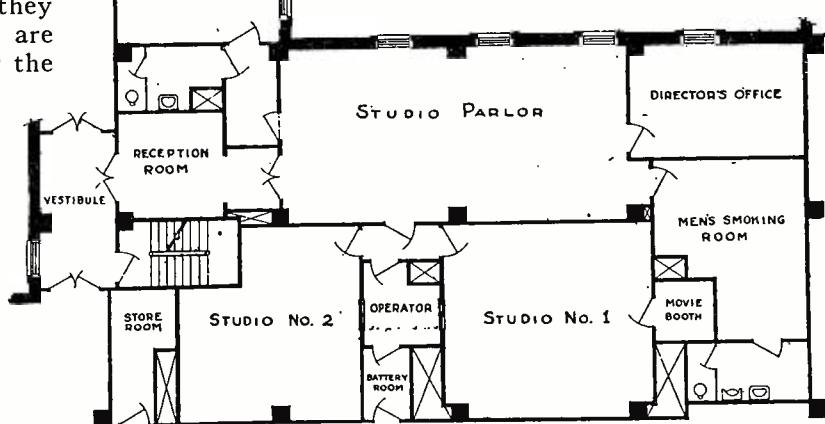
Special Signal System

An elaborate yet thoroughly practical signal system is installed which will tell the announcer or director at a glance whether the studio is "on the air," and if the dance orchestra downstairs in the hotel is playing, which

studio is in operation and whether a singer or accompanist is too loud, too soft—in fact, his signal box tells practically what is going out and how.

From the plan printed herewith it will be noticed that rest room and smoking room are provided for the guests and artists. The studio parlor is furnished in the "living room" style, having sofas, lounges, davenport and comfortable chairs for the artists not actually performing and the guests of the hotel who will always be welcome to come in and see "how it is done." This is said to be a great improvement over the "audience rooms" which have been added to some studios of late whereby the guests can sit in wooden benches similar to pews and watch (through plate glass windows) and hear (by loud speaker) what goes on in the studio. The latter is all very satisfactory except that many artists have said that such an arrangement makes them feel as though they were in an aquarium. In the WJJD Suite the same result is accomplished for their guests, except that they have comfortable chairs and are in a truly "home" environment. They can hear the artists by means of a concealed loud speaker and can see them through the windows, but these windows are so draped that the artists cannot see through into the living

(Turn to page 47)



The "Ideal Radio Studio," as shown by the plans for WJJD's new studio in the Palmer House, Chicago. Three studios are provided for, with luxurious lounging rooms for entertainers and visitors. This new system of studios is expected to be opened by WJJD late in December.

Reviewing the Trend of Circuit Design

(Continued from page 35) of "baby" supers or reflexed superhets that do not seem to be very much in demand. In general I find that the most six or seven tube receivers consist of one of the conventional circuits shown in Figures 2, 3, 4, 8, 9 or 10 to which a push pull amplifier as illustrated in Figure 11 or a Resistance Coupled amplifier as illustrated in Figure 12 has been added. In Figure 11, the prongs of J_1 represent the two inside springs of the detector jack which should be of four prong construction. A_1 is 2:1 ratio standard audio transformer. A_2 is a special push pull input transformer, while A_3 is the output device of the same design. The only other puzzling detail is C_1 which is not critical and may be a .002 mfd. fixed mica condenser. The leads connect as indicated on the diagram.

Figure 12 shows the resistance coupled affair for amplification that is fast gaining in favor with discriminating fans. In their circuit as in Figure 11, J_1 again represents the detector output springs. When this hookup is used, the bottom spring of the 4 leaf jack is connected to the second from the bottom spring, and the plus B detector voltage (usually $22\frac{1}{2}$ volts) is increased to 45. C_1 , C_2 , C_3 and

*Fig. 12
Sometimes the owner of a receiver is fussy and demands extra fine quality. This circuit illustrates how he gets it.*

C_4 are .00075 mfd. fixed mica condensers of good make. R_1 , R_3 , and R_5 are 100,000 ohm. resistances while R_2 , R_4 , and R_6 are 500,000, and 250,000 and 250,000 respectively. R_7 is a 10 ohm. rheostat. The tubes T should be the Daven MU type or the 201A amplifiers. A C battery of 6 volts is used at C to keep the drain on the B battery by the last stage from becoming excessive.

The Standard Eight

WHEN we run into 8 tubes we have the standard superheterodyne as illustrated in Figure 13. We shall be pleased to furnish complete details inci-

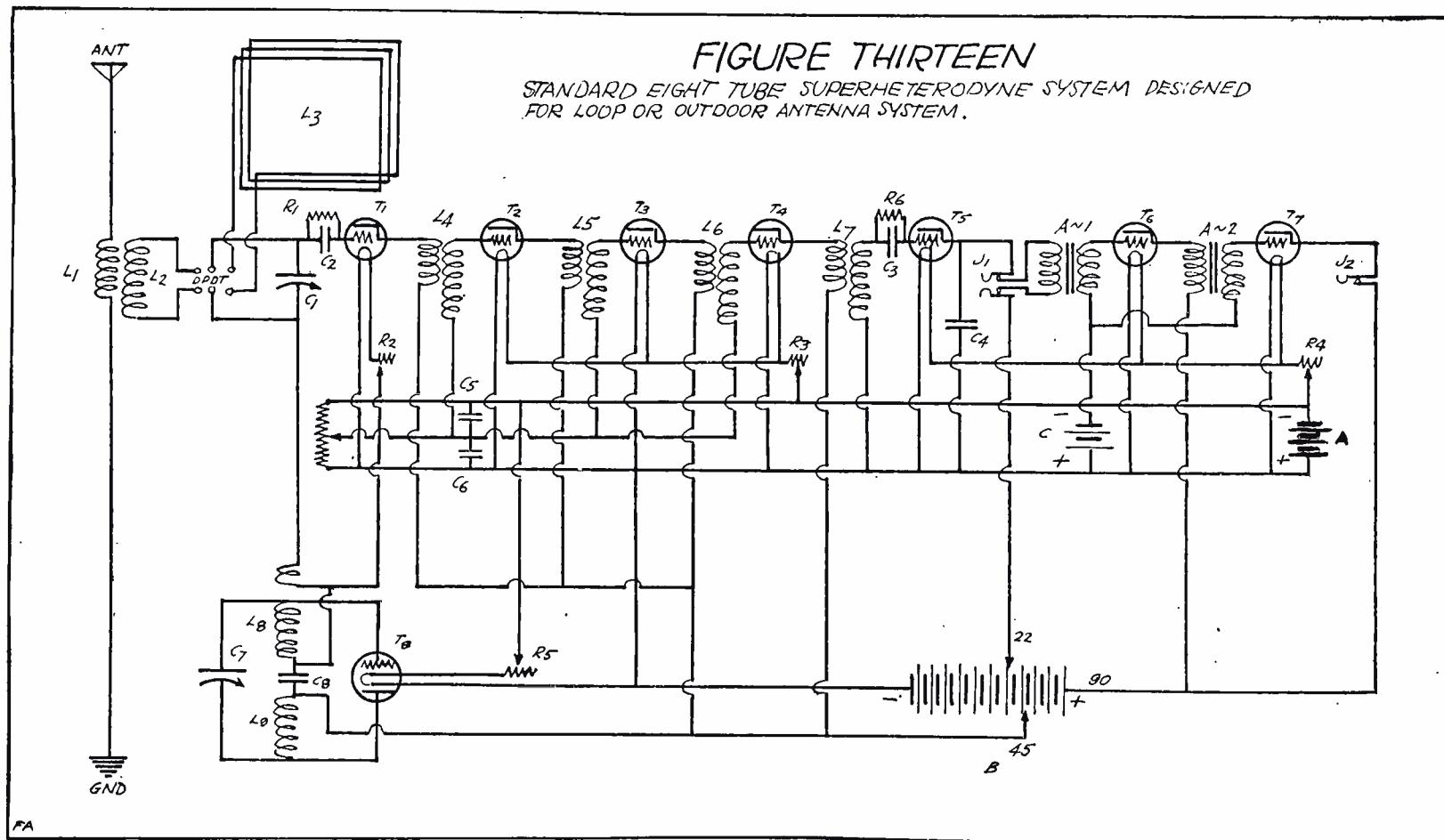
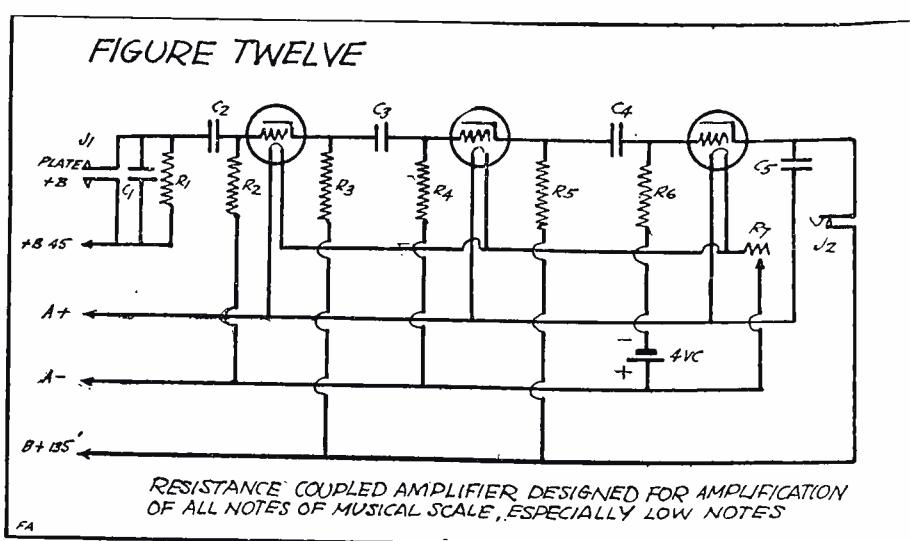
dental to this circuit upon request. There are several good kits on the market, and in writing for information we would ask you to specify just what amount you expect to expend, so we may judge with that in mind.

The building of a superheterodyne is what every amateur builder of radio looks forward to, and it is certainly an ambition to be commended. A good superheterodyne is the real thing, especially when

you build it yourself and it gets to purring—bringing 'em all in all the time. However, the amateur must not be surprised or discouraged if he has a little difficulty with some of the final adjustments. An authority on super-het construction has said that six weeks is not too much time to spend with the adjustments. And Oh, boy! What a kick!

In future issues ON THE AIR will further discuss the "Trend of Circuit Design" and comment by readers is earnestly desired. It is the combined experiences of all the individual fans which form a true basis for comment, and to that end you are requested to write, giving yours.

Further information on any of these circuits may be obtained from ON THE AIR, Suite 1322, 306 S. Wabash Ave., Chicago, Illinois.



*Fig. 13
The good old super-heterodyne gives them a run for their money every day. This standard circuit when built up properly represents the ultimate in receiver design. It is the very highest existing rung in the citizen radioist's ladder.*



The Technical Editor to the Broadcast Listener



Location and Type of Set

G. A. P., Schenectady, N. Y.

Question: I wish information on two popular radio circuits: the neutrodyne and superdyne. I have found the superdyne very efficient but lacks the ability to cut out WGY three miles away. My aerial is a three wire strung across my attic. I have tried the neutrodyne but with the 199 tubes which I had I found the results very unsatisfactory. I am partial to the regenerative principle, however. So, I want to know:

1. Can I make the superdyne cut out local interference?

2. Will the neutrodyne or the "Celeradyne" described in October's "On the Air" be the best circuit for me if I will use 201A tubes with three stages of resistance coupled amplification?

3. Is it necessary to have a separate rheostat for each tube in the "Celeradyne"? Would not two rheostats serve as well?

Answer: I would most emphatically advise that you forget both neutrodyne and superdyne circuits in your location. Neither of them will give satisfactory results within 3 miles of a 5 kw station.

I would most strongly advise your building a super-het with a loop antenna using regeneration, to get the best results as regards selectivity.

Concerning Noises

G. G. G., Spencerville, Ohio.

Question: A few questions please. I have a five tube radio set. Station interference is bad; am using 125 feet of outside aerial. Very noisy on low wave lengths. Would it be advisable to erect an inside wire with this set? Is my outside wire too long?

A few stations come in on my set with poor tone. Sounds like someone pounding on a tin pan. As all stations do not do this I do not think that the set is at fault. What would you suggest?

Answer: 1. First cut down the length of your antenna to about 85 feet. Next determine if the interference (noise you speak of) is within the set or from out-

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.

side sources. Disconnect the antenna and listen without it all over the scale. If the set is quiet, the noise is from "pickups." The next job is to locate the interference (see **ON THE AIR** for November, 1925, p. 17) and eliminate it.

2. I think the trouble on the low waves is due to the set design itself. Oscilla-

tions and squeals are always noticeable on short waves more so than on long waves.

3. The pounding on a tin pan noise you speak of may be "beat" interference and might be due to an improperly adjusted grid leak or a bad tube. Have you tried shifting the tubes around? Weak batteries or tubes that are old often do this.

Your questions are pretty general, but I am doing the best I can with the material you give me. If you need further help write again, explaining more fully the performance of the set.

That Regenerative Set

H. G. B., Indianapolis, Ind.

Question: In your last issue you mention a set under "What set to build." This article was written by Marvin Hugues. I am seeking more information in regard to this set, and would like to know what it consists of and how I can obtain one?

Answer: I take pleasure in informing you that the receiver referred to was written up in our September, 1925, issue in detail. A copy of the September issue may be had for 25c in stamps or currency from the circulation department.

If you do not care to build a receiver yourself but would like to have a reliable organization do this for you let me suggest that you write the Ensell Radio Laboratory, Mr. Thomas Ensell, 1208 Grandview Avenue, Warren, Ohio. This firm specializes in building receivers to specification.

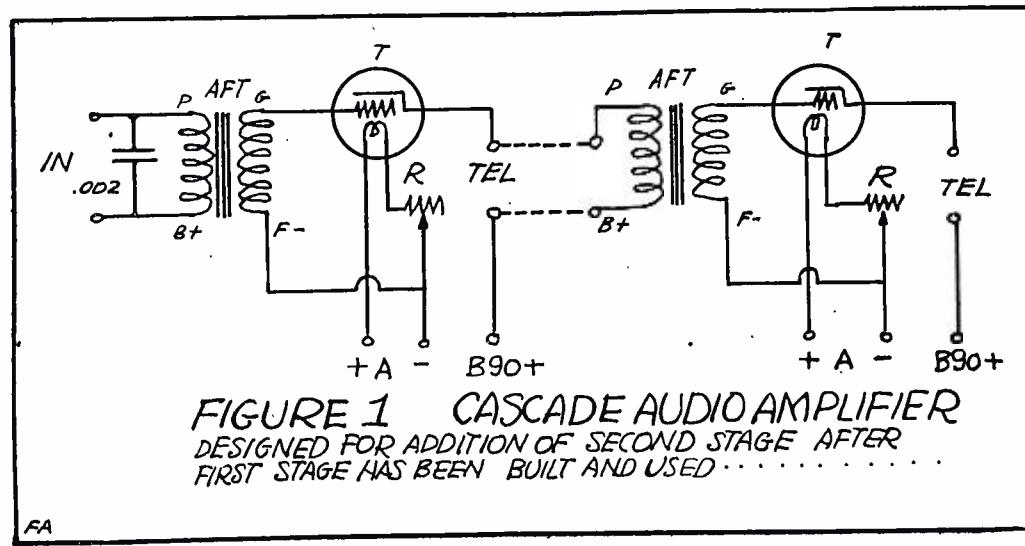
The Technical Editor's Set

F. J., Grand Rapids, Mich.

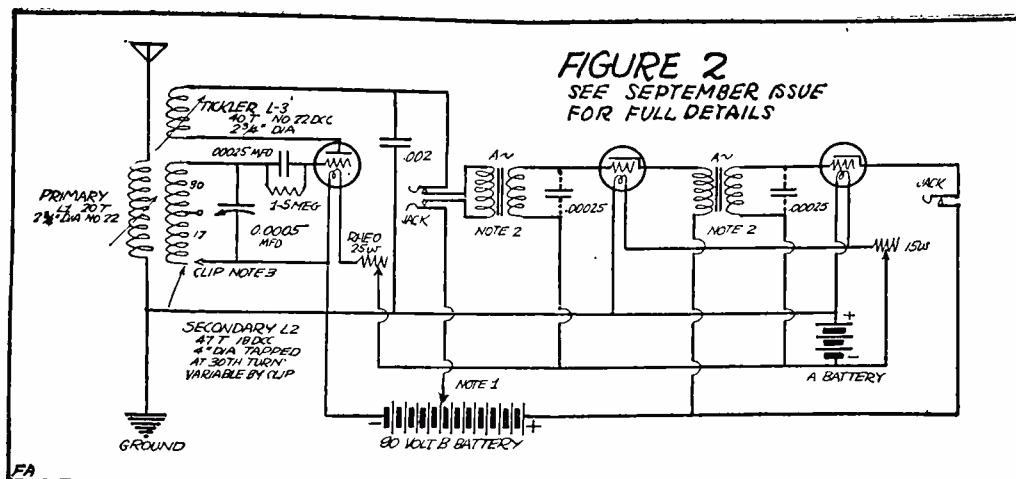
Question: I have read with interest your article on the three bulb regenerative set in the September issue, and as I would like to put up a set like it would like a detailed wiring diagram of the circuit. I am a beginner and do not understand the wiring of plate and filament circuits, etc.

If it is possible to get everything in detail, can I get it from you?

Answer: I take pleasure in enclosing herewith several wiring sketches that I trust you will find useful in building



A wiring diagram of a unit amplifier that may be built in two sections. Many of our readers have been asking for this arrangement, permitting them to build first one stage and later add a second.



This is the wiring diagram of the popular three tube regenerator published in our September issue. Many of our friends who roll their own have built this set with very satisfactory results.

the receiver you mention.

If you will follow the lines as they are laid out on the sketch, after you have secured all the parts on the baseboard and back panel, I feel sure you will have no difficulty.

Incidentally, wire the filament circuit first. I have made a separate drawing of the connections for this department of the circuit.

I wish you the best of luck and hope you hear lots of stations. Don't hesitate to write me again should you have trouble.

R. DeW., Fort Worth, Tex.

Question: I am a subscriber to your good magazine and am sending you a copy of the hookup I used on my radio. I would like to know if the Murdock loudspeaker would make the reports loud enough to hear all over the room without an amplifier. If not, please send me a diagram of a one stage amplifier and another of a two stage. I want to make one stage first and add the other later.

Answer: It will take at least one, and possibly two stages of amplification to make the loud speaker perform satisfactorily so I am enclosing (Figure 1) a diagram showing you how to add first one stage and later one more. This should operate the loudspeaker very nicely. As a word of caution, let me suggest that you use low ratio transformers in the amplifiers. They always give much more satisfactory quality on signals.

Rebuilding Advice

R. D. V., Fort Worth, Tex.

Question: I, the writer, have been a constant reader of your ON THE AIR and find it most instructive and would not part with back numbers which I keep for reference.

I own a WLRA Hesler radio Corp 5 tube set radio Frequency coupled and desire to change it to a regenerative or any good standard hookup using the Duo coupler 23 plate condenser.

The pamphlet enclosed will give you an idea of the construction of same, i. e., I find that the two inside balls or ticklers are connected at one end and not at the other and the inside winding of the stator is not split.

FIGURE 2
SEE SEPTEMBER ISSUE
FOR FULL DETAILS

teresting and instructive, and we hope that you will continue to find it so. After looking over the data you enclosed, I believe you can convert your set into a regenerative receiver with little or no trouble. I believe it would be to your advantage to hook up the circuit shown on the enclosed (Figure 2) diagram. Many of my readers are using this hookup with excellent results. The circuit only shows four tubes, but since your layout is somewhat crowded, I believe this is an advantage instead of a limitation. You can obtain further data on the construction of the circuit illustrated from our September, 1925, issue obtainable from the circulation department for twenty-five cents. Information service is free of charge—we are always glad to be of assistance to our readers. Write again.

F. M. C., White Hall, Ark.

Question: I have discovered a hookup which seems to be better than any I have tried before, including most standard ones. Would it be wise to try to patent my hookup? How does one go about this matter in event that my hookup is patentable?

Answer: If your circuit does not embody any of the existing systems of reception, with especial reference to regeneration, I would most emphatically advise that you seek the counsel of a reliable patent attorney for further details. If you are using reaction (regeneration) it is quite impossible to obtain a patent on your circuit.

The SLF Problem

G. E. T., Chicago, Illinois

Question: This business of introducing new condensers on the market every two weeks is getting my goat. I want to keep pace with the most recent trend of the technical side of radio, but try as I will I can't. Every time I pick up my soldering iron someone puts over a new idea. The thing that bothers me now is this SLF proposition. I want to take advantage of the new type of condenser with my present set. It is a D Coil receiver constructed from a circuit given by another magazine. There are three (Turn to page 51)

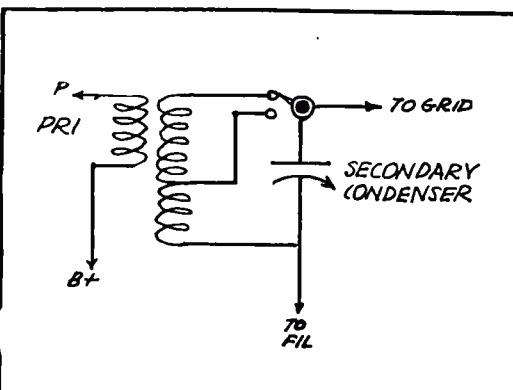


FIGURE 4
SHOWING HOW SWITCH AND TAPPED
SECONDARY COIL CONNECT TO GET
"SPREAD" LOW WAVE TUNING

Here is one way to get SLF results with your SLC condensers and old coils. Tap the secondary of the tuning device and control the inductance with a switch. With the switch set on the mid tap of the inductance, tuning on the lower end of the scale becomes much simplified.

any charge for this information send it C. O. D.

Answer: We are very glad to learn that you are finding ON THE AIR in-

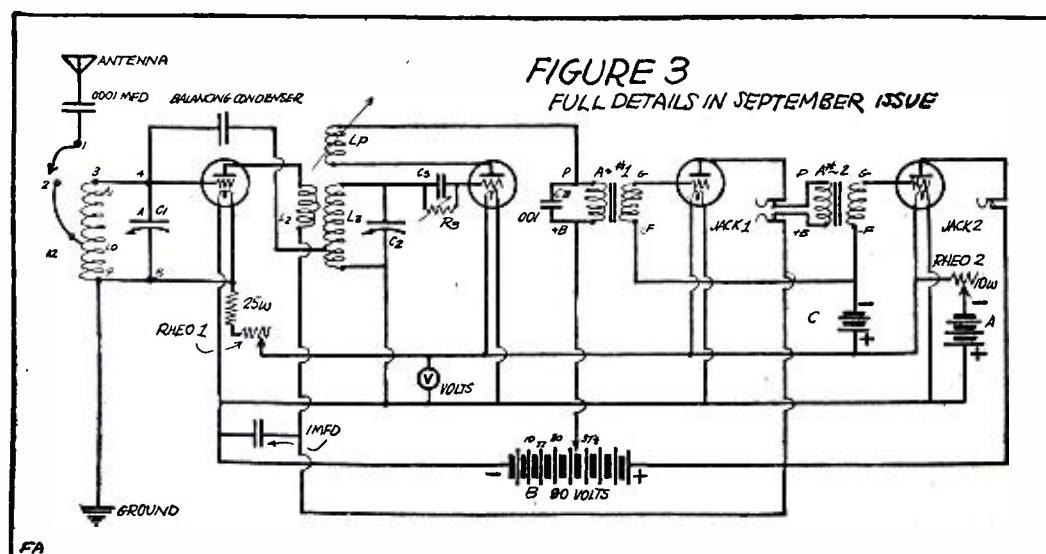


FIGURE 3
FULL DETAILS IN SEPTEMBER ISSUE

The Browning Drake receiver is a type of receiver that gives five tube results with four tubes. This is because regeneration is used in combination with a stage of radio frequency amplification.

Description of the "Counter-phase" Receiver

A Two Control Receiver of Five or Six Tubes
That Employs a Unique System of Balancing

By J. T. CARLTON

THE circuit I am describing is one that has attained unusual attention for the reason that it is one of the very few circuits in use that has been rewarded with the distinction of a patent by the U. S. Government. Of course, the Government issues many patents on radio circuits, but the number of the same that are in use at this time is very limited, in fact, there are only about four that are noticeable; the first, of course, being the original Armstrong or Regenerative, which occupied the stage when three-tube sets were the rule.

There is the Neutrodyne which reached the height of its popularity the year before last, the Superheterodyne which is being used in factory built receivers of one company and the Counterphase described herein.

Invented By Chicago Engineer

There is an added interest in the Counterphase because of the unusual success of previous creations of its inventor, Harry A. Bremer, a Chicago Engineer, who built his first wireless apparatus twenty years ago and whose Nameless circuit is one of the best known in the country.

The Counterphase Circuit may be built with either two or three stages of radio frequency making a five or six tube set or the Counterphase principle may be used in adding a stage of radio frequency to the ordinary three tube circuit, making a four tube set.

Controls Oscillations

WITHOUT being too technical it may be said that the objective obtained by means of the Counterphase principle is the securing of equal efficiency at all broadcast wave lengths and to control the characteristic oscillations of the present radio tube without reducing the effectiveness or volume of the receiver or interfering with the tone quality.

The great draw-back in the design of radio frequency receivers is due to the fact that oscillation tendencies vary greatly at different wave lengths. It might be said that there is a similarity in driving your automobile over a mountainous country. Certain stretches of road are smooth and level and the car runs along nicely; then you come to a very steep down-hill grade and your brakes must be very efficient to hold back the car. This condition corresponds to a low wave length where the frequency is very high and there is great tendency for the circuit to break into oscillation, in the same way that there is a tendency for the brakes to fail to hold, in which

case the driver loses control, probably with serious results.

On the other side of the valley the grade is upward instead of downward, and instead of needing brakes the driver needs all the power he can get out of his engine, and brakes "off." This corresponds to the upper wave lengths where the frequency is low and the inherent tendency to oscillate is too little instead of too great. Now the ideal kind of a brake on the automobile would be one that the driver could set when he started out and which would automatically take care of all the ups and downs in the road, but it is easy to see that such a "fixed" brake would be a detriment going up-hill and would not be sufficient going down if the grade were steep.

The comparison in radio circuits is not very much different.

The owner of a car may never wish to travel at a seventy mile clip. Nevertheless he likes to feel the power at his touch that would enable him to do so should he so desire. Here again we find an analogy in the radio receiver. The major portion of the owner's time may be spent on nearby stations, but the desire for greater ability in bringing in distant programs is a natural instinct that always develops after the first novelty fades.

It is for that reason that the Counterphase method is of such importance as it does not depend on putting losses into the grid or plate circuits, and therefore allows the signal to operate at full strength. Another feature of importance is that for ordinary tuning only the two tuning dials need be used, but when the

user wishes to go after maximum volume or distance, all the essentials are readily accessible.

Counterphase Theory

THE Counterphase circuit includes a bridge between output and input circuit. Counter potential is derived from a coil inductively coupled to the plate circuit and set through an adjustable capacity to a coil inductively coupled to the grid circuit. Any connection made between plate and grid circuit must to some extent increase grid to plate capacity which in turn tends to increase oscillation. A most careful design is necessary, therefore, to avoid such increase as to make neutralization impossible in any neutralizing circuit at the shorter wave lengths of the broadcasting range. In the Counter-phase method this capacity effect is overcome to such an extent that neutralization down to 200 meters is easily accomplished.

As compared to any other fixed method of neutralization it will be noted that the link circuit between each R. F. stage includes a small adjustable condenser. The method of controlling two or more stages of R. F. is extremely simple.

It is generally known that the variation of resistance in series with a condenser varies the effective capacity of the condenser. Therefore, by placing one resistance in series with, and common to, all neutralizing circuits, the capacity of each can be changed by varying this common resistance. The effect is to unbalance these circuits, permitting an increased sensitivity easily variable over all wave lengths within the range covered.

Here again we find a fortunate factor operating in our favor. Aside from the advantage of enabling us to control several stages with one knob, this resistance does not introduce losses or interfere with selectivity, and in addition to that, it does not affect dial readings by detuning the circuit.

Inasmuch as sensitivity is not required on stations where it is desirable to reduce volume, the same knob can be used to operate a separate resistance of the "B" battery circuit to control volume.

This is accomplished by a dual resistance containing two distinct resistance elements, each operating over an arc of 240 degrees.

When sensitivity is the objective, no reduction in volume is desired. When a decrease in volume is wanted, there is no demand for sensitivity. Therefore, in operation, it is necessary only to turn one knob to the right or left to secure either one or the other, as desired.

(Turn the page)

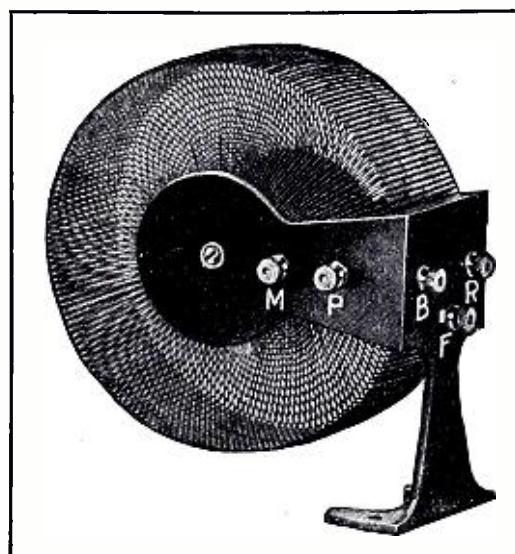


Figure 1. This is the toroid type of coil used in the Counter-phase Receiver. It is especially designed to simplify wiring and to eliminate interactive effects that generate noises in receivers.

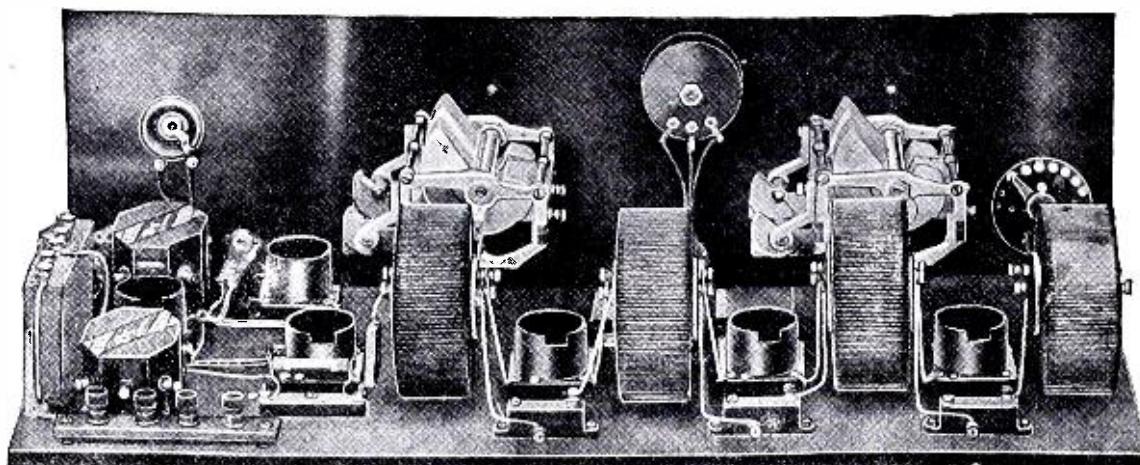


Figure 2 (Left). The interior of the Counterphase Receiver is one of exceptional neatness and compactness. Note the tandem condensers and compensating condensers which keep step with the tendency of the receiver to oscillate at various wavelengths.

Figure 3 (Below). Shows the symmetrical appearance of the front panel. The new type of vernier dial is used on the set.

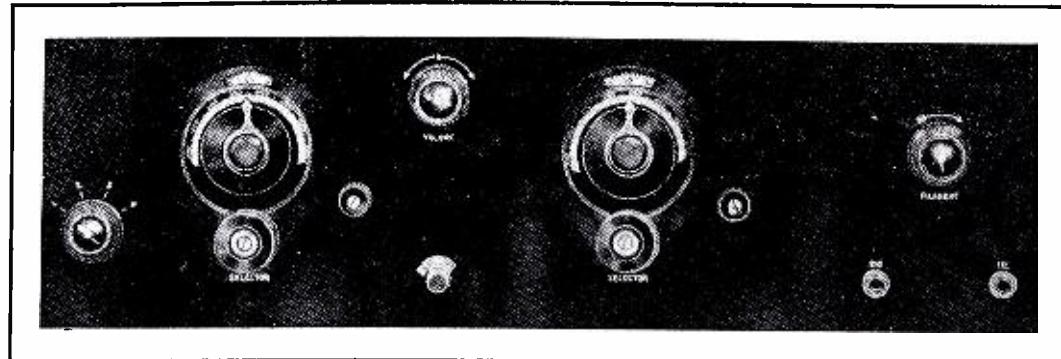
Sixth Tube Where It Should Be

In addition to the simultaneous unbalancing feature which makes it possible to secure sensitivity over the full range, the Counterphase method makes it possible to control three stages of tuned radio frequency with but two tuning controls.

Indeed, it would be possible to use but one control, but neither the writer nor his assistants find it possible to believe that two tuning controls are not only more sensible but also more attractive and interesting to any one who desires the ultimate efficiency of an up-to-date radio receiver.

For anyone operating his receiver in a congested district, or close to a broadcasting station there is great advantage in the use of the Torostyle radio frequency transformers, as their use permits the set to be fully shielded, that is, to be completely enclosed in a metal-lined cabinet if desired, without the loss in efficiency which would occur if the open type of coils were so enclosed. The shielded set is quieter in operation, more selective, as there is no local pick-up. In using a metal panel care must be taken to insulate all parts from the panel that are not intended to be grounded.

Constructional articles usually give data for building the coils at home, but this practice is gradually developing less importance as the necessity for better inductances becomes apparent and greater knowledge in regard to their importance becomes available. Home



building is not recommended in the case of the Torostyle transformers, as the factory built article is more effective and in the end less expensive.

LIST OF PARTS REQUIRED FOR COUNTERPHASE SIX (6 Tubes)

One No. 6 Counterphase

Kit consisting of—

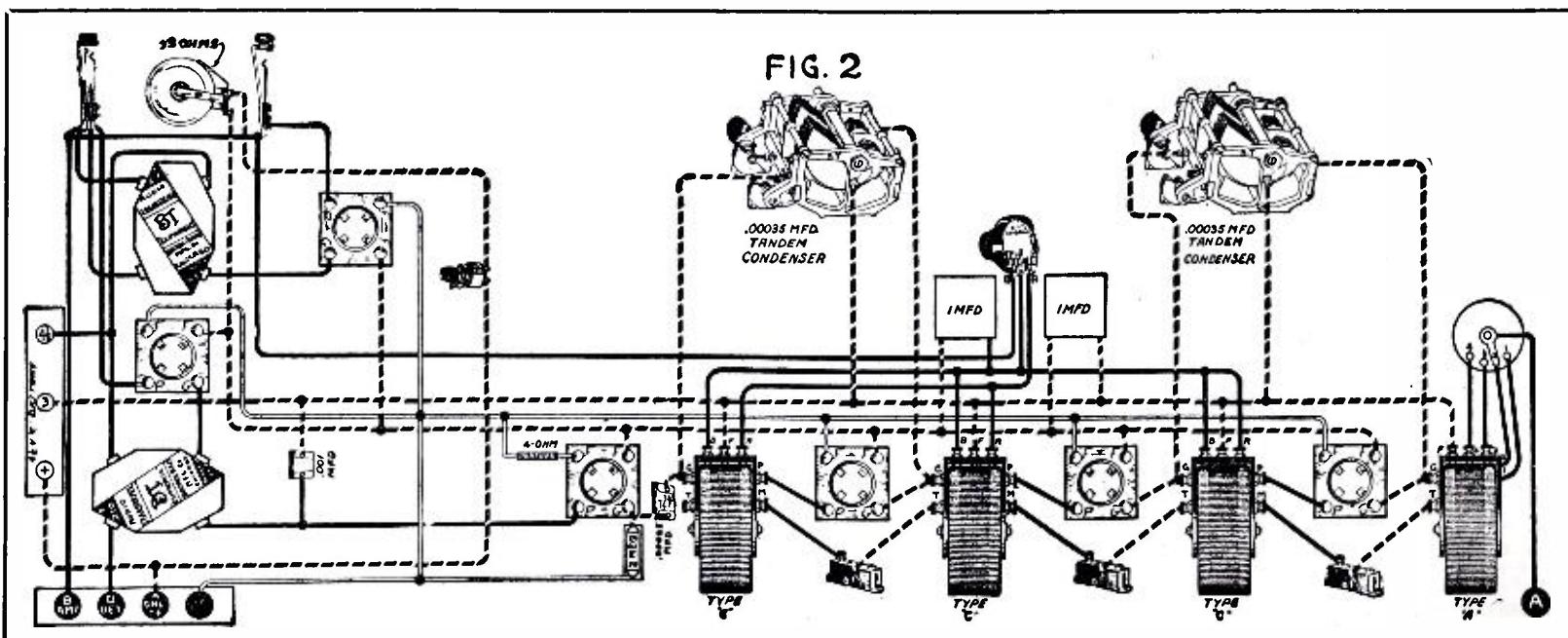
- One Type TA Torostyle Transformer.
- Three Type TC Torostyle Transformers.
- Two Type LD-17, B-T Tandem Condensers.
- Three Micro-Mike Condensers.
- One Dual Resistance.
- One 4-Ohm Fixed Resistance.
- One Set of Radio Frequency Leads, in code colors. Set of Blue Prints, Color Charts and Diagrams.

OTHER PARTS REQUIRED

- One Panel 7"x24".
- One Wood Baseboard 9 3/4"x23 1/2".
- One Euphonic Audio Transformer, Ratio 2.2 to 1.
- One Euphonic Audio Transformer, Ratio 4.7 to 1.
- Two Tuning Controls.
- Two 1-MFD Fixed Condensers.
- One .001 MFD Fixed Condenser.
- One .00025 MFD Fixed Condenser.
- One 2 Meg. Grid Leak.
- Six Type UL Sockets.
- One Double Circuit Jack, No. 104.
- One Single Circuit Jack, No. 101.
- One Filament Switch.
- One 3 Ohm Rheostat.
- One Inductance Switch.
- Five Binding Posts and Mounting Strips.
- One "C" Battery, 4 1/2 Volts.

For the five tube one single condenser is used instead of one double, there is one less TC Torostyle socket and Mikro-Mike condenser.

Figure 4. The illustration below is the diagram of electrical connections for the interesting Counterphase Receiver. This represents the very latest word in the design of radio frequency receivers.



Now Comes an "Ultra Modern" Radio Studio

(Continued from page 41)

room. This is accomplished, of course, by having the studio more brilliantly lighted than the studio parlor and light gauze "glass curtains" hung behind the windows.

Has Motion Picture Booth

THE Radio Suite in the Palmer House is the first in the world to have a motion picture booth provided so that motion pictures of celebrities in action before the "mike" can be taken with little inconvenience. When such things are done in the ordinary studio, it means the difficulty of getting the proper "high tension" electric lights that are necessary. In the WJJD "movie booth" these high power lines are always available; there being introduced there direct wires from the main switchboard of the Palmer House in the basement. The cameras and lights also will be housed in this booth so that all that is necessary is a camera man who will be available on short notice. This feature may not be used often, but when it will be used, it will be found to be a great convenience both to the house electricians and the studio staff.

The old way of having the microphone on a pedestal has been eliminated here, and instead the microphones used ordinarily will be suspended on an adjustable arm made of ornamental wrought iron—a part of the decoration scheme and a technical improvement. Thus the microphone may be changed to suit the voice of each artist by simply moving it to where it is needed. In this way the microphone can be moved quickly, easily and with no noise on the air, to any position where it will stay "put" at any height. This arm is eight feet long and can be moved around or up and down. This eliminates the troublesome "mike" stand, the floor plug and ungainly wire on the floor. It also eliminates the possibility of anyone accidentally kicking the wire which sometimes pulls the plug from the wall socket and delays programs.

Loud speakers are concealed in the studio parlor, in the director's office and in each of the rest rooms so that the program can be followed from any part of the Suite.

The two studios were purposely put in the interior of the hotel to exclude any possible noises from the outside, while the studio parlor, office and rest room have outside windows.

Nearly \$10,000 was spent on the ventilation of the studio alone. All the rooms are "piped" for proper ventilation which, of course, is a vital thing for studios. It can be easily appreciated by visiting a studio which has no ventilation and which has been in use for a half hour. Especially is this true where more than soloists are on the program. A half hour program by a band or orchestra or glee club makes the rest of the program hard because of the air in the studio. Jack

Nelson, Director of WJJD, who is largely responsible for the layout of the "Ideal Studio" says, "From my experience at WDAP and WJJD, and my observation of more than fifty studios in Chicago and all the large cities east of Chicago, ventilation is one of the most vital considerations in planning a new radio studio." The incoming air in the radio suite, as well as all other rooms of the hotel, will be "washed-air" heated in winter and cooled in summer, so that it will always be comfortable for the artists and guests.

The Palmer House is so completely wired for its "Public Address System" that any conceivable combination can be used for broadcasting. The "Public Address System" is the equipment which allows an event in one part of the hotel to be relayed to concealed loud speakers in other parts of the hotel, where it can be heard by guests. Four sets of three outlets each have been installed in the two large dining rooms, and the two large banquet halls, which are immense in size. In the private dining rooms also there are outlets for microphones and wall plugs for loud speakers, so that an event in the main dining room can be heard in the other dining room, the two banquet halls, all the private dining rooms (which occupy one whole floor), the lobby, the foyer, and in fact, all over the hotel. Similarly the program in the Radio Suite upstairs can be relayed downstairs to each of the rooms mentioned. Also anything happening in any of those rooms can be broadcast by WJJD, at Mooseheart, in addition to being relayed to other rooms in the hotel. In other words, celebrities downstairs or upstairs can be broadcast by WJJD and also be heard directly in all other parts of the hotel.

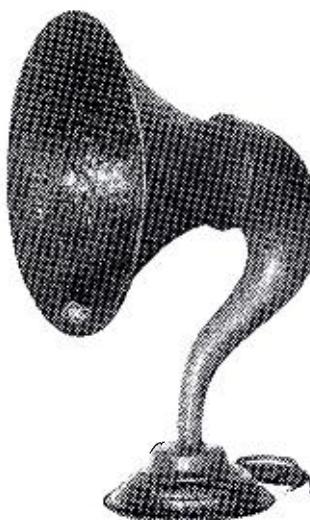
When in Chicago, you are most cordially invited to visit the "Ideal Radio Suite."

Cuba Organizes Communications

Cuba has created a department of communications which will handle matters pertaining to radio, telegraphy, posts, railway, ship and air lines, Minister Crowder reports to the Commerce Department. Radio itself appears to be under the administration of the Director of Telegraphs. The Government of Cuba, a member of the international convention, controls eight commercial stations and all radio except broadcasting, which being operated for entertainment and not for gain, is permitted to be carried on in private hands. Thirty-six broadcasting stations are in operation; among the larger is that owned by the telephone company, PWX. Another is operated by the tobacco monopoly. There are but ten with 100 or more watts power, yet many fans in the States are familiar with these Cuban calls, which begin with a number, like our amateur calls.

Tell them you saw it advertised in On the Air.

Why This LAKESIDE TYPE M SPEAKER Has Made "HORN History"



It is the ONE all-metal, Non-Vibrating horn that will give your customers tone-thrills they cannot secure from any other horn at anything near the price.

Clarity, volume and faithful reproduction are the three points on which this speaker makes friends, and sales.

Horn being all metal, and well packed by us, can be shipped without any danger of breakage.

Weight, packed ready for shipment in heavy corrugated container, 9½ pounds. Height of horn 22 inches. Diameter of bell 13½ inches.

Thousands of these horns have been sold by us to dealers all over the country, and they are giving perfect satisfaction in every way.

List price, complete with adjustable unit, - - \$16.00
List price, complete with armature unit, - \$19.00
Liberal dealers' discounts.
Write!

LAKESIDE SUPPLY CO.
Radio Sets, Cabinets and Accessories
73 W. Van Buren St., Chicago

THRILL YOUR RADIO AUDIENCE

Bring in the stations outside of Chicago clearly with a Thomas Loop on a loud speaker volume.

Many sets not especially designed for loop reception, function splendidly on our loops.

LARGE HEX, turns on 9½ inch radius - \$12.00

LARGE SQUARE - \$8.50

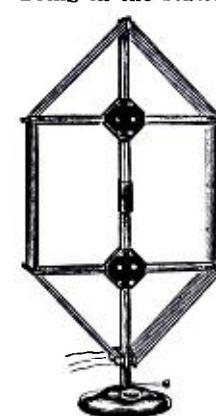
SMALL HEX, turns on 7½ inch radius, - \$12.00

SMALL SQUARE - - - \$12.00

Go to any one of the dealers listed below and have him demonstrate the Thomas Loop for you:

Hartman Furniture Company, 144 S. Wabash Ave.; Atwood Electric Company, 3120 W. Madison St.; Loop Department Stores; Wonder Radio Sales Co., 3152 Irving Park Blvd.; American Radio Mfg. Co., 6235 Broadway and others. If your dealer can't supply you, call on our factory.

W. I. THOMAS CO., 217 No. Desplaines St.,
Telephone Monroe 3426 CHICAGO



Radio Conference Curtails Number of Stations

Resolutions Adopted by Fourth Conference Indicate Radio Has Clear Sailing Ahead

By CARL H. BUTMAN

WASHINGTON:—With the conclusion of the Fourth National Radio Conference, the radio public heaved a sigh of relief at the action taken and the recommendations made to Secretary of Commerce in their behalf and in the interest of the industry in general.

No more broadcasting stations will go on the air until such time as there are suitable channels released; no more stations will be forced to divide time or wavelengths; the broadcasting band was left as it has been, between 202 and 545 meters; and efforts to eliminate all forms of interference were advocated—in resolutions adopted, almost unanimously, by a conference representing every phase of the industry.

This conference, cited as the largest and the most satisfactory of all, ended with the adoption of a resolution thanking Secretary Hoover for his interest, and promising him the support and co-operation of all branches of radio and its allied interests. In reply, Secretary Hoover thanked the conferees in turn for their close co-operation, which, he said, showed that this industry was the first to administer to its own needs through practically "self government"—setting an example for other industries.

Smooth Sailing Ahead

CERTAIN of the recommendations, when worked out into regulations by the Department and laid down in legislation by Congress, it is believed, are indicative of far smoother sailing for the many radio craft on the ethereal seas in the future.

Among the salient points touched upon—some of them felt to be drastic, are the following:

If, in the opinion of the Secretary, there be no public need for additional broadcasting stations on the air, he will not license any more, even if stations are now complete and awaiting a channel. This position may be taken pending action of Congress. It will be considered a hardship by some desirous of entering broadcasting but is held a benefit to listeners.

Throughout the whole conference the keynote was "service to the radio public." The manufacture and sale of radiating receivers was opposed by the Conference, it being pointed out that although control of some types of oscillating receivers was possible and that education was needed, the committee on interference was anxious at some early date to prevent the further manufacture and use of this type of listening device.

Advertising by Radio Deplored by Hoover; Move is Started to Cut Out Interference

While opposing this drastic action, Powell Crosley suggested that there were three types of receivers which might cause such interference, he was willing to let the resolution stand. Spark sets used by amateurs were discouraged, as well as those in marine use, in an effort to further clear the air. Arc apparatus, it was held, might be further improved and the use of high-power only when necessary was advocated.

While no attempt to draw up a radio bill was made, a number of salient features were outlined and will be presented to Congress through Chairman White of the House radio sub-committee. These recommendations covered licensing of stations, opposed a monopoly in radio communication, and suggested an appeal over Secretary of Commerce decisions, although vesting in him the power of administrations in radio matters. Five years was proposed as the time of duration of stations' licenses, and established fees ranging from \$25 to \$2,000 per station, were advocated. Any form of Government censorship was objected to, and, as radio broadcasting was not felt a public utility, the question of rates and fees was not considered a matter for legislation.

Secretary Hoover registered himself as opposed to the granting of so much power upon a Secretary, or rather an official of the government, without having some form of appeal from his decisions, which suggestion will undoubtedly be incorporated in any legislation.

The Problem of Publicity

CONTRARY to the general opinion, the allocating committee accepted the present broadcast bands without change, but urged that special consideration be given the various government departments in the dissemination of their particular news.

In dealing with the complicated problem of advertising by radio, the conference expressed itself as unqualifiedly opposed to direct methods of advertising and called upon the members themselves to keep radio as free from this practice in the future as it had in the past. It was decided that the burden of keeping the

air free of direct advertising should fall upon the broadcaster rather than upon the government and that no legislation was necessary at this time.

It was recommended that inasmuch as the distinction between Class A and B stations is purely artificial that this terminology should be discontinued. The licensing and classification committee also suggested that a permit for the construction of a station should be necessary before the building operation was commenced in order that the owner might be assured of a wavelength when the station was complete.

The Department of Commerce was urged to decrease the number of stations by refusing to grant any more wavelengths and likewise refusing any more operating permits until such time as the mortality of stations had created a demand. This resolution was passed in different forms by several of the committees and accepted unanimously by the convention.

A blow was dealt the rebroadcasting of programs without the specific consent of the originating station and a warning sounded against the practice of speculation in wavelengths. It was urged that the Department scrutinize the sale of broadcasting stations in the future to discourage any attempt to speculate in wavelengths which are becoming more and more valuable now that the number of stations is to be limited.

In dealing with the Marine radio situation, it was recommended that the users of radio transmitters be encouraged to install transmitters of less broad emission. This was assured by the steamship authorities, who were replacing the spark equipment with modern apparatus.

It was felt that the matter of interference from radiating receiving sets should take the form of persuasion rather than coercion and that such interference could better be eliminated by giving publicity to methods of operating these receivers in such a manner that they would not radiate. Publicity of this kind had accomplished much during the past year but this, it was felt, must now be more emphatic to accomplish the desired result. This objectionable feature to radio had been greatly reduced in Canada, the committee pointed out, by the circulation of pamphlets to all the receiving set owners. The committee urged the press to publish such articles as would help to educate the public in the use of radiating receivers and the proper manipulation of sets which through changes made in factory-made equipment might be made to radiate.

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.

HARRY GRANT, Jr., of 904 Oak Grove Avenue, Burlingame, California, favors us with a little technical item on the construction of a crystal set that should be of interest to radio enthusiasts who would like to make simple crystal sets for Christmas presents. The set is very simple in construction and design, and is very efficient.

The Circuit diagram shown in Figure 1 gives the electrical connections for the various parts of the set. Figure 2, shows how the parts are mounted and connected up on the panel. When the whole outfit is hooked up it can be slipped into a neat little cabinet, and makes an unusually fine gift.

Crystal sets are coming back into favor with the increased sending powers, and are generally accepted as producers of finest signal tonal quality. If they are carefully built, and use a good mineral, long distance is not impossible with them.

In the drawings, coil L_1 is a 35 turn winding on a three inch cardboard tube, of number 20 DCC wire. This coil is fastened to a shaft, which in turn revolves on a strip brass bearing and a hole in the panel. Selectivity is controlled by this coil. L_2 consists of 25 turns of No. 20 DCC on a three inch cardboard tube, and is fastened stationary to the panel as illustrated. C_1 is a .0005 mfd. variable condenser. C_2 is a fixed condenser of .001 mfd. capacity. The crystal and detector stand is mounted on the front of the panel as indicated by the two screws a and a' . These screws also are the connections to the crystal detector. B_1 is the antenna binding post, B_2 the ground, and T_1 and T_2 are the connections for the telephones.

When operated in a

good location, this set gives unusual results in respect to selectivity, tone and distance. One of Harry's friends sent him the following list of stations heard from Alameda, California (the fellow's name is J. Miguel). KFI, KHJ, KJS, KGW, KFSG, and CFCN. He also says "I get KGO on the loud speaker and I hear it in every room in the house. I take the phones clear off my head, and hold them in front of my face, and hear KFI very easily."

If you build this little crystal set, let us know how you come out.

L. A. Hix says he is going to make a new super-heterodyne. Good luck, Hix. We understand you're going to use Georgie Walker's Victoreen kit; we're quite sure you'll get results.

Paul Hollinger of 5747 Blackstone Avenue, Chicago, Illinois, sent in a suggestion

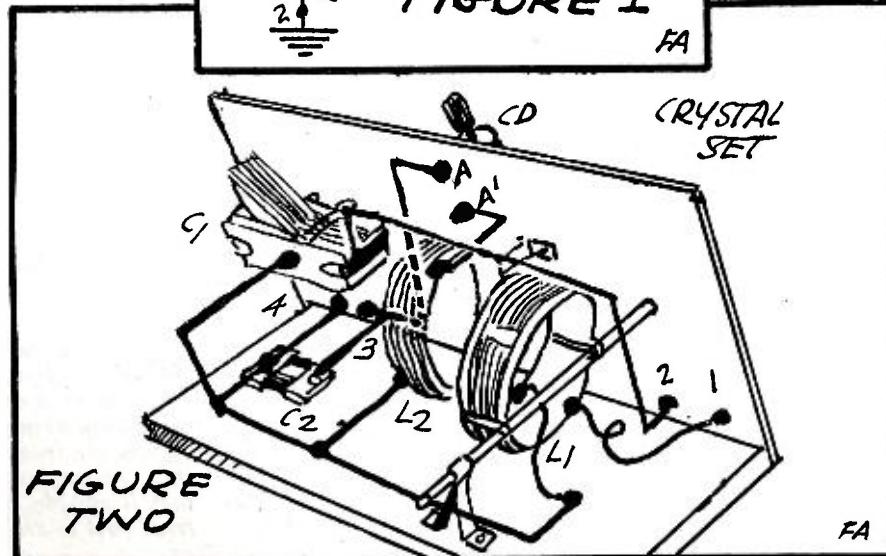
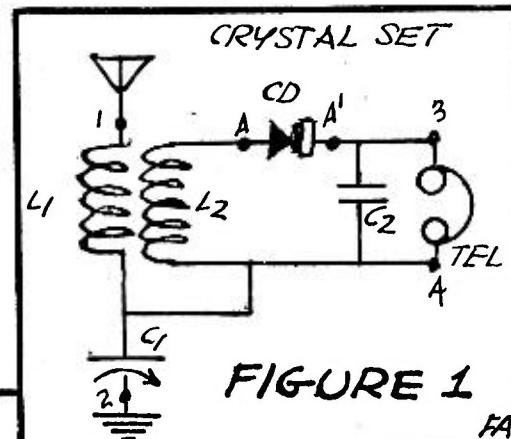
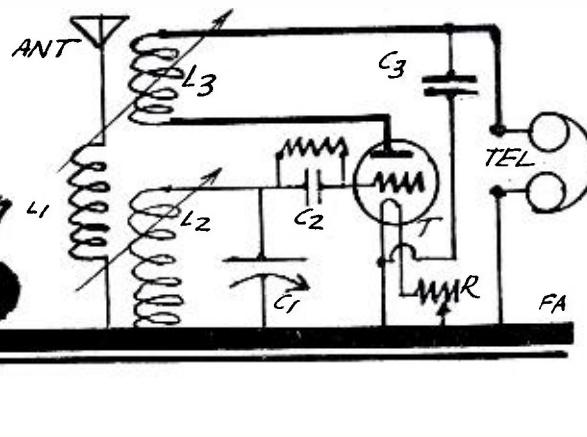


Figure 1 shows how the parts are connected up to make an efficient crystal receiver as described by Harry Grant, Jr., in a letter to the editor of this department.

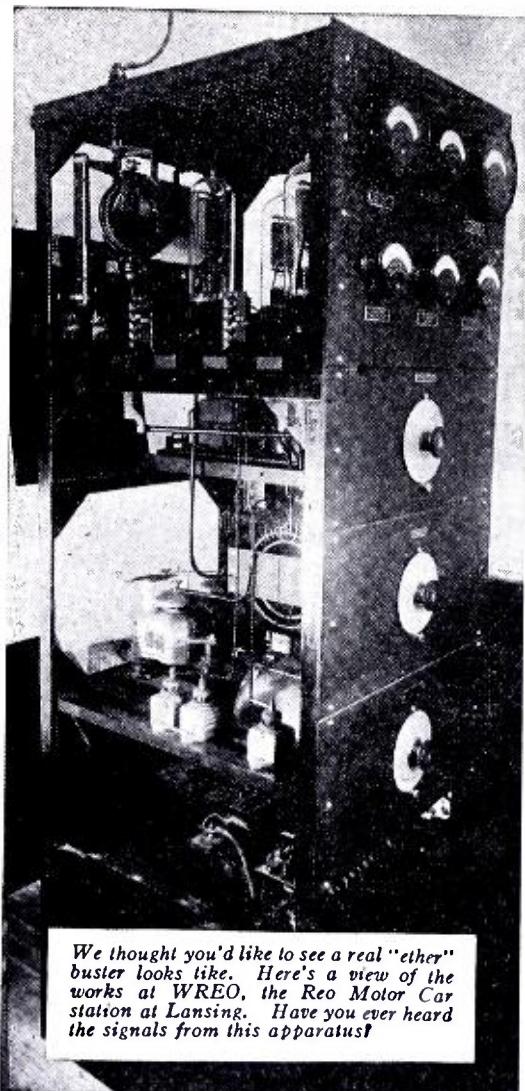
for an antenna lead in insulator. We think the idea is pretty good, and pass it on to the gang with Figure 3. It consists of two ordinary quality drinking glasses that taper toward the bottom. A hole is drilled in the bottom of each glass with a three cornered file and turpentine. This is quite easy—the glass drills harder than fairly hard steel if you keep the file (which would be broken in half to get a good cutting edge) thoroughly saturated with turps. The rest of the equipment consists of a short length of glass tubing or porcelain telephone lead in, a threaded brass rod, two bolts to fit thread, two washers, two washers and a wall to lead in. (Note: Brick walls don't work so well with this affair—Tech. Ed.) After drilling the holes in the glass make the holes in the wall just a little smaller than the diameter of the glass, two thirds of the way from the bottom. One hole in outside wall, and one in the inside. Then assemble the affair as illustrated, tighten down on the bolts, and LO! See the nice lead in insulator—low loss . . . You Bet.

G. B. Bassler, our advertising representative, couldn't find the resonance point on his super-heterodyne receiver (that he built all by himself) so H. J. Meister, our publisher, whittled him one out of a piece of packing case. It looks something like the illustration in Figure 4. That was very obligeing of Mr. Meister.

Lawrence A. McCormick of Chicago, Illinois, writes us of his experience with one of these self assembled storage B Batteries of the Edison Alkali type. He Says:

Dear Editor:
Gaze upon me and you shall see what the curse of (Turn the page)

Figure 2 illustrates the best mounting and layout for the parts. This makes the front panel symmetrical and easily operated. The binding posts are taken off the bottom of the panel in this set but may be mounted any convenient place to suit the individual requirements of the installation.



We thought you'd like to see a real "ether" buster looks like. Here's a view of the works at WREO, the Reo Motor Car station at Lansing. Have you ever heard the signals from this apparatus?

radio has done. I've gotten gray hairs, and lost 15 pounds in an ordeal that you've gotta know about.

Some @ *%&'^?* radio dealer told me to make up a set of B storage batteries; he was selling them: and save a lot (?) of money and get a better battery than Exide or Philco or anybody for that matter ever put out.

So after acquiring all the essentials of the inquisition, I started homeward to make the perfect B battery. Please explain if you can, to my harrassed mind, how nickel wires are fastened to the electrodes. I mean to stay. I couldn't do it and I doubt if it is possible at all. That is only one of the many details I don't know about. After mounting all the elements in a nice rack of shiny test tubes

An interesting type of low loss lead in insulator that is available to enthusiasts who dwell in frame houses. This is so sturdily designed that it would be serviceable in a transmitting station. It is simple to construct, and requires only a few easily acquired parts.

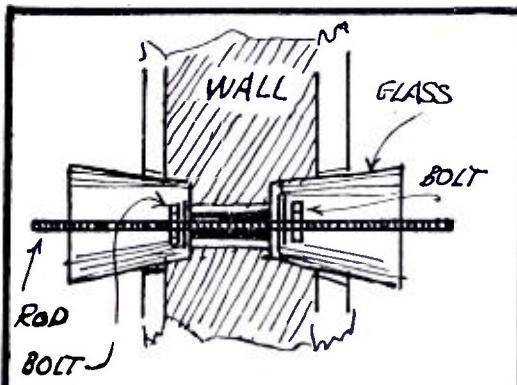


FIGURE 3

and filling the affair with electrolyte, I started to charge them. After the charging was complete (?) the whole business looked like a garbage receptacle, or maybe a beer still. There was froth and foam all over the place. My dog ate some, and hasn't been the same since.

I started all over again after cleaning up the place, and once more got the thing in shape. The next time I tried to charge them, all the lights in the neighborhood went out.

This is written in hiding, as the power company is still looking for me. What would you suggest?

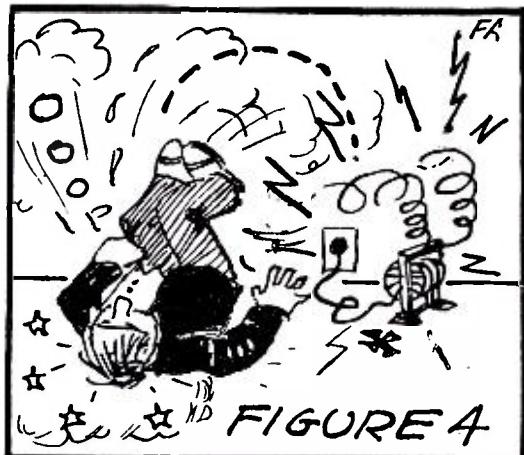
Very truly yours, "Larry."

P. S. I had a great time shooting the test tubes off the back fence last Saturday.

Earl Camm of Dubuque, Iowa, tells us he has a new way of testing the secondary voltage of B battery eliminator transformers. He says he was building a B Battery eliminator, and didn't know the voltage of the secondary step up transformer. This is the test for voltage as he describes it:

"Grab both secondary terminals of the step up transformers firmly with right and left hands. Then connect the primary to the house current. The voltage and current flowing in the secondary winding of the transformer is in inverse (meaning you go upside down we suppose) proportion to the distance or the square of the distance I forget which, that the jolt throws you."

That's simple enough. We suppose that an equally simple way to estimate it is to



Test your rectifier B eliminator transformers in the approved fashion as illustrated above. One of our readers explains the technical details in the accompanying text.

Malaga, Spain, is having a broadcasting station erected, the first in that section of the country. A radio boom is anticipated in about two months, or as soon as the pioneer station goes on the air. Considerable interest in radio is already shown by Malaga fans, but without a local station, and with bad static interfering, even foreign station reception was poor.

A Merry Radio Christmas and A Happy Radio New Year!!

FIGURE FIVE

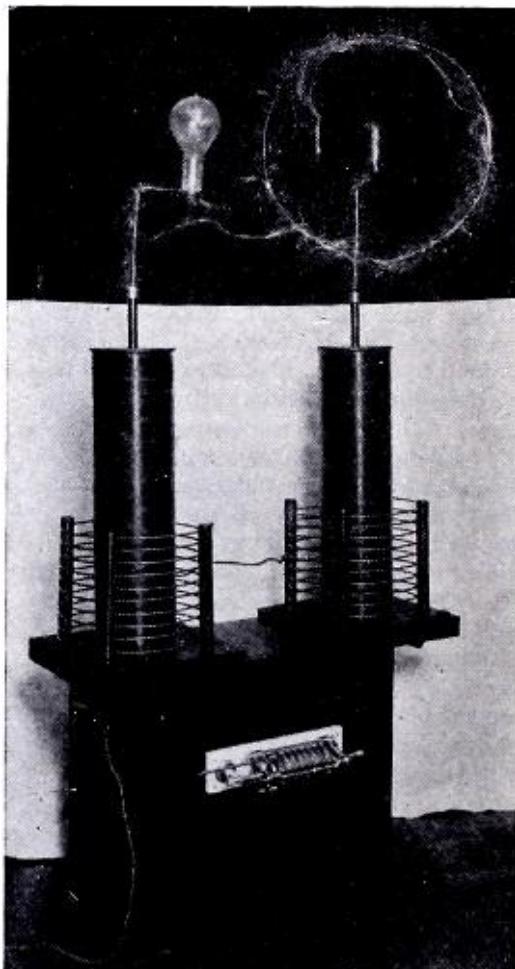


A Resonance Point.

count the number of stars you see when your head hits the floor and multiply by ten. This ought to give you just about what you think the voltage was. See Figure 5.

Will some of our readers who haven't got "dial twisters cramp" so badly that they can't write, please send in a few reports on DX signals? have any of you heard Europe yet this season? Have you made any Transcon receptions yet this year? Drop us a line with a list of the stations you've heard this season. And how you did it and what with. Don't be a dead spot, join in.

The Department of Commerce in a tip to radio exporters points out that they should not ship radio receivers abroad to countries where the proper style of tube is not available. The consignment of certain radio sets, requiring a special tube, to Singapore recently caused embarrassment to both distributors and the consumers, since no suitable tubes or adapters for them were available. Equipment for use in connection with electric light sockets, such as antenna plugs, must also be of a type which can be used in the foreign sockets, it is pointed out.



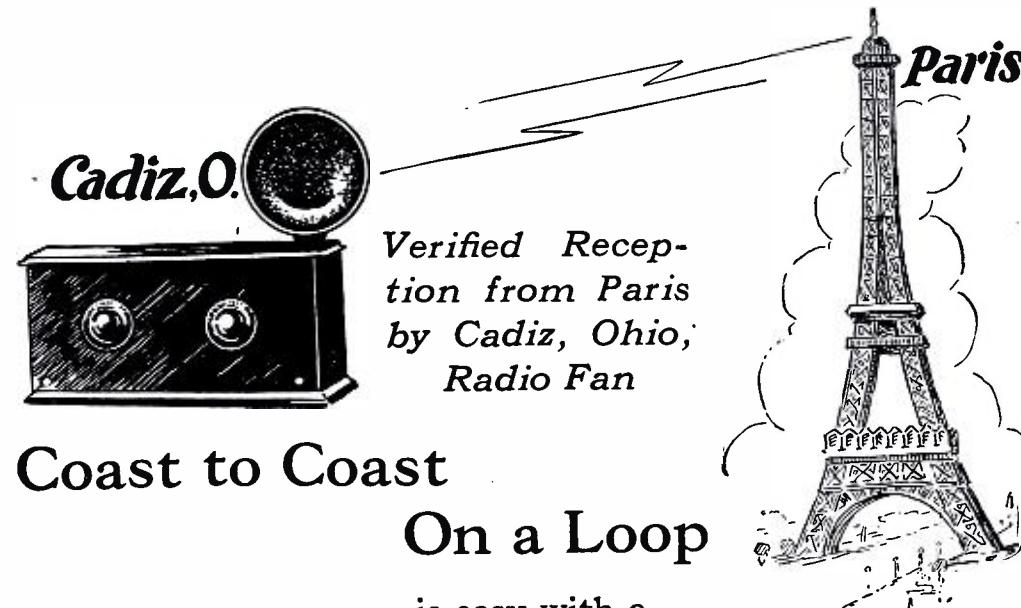
The above is a photograph of a Tesla-Oudin Coil built at the Institute of Engineering of Joseph G. Brach. It gives a twenty inch spark with a magnificent Brush discharge, the voltage being approximately ten million. If you are interested in learning more about this spectacular coil write the Institute, and they'll supply you with full details. It is a treat just to see it.

The Technical Editor's Advice to the BCL

(Continued from page 44)

coils, each with a 10 turn primary and a 50 turn secondary. They are tuned by .00035 Mfd. plain condensers. In operating, I notice that the stations bunch at the lower waves. I learn the SLF condensers represent the remedy for this, and I want to use them. I find now that the SLF type I intend to use (and which I have already purchased) are not .00035 Mfd. but .0003 Mfd. Will this make any great difference in the set? Please advise me. Will it be necessary to rewind the coils and if so, how many turns should each one have? Thank you very much.

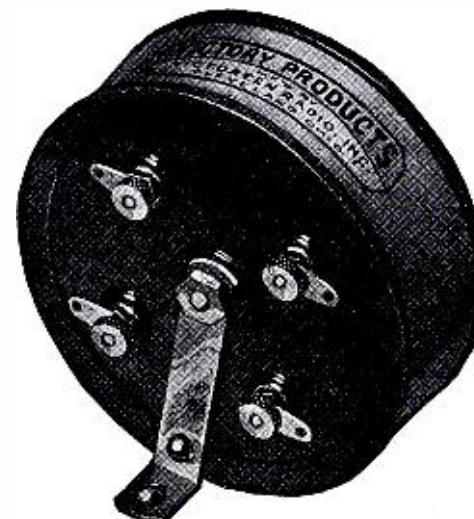
Answer: Right here, I want to tell my readers that it is not vitally essential that you go to the expense of buying SLF condensers in order to separate the bunched stations at the lower end of the scale of the secondary tuning dials of sets such as that of G. E. T. The same effect can be accomplished by tapping the coil, thereby spreading out the tuning range of the condenser. If G. E. T. will tap his coils at the 25th turn, and bring the 50th and 25th turns out to switch-points on the panel and connect the rotary plates of the plain condensers he now has to the switch the lower stations can be easily separated. The electrical connections for each coil are illustrated in Figure 3. With regard to the LC ratio (coil and condenser ratio) let me suggest to G. E. T. and all other fans as far as that is concerned that the best and only way to wind coils to suit is to use the cut and try method. G. E. T. has forms already prepared for him, so the thing to do is to rewind the forms with plenty of turns—too many and then remove a turn at a time until the coil covers the wavelength range you seek. A good pointer to remember is that one turn on the average coil represents three divisions on a 0 to 100 dial. This is a rough estimate, but will give a general proportion to work from. With a 0 to 100 dial scale, proportion the coil so that a 500 meter station comes in at about 80 on the dial. This will allow plenty of room on the lower waves. For the experimenter who is going to wind a coil and does not know the proper diameter of form to use the procedure is different. The rule to follow is to keep the length diameter ratio in favor of a greater coil length. Coils of large diameter have fields that spread over considerable territory in the set. Keep the diameter of the coil small within reason, that is don't wind a coil six inches in diameter having a winding only three-quarters inch long. The better ratio would be a coil three inches in diameter four inches long. This coil length proposition is of course dependent upon the size of wire used. Tables giving the number of wire turns per inch should be consulted if you are in doubt. In general there is little or no advantage in using wire heavier than No. 18 B. & S. gauge and sizes up to 26 may be used without impairing the effectiveness of the set to any great extent.



Coast to Coast On a Loop

is easy with a

Victoreen Super Heterodyne



Victoreen No. 170 R. F. Transformer—Neat and Compact 3" in diameter, 1" thick.

- 4—No. 170 R. F. TRANSFORMERS at \$7.00 each and
- 1—No. 150 Oscillator Coil at \$5.50.

Constitute The Heart of The Circuit

No oscillations, howls or squeals—no matching of tubes.

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

Ask your dealer for free "Victoreen" folder which contains hookup and complete information, or write us direct.

THE GEORGE W. WALKER CO.

6544 Carnegie Ave.

Cleveland, Ohio

Branches Sales Offices Are Located at

50 Church St., New York City
719 Raymond St., Philadelphia, Pa.
1323 Wall St., Dallas, Texas
910 Terminal Sales Bldg., Seattle, Wash.
300 Sugar Bldg., Denver, Colo.
383 Brannan St., San Francisco, Calif.

508 So. Dearborn St., Chicago, Ill.
45 Ruggery Bldg., Columbus, Ohio.
443 So. San Pedro St., Los Angeles, Calif.
Box 321, Boise, Idaho
332 St. Catherine St., W., Montreal, Que., Can.

With regard to the primary of G. E. T.'s coils, I would suggest a few more turns on the primary. If 18 turns are wound, the transfer of energy on the higher waves will be much greater. It has the disadvantage however of increasing the tendency of the set to oscillate when tuned to the lower wavelengths. If this is found present in the set stabilize it with a potentiometer system or neutrodon capacity. A little regeneration is always helpful however in getting the DX stations, especially in the last stage of RF in any RF cascade systems. Some discussion on this point was printed in our November issue under the title "Revitalizing Your Neutrodyne," by Radio Operator 37936.

Potentiometers Serve in Efficient Sets

Long before the perfection of the three element vacuum tube, or even the two element Fleming valve, the potentiometer was an essential part of the then very crude radio receiving set.

The early potentiometers usually consisted of a carbon rod or flat strip.

Some of the best engineers have for a long time been trying to get back to the carbon strip potentiometer, which is generally admitted to be much better than the wire wound type. It remained for the laboratory staff of the Centralab, Milwaukee, to work out a new design that meets these needs.

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

News of The Radio World

A Visit to the Home of "Clarostat"

WHEN you've been in the radio game for quite a long time, and you've become pretty much hardened to "new" devices, and you suddenly run across a little instrument that makes you sit right up and take notice—well, that's worth a story. Hence this tale about the Clarostat and its cousin, the Clarotuner, both products of the American Mechanical Laboratories of Brooklyn, New York.

The first stop on the tour through the factory was at a unique demonstration board. Meters are so rigged on this testing machine that the comparative functioning of a Clarostat and any other variable resistance is seen at a glance. A portion of this board is reserved for the same kind of visual test of the Clarotuner in competition with any other similar tuning device. It's all very simple after you get the hang of the thing.

To make a long story short, the Clarotuner brought the circuit right up to the oscillation point, right up to within a very shade of it, and held it there. No trouble at all—but just the same, the other tuning units sort of put their tails between their legs and gave it up for a bad job. The Clarostat did its job like a man, too. The dials showed a remarkably gradual resistance change when the knob was turned. The other resistance devices were noticeably jerky. That might sound like a lot of biased enthusiasm, but just remember that seeing is believing.

The reason for the results just noted became obvious at the next stop, where a Clarostat had been opened up and its parts scattered about on a display board. The precision manufacture apparent in all the parts, from the main spindle to the smallest stamping, would do credit to a watch. It all just goes to show that, even in radio, it's worth doing things well.

The Benwood-Linze Co. Moves

The Benwood-Linze Company of St. Louis moved from 1129 Olive Street to 1700 Olive Street in the wholesale district, where it will confine its business exclusively to the wholesale distribution of radio receivers, necessary accessories and supplies.

The Company disposed of its retail business to the Alexander Radio & Electric Company, formerly located at 1003 Pine Street. That Company moved from their old address to a new location at 1129 Olive Street and took over the entire retail stock.

The Benwood-Linze Company is a pioneer in radio being a consolidation of the Linze Electric Supply Company that was established in 1886 and has dealt largely in radio for ten years and the Benwood Company an exclusive radio house that was established in 1920 and has never handled anything else but radio apparatus and supplies.

The company is distributor for Freed-Eisemann, Colin B. Kennedy and Crosley receivers, Brandes Loud Speakers,

Eveready Batteries, Cunningham Tubes and a complete line of nationally advertised necessary accessories and supplies.

The present officers of the concern are as follows:

Harold J. Wrape, President.
Carl H. Hambuechen, Treasurer.
E. T. Sheehan, Secretary.

Days of Merchandising Joyrides Are Over

"No longer a Sellers', but a Buyers' Market—and they Know What They Want" Says G. C. Cunningham, of Pittsburgh Office, Music Master Corporation.

UNTIL very recently," says G. C. Cunningham, field representative of the Pittsburgh district headquarters of Music Master Corporation, "we in the radio business have had one grand merchandising joyride. People have flocked into stores and almost begged to be allowed to buy a radio set—any set and every set—just as they flocked into Dawson in the first wild days of the Gold Rush. A sellers' market—and real selling effort was unnecessary.

"That was when radio was new. Today it's different. The buying public, through the efforts of reputable radio manufacturers, have been taught to know what they may expect of a first class radio set. And the manufacturers themselves, through protective, iron-clad sales policies and restricted distribution, have done much to make the radio industry safe and sound, both for the buyer and for the seller. Today, I am proud to say I can offer to the merchant, and through him to his customers, the very best in the radio line."

Mr. Cunningham has literally come up through the ranks to his present position in the radio trade. A native

of Pennsylvania, he learned the practical trade of machinist as a tool and die maker. He has served successfully as instructor, inspector, foreman, and superintendent. During the world war he still followed his chosen trade to practical advantage, serving as Chief Army Inspector of Ordnance. Here his training proved valuable, and he came through with a clean record and a certificate for faithful service rendered.

"I have been a salesman for twenty years," says Mr. Cunningham, "and have sold nearly everything from cash registers to electrical fixtures. And now enlisted under the Music Master banner, I see splendid possibilities ahead. Under our protected sales policy, the merchant is assured of his profit and his customers get full value for their money in the unending satisfaction and pleasure of Music Master Radio Products.

No Radio Tax, Says Frost

The radio listener in America will never be taxed for broadcasting. This statement was made by Major Herbert H. Frost, president of the Radio Manufacturers' Association, at the opening of the new high power station WENR of the All-American Radio Corporation, at Chicago.

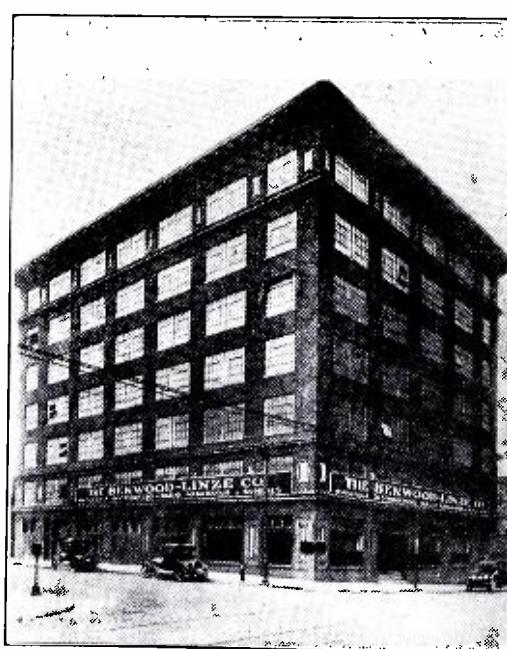
"In some European countries the listener is taxed directly to pay for broadcasting," said Maj. Frost. "Interests hostile to radio would like to see the same conditions prevail in America, but there will never be a tax of this kind in the United States for the reason that if all other stations were to shut down tonight there would still be enough high powered stations, owned and operated by radio manufacturers to reach every corner of the country.

"Schools, newspapers and radio manufacturers are the logical broadcasters. No school should, and no newspaper would be willing to, sacrifice its independence by accepting a subsidy from any federal administration or other group. The manufacturer will pay for broadcasting because his business depends upon it.

Lux Fibre Furniture Co. Enters Radio Industry

Charles E. Nelson, general manager of the Lux Fiber Furniture Company of Waukesha, Wisconsin, informs our manufacturer's representative that they are about to enter the radio field with an extensive line of radio furniture, consisting of cabinets, consoles and deluxe wood-working for radio receivers. Our representative made a call on them recently, and reports that they have an enormous two acre plant devoted exclusively to making fine wood products.

Set manufacturers, cabinet dealers, as well as radio fans will welcome this much needed addition to the radio profession. We have been looking for a progressive manufacturer that would manufacture a cabinet that retails at a reasonable price, and that includes real quality raw materials and workmanship. Wholesale production should make this possible. And so we welcome the Lux people.



NEW QUARTERS OF THE BENWOOD-LINZE CO., 1700 OLIVE STREET, ST. LOUIS, MO.

The company is occupying first and second floor of this building and devotes entire efforts to wholesale distribution of radio apparatus and supplies.

HOW is radio apparatus tested, and how do engineers know what they're testing is good?

This question has been asked time and time again by visitors to the ON THE AIR Research Laboratory, located in the Kimball Building, Chicago. These visitors gaze at the unusual array of radio parts, radio sets, and testing instruments strewn on the work-bench, underneath it, or even attached to the wall. And naturally they wonder about the "why" of the whole thing.

Not every one can test a piece of radio apparatus, no matter how much experience he has had or how much paraphernalia he has on hand to do his testing. Actual laboratory experiments require infinite patience and days of tinkering to determine the real worth of the apparatus submitted.

So it is with the laboratory of the ON THE AIR Magazine. In olden times it was deemed proper to unwrap a radio part from its mailing package, look at it, test it for resistance or durability, stamp "OKAY" on it and send it back to the manufacturer or designer.

The Test of Merit

NOT so today. A radio engineer does not expect his pet radio development to be approved or cast aside in the twinkling of an eye. If he can be shown that his condenser, for instance, has been used in several home-built receivers and tried in every type of circuit where it will function properly, why, then he begins to believe in the sincerity of the testing laboratory. Such tests, he reasons, must be extended over a period of several weeks, and sometimes months—rather than a few days. The testing engineer of the laboratory may be only one of many radio "bugs" testing the instrument. What the testing engineer is interested in is the *average results* reported by the numerous fans to whom he has entrusted the care of the instrument submitted, over a period of four weeks for each tester, for example.

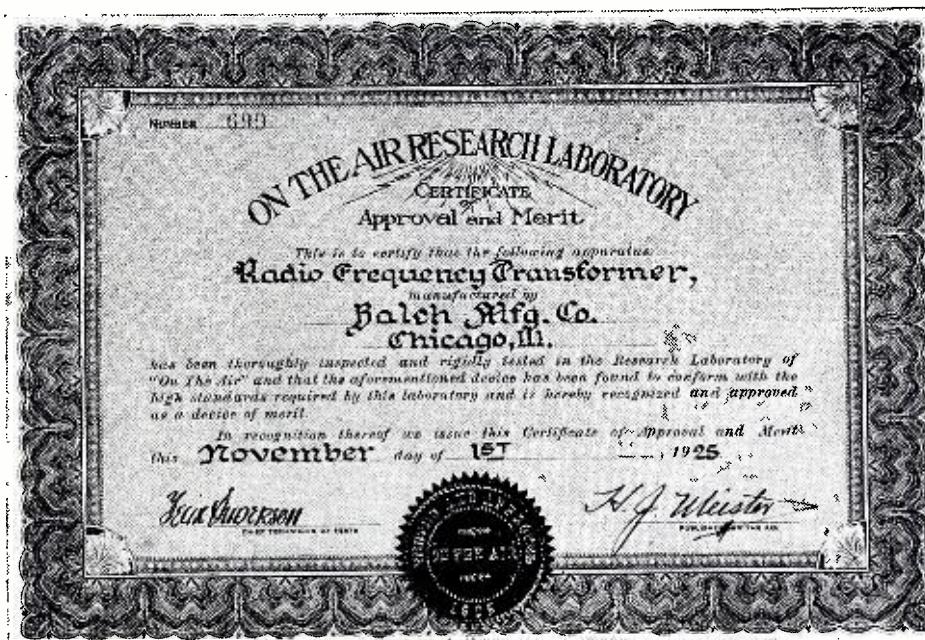
Before a certificate such as reproduced on this page is awarded to a manufacturer or designer, it must go through several hands according to the plan outlined above. This policy was formulated in the belief that no one engineer is qualified to pass on a radio instrument's merit alone—no matter how good he thinks he is or how good the world thinks he is. Detailed scrutiny of the apparatus by a number of unbiased engi-

A Sign of Merit!

A Peek Into Our Testing Laboratory

By H. T. KELLEY

Testing Engineer



Above is a fac-simile reproduction of a sample certificate of merit, such as is awarded by the ON THE AIR Research Laboratory to manufacturers, engineers, and inventors whose radio apparatus meets the exacting tests of our Laboratory engineers. The certificate measures 7 by 10 inches and is handsomely engraved from steel, on a green bond paper.

neers, and a comparison of their analyses into one condensed report, are far more valuable to the far-sighted manufacturer than a hurried, haphazard report prepared by an engineer who must finish one report quickly in order to tackle a few hundred others demanding his attention.

A "Fool-Proof" Method

BY adopting this plan, the ON THE AIR Research Laboratory believes it has hit upon the best method to give manufacturers a "fool-proof" and authoritative opinion of their products, uninfluenced by thoughts of advertising or circulation again. Such a report places the responsibility directly upon a group of qualified engineers, who are ready to stake their reputations upon their statements made in this magazine.

Such, then, is the way things are done at ON THE AIR which, according to the plan now followed, operates its testing from a main laboratory in its offices, and extends these operations to several well equipped laboratories, including those of the technical editor, research editor and testing engineers. ON THE AIR believes the results of its tests, and the announcements thereof, in each issue, will prove of greater value than ever to the average listener who *wants facts* and not claims.

Likewise, the value of the certificate awarded by this laboratory is greatly enhanced when one considers the labored process entailed before a certificate of merit is awarded.

A Typical Example

AS an example of how such a laboratory functions, it may interest our readers if we cite a typical day of testing and experimenting.

Early in the day, for instance, a loud speaker is brought in by the manufacturer for testing. He is enthusiastic about its past performance in his own laboratory, and in the homes of his customers. He believes that a stringent test in the "ON THE AIR" Laboratory will bring out the same satisfactory results. He hopes that this magazine's approval will be expressed by the issuing of a certificate of merit similar to the one reproduced on this page.

The receipt of the aforementioned loud speaker is "checked in" by the technical editor, who records its name, manufacturer's name and address, price, type, general construction facts, and date received. A larger space is reserved for

the engineers' report of the tests over a period to be decided upon after the initial "tryout" test.

The speaker is then given its regular place in line, so that it may be tried out when its "turn" arrives. This is usually a week or so after its receipt, for individual testing is a laborious process, and attempts at hurrying testing are discouraged.

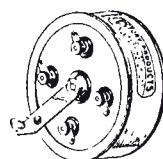
Finally, the testing engineers and the technical editor reach the loud speaker, and connect it to the receiver in "On the Air's" Kimball Hall laboratory, and listen to reception under the peculiarly adverse conditions to be found in Chicago's steel-girded "loop."

After careful notations as to tone, quality, pitch, articulation, string music, and other forms of radio reproduction have been made, the speaker is designated to laboratories and homes at a distance from the downtown district, where the speaker can be tested under favorable conditions.

After from three to four weeks of this testing, the speaker is returned to the main laboratory, and the various analyses of its performance compared, a final rating is decided upon, and if this rating is equal to or above the "passing mark," the publisher of the magazine issues the engraved certificate of merit under his seal and signature. The manufacturer is duly informed of the fact and an outline of all the tests furnished him if he desires to study this report with a view to improving his product.

On the Air Research

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.



SUPERHETERODYNE EQUIPMENT

Test No. 98. Readers who are interested in superheterodynes will undoubtedly be glad to learn that the first superhet kit to be tested passed requirements easily and with especial merit. The kit submitted is the product of the George W. Walker Company of 6544 Carnegie Ave., Cleveland, Ohio, and consists of a set of unusually accurate intermediate transformers of the aircore type, a well designed filter, an oscillator of meritorious design, and an input transformer (secondary circuit) designed for the present wave allocations. We like this kit so well that we asked Mr. H. G. Silbersdorff, an engineer, to write up his experiences with the apparatus. The story was printed in the November issue in part. The second installment appears in this issue. Awarded certificate of Approval Number 223.



SLF CONDENSER

Test Number 99. Amsco Allocating Condenser. Manufactured by the Amsco Products, Inc., Broome and Lafayette Sts., New York City. A small, well designed variable capacity, highly accurate and varying very little from the straightline curve, this condenser is awarded our certificate Number 224 indicating its approval and merit by our research laboratory. The losses are uniformly low over a wide range of frequencies, and the condenser represents one of the most desirable in the SLF field.



MARCO DEVICES

Test Numbers 100 to 122 inclusive. The Martin-Copeland Company submitted for test twenty-two of the devices they manufacture consisting of the most popular parts used in radio construction. The laboratory after giving them all a thorough test and inspection is pleased to issue certificate No. 225 indicating that everyone of the articles submitted pass the requirements easily, and that they unhesitatingly recommend Marco Devices after the opportunity to test them out. The entire line is well designed, and some of the devices are especially meritorious from an electrical standpoint. The following is a list of the devices tested:

Marco Dial, vernier type.	Switch Plug.
Neutralizing Condenser.	Super Vernier.
Filament Switch.	UX Adapter.
7 point Switch.	UV Adapter.
Grid Leak.	UV 199 Socket.
30 Ohm rheostat.	2 pt. switch.
Antenna Tape.	Multi-connector.
UX 120 adapter.	Phone plug.
Audio Transformer 3:1.	SLC condenser.
Series Parallel switch.	Multi-connector.
DPDT Switch.	Jack.



Radio Laboratories

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.



RADIO FREQUENCY TRANSFORMER

Test Number 123. The Charles A. Branston, Inc., of 815 Main Street, Buffalo, N. Y. submitted a novel design of transformer, incorporating several radical ideas in manufacture that are of exceptional worth. Laboratory tests show this transformer worthy of our Approval Certificate Number 226. It is of toroid construction, designed to cover the present wave band with a 350 mif condenser of the slf type. They are rigidly constructed, and electrically efficient.



GRID LEAK AND CONDENSER

Test Number 124. The unique combination grid leak and grid condenser furnished by the Daven Radio Corporation of 158 Summit Street, Newark, New Jersey has been awarded our certificate of Merit and Approval Number 227 because we find it to be accurate in resistance and capacity. It is also a step in the right direction of standardizing and simplifying radio apparatus. Furnished complete with two special clips that make good contact and eliminate the possibility of noise.



DETECTOR MINERALS

Test Number 125. Two types of detector minerals, submitted by the California Radio Minerals organization of 904 Oak Grove Avenue, Burlingame, California were given a rigid operating test by our laboratory, both on straight detection and reflexing, and were found to be deserving of our certificate of approval and merit number 228.



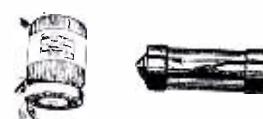
SLF CONDENSER

Test Number 126. The Capacigrad Condenser, manufactured by the Pilot Electrical and Manufacturing Company of 113 Broadway, Brooklyn, N. Y. passed the requirements of the research laboratory and has been awarded our Certificate of Approval Number 229. It is of the straight line frequency type, good construction.



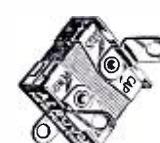
RECHARGEABLE B BATTERY

Test Number 127. A storage B battery of the 24 volt type submitted the Cleveland Engineering Laboratories Company, of 2104 Superior Viaduct, NW Cleveland, Ohio, was put through exhaustive tests for operating life and the data indicates that it passes our specifications for a good battery. The battery was discharged through resistance of various sizes representing different plate potential and current demands of various radio receivers, and the results show it to stand up very well under the heaviest line of duty. Given Certificate Number 230.



TRANSFORMER AND GRID LEAK

Test Number 128. The Radio Foundation, Inc. of 25 West Broadway, New York City, N. Y. asked us to test out two of their products, a grid leak and a very different inductance called the Doubletoroid. The grid leak is one of very good design because it is so constructed to eliminate noises, and insure an even change of resistance. The coil is something new in inductance design, incorporating several features of engineering skill that are entirely approved by our laboratory. Both products are approved under our Certificate Number 231.



FIXED CONDENSER RESISTOFORMER

Test Number 129 and 130. Fixed Condenser, test Number 129 consisted of a check on the capacity rating and mechanical construction, the search for noises and leakage, and the laboratory reports it to be OK. The Resistofomer, consisting of a large well made fixed capacity and two resistance units, designed for resistance coupled amplification also is satisfactory, actual operating tests show. Both devices were submitted by the Aerovox Wireless Corporation of 493 Broome Street, New York City, and are approved under our Certificate Number 232.



BATTERY CHARGER

Test Number 131. The France Manufacturing Company of 10321 Berea Road, Cleveland, Ohio expressed us one of their chargers for test, and after a checkup on the charging rate we agree thoroughly that it is a "super" charger, and well worth our Certificate Number 233. The device is neat in appearance, well constructed both electrically and mechanically, and is recommended to any radio fan who has no objections to a vibrating valve rectifier.

**LOUDSPEAKERS**

Test Number 132. The F. G. Baumgart Company of 4556 Grand Avenue, Chicago, Illinois, submitted one of the unique loud speakers for test and we are pleased to report that it passes the requirements for volume percentage and quality. This company is an advertiser in this issue and reference should be made to the advertisement for further particulars. The research laboratory believes this speaker to be well worth the price asked.

**POWER CONDUIT**

Test Number 133, 134. These tests comprised the mechanical examination of the Jones Cabelug (133) and the Jones Multi-plug and Cable (134) manufactured by the Howard B. Jones organization of 618 S. Canal Street, Chicago, Illinois. Little need be said about the electrical performance of these inventions since they are of highly conductive copper, well insulated, and neatly assembled into one heavy duty cord. Certificate Number 234 has been awarded these devices in recognition of their merit.



Test Number 135. The "X-L" Push-post, a spring binding post, manufactured and submitted by the X-L Radio Laboratories, 2424 Lincoln Ave., Chicago, Ill. A new type binding post. Its principle is simple; push it down, insert the wire, and let loose—the connection is then made. Extensive tests showed it cannot jar loose from vibration and does not shear off wires. Each post is marked, such as "Aerial," "Ground," etc. as desired. Tested in several sets built by On The Air Laboratory, and awarded Certificate of Merit Number 235.



Test Number 136. "ALA" Hydrometer, manufactured and submitted by the Ala Manufacturing Co. of 401 S. Sangamon St., Chicago. The type used for both A and B batteries was the one submitted, and it stood up well over a series of stringent tests. It is built in novel design and has an oval float and hard rubber nozzle, features that make for good operation. Stood up well under all conditions and is still in use without deterioration of any kind. May be used both for radio and auto batteries, although these tests were restricted to radio. Tested and awarded On the Air Certificate of Merit Number 236.



Test Number 137. "AMACO" Amascostat, a graphite disc compression variable resistor furnished in various ranges for stepless, noiseless and non-inductive radio controlling purposes. Manufactured and submitted by the American Apparatus Company of Richmond, Ind. Each type submitted for test was equipped with a Bakelite finish knob and barrel, a $\frac{1}{8}$ in. single hole mounting feature and a Dead-Off position. The resistance discs are ground parallel, and very strict tests showed they did not decrease in capacity or burn out due to uneven surfaces or contact. Tested over a period of two months in the On the Air Laboratory and awarded Certificate of Merit Number 237.



Test Number 138. HILCO Fixed condensers, manufactured and submitted by the A. E. Hill Mfg. Co. of Atlanta, Ga. A tested mica condenser using very good quality brass. There is an agreeable absence of paper, tinfoil or other material capable of burning or altering capacity when soldering. The design is round, which was found to permit a constant, fixed and non-variable pressure exerted over the entire area of the plates. The capacity in the On the Air tests was found to be accurate and noiseless. Found to be efficient in every way in tests made by On the Air Laboratory. Awarded Certificate of Merit Number 238.

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.



Test Number 139. "CE-CO" Radio Vacuum Tubes, manufactured and submitted by the C. E. Manufacturing Co., Inc., of Providence, R. I. Three types A, B and C, were investigated. Type A has 5.0 filament volts, filament current of 0.25 amp. and plate voltage of 20-140. Type B, 3.0, filament; .06 amp. filament current; 20-80 plate voltage. Tube C, 3.0 filament volts, .06 amp. filament current; 20-80 plate voltage. An efficient, uniform tube, made to fit all types of sockets, and standing up well against hard and continual use in all types of receivers, dry cell and storage battery operated. Tested and awarded On the Air Certificate of Merit Number 239.



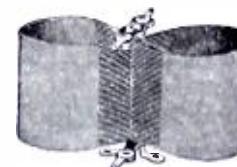
Test Number 140. RADIOPHAN ADAPTER, a "2 in 1" crystal detector, manufactured and submitted by the Tuerk Mfg. Co. of 561 W. Washington St., Chicago, Ill. This adapter permits the use of two crystals in contact or catwhisker, with crystal. Any unmounted crystal may be used. No screws or solder necessary. A two-piece screw-up is used to accomplish this. The adapter can be used also for baseboard mountings, inside the set, vertical or horizontal. Tested over a period of 30 days in the ON THE AIR Laboratory and awarded Certificate of Merit Number 240.

**LOUDSPEAKER**

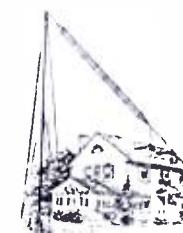
Test Number 141. Our engineers secured an Amplion Loudspeaker from one of the local dealers for a rigid test, and have put it through a rigid test for percentage of volume as well as for acoustical characteristics, and find it passes the requirements and standards of the ON THE AIR Research Laboratory. We are awarding this loudspeaker our Certificate Number 241 in recognition of its merit. It is manufactured by the Amplion Corporation of America, of 280 Madison Street, New York City.

**SLF CONDENSER**

Test Number 142. The Allen D. Cardwell Mfg. Corp., 81 Prospect Street, Brooklyn, N. Y. have marketed a new type of SLF condenser that differs radically from the conventional type of straight line frequency condenser in that the plates are of the SLC shape. The SLF effect is obtained by making the plates heavier at one end, giving a more gradual change in capacity as the rotor is moved. Tested and approved by ON THE AIR Research Laboratory and awarded Certificate Number 242.

**RADIO FREQUENCY TRANSFORMER**

Test Number 143. Certificate Number 243 has been awarded the Bodine Electric Company of 2254 West Ohio Street, Chicago, Illinois for their unique "twin eight" transformer. The inductance is wound in the shape of a figure 8, keeping the distributed capacity low, and minimizing the coupling effect between the coil and other objects of the receiver. Tests with the device show that it easily covers the wave band now used for broadcasting efficiently and creditably. In tests the absence of dielectric and absorptive material within the field of the coil gave very pleasing radio frequency resistance readings.

**STEEL ANTENNA MAST**

Test Number 144. The S. W. Hull Company requested us to test out their steel aerial mast for them and issue a certificate of approval. No actual laboratory tests could be carried out on this device, but one of our laboratory men was sent out to check up on the performance of this mast at various points in the city where installations already had been made. The mast appears to be of exceptionally good design and of high grade materials. In every case the owner of the mast was thoroughly pleased and satisfied, and we therefore issue the S. W. Hull Company of 2048 E. 79th Street, Cleveland, Ohio our Approval Certificate Number 244.

**STANDOFF INSULATOR**

Test Number 145. The standoff insulator manufactured by the Barkelew Electric Manufacturing Company of Middletown, Ohio, was tested rigidly with a 50 watt oscillator in a dummy antenna circuit at the experimental station 9DQS of ON THE AIR Research Laboratory, and try as we would we couldn't break the insulator down. There was no flash over either with the surface wet or dry. In view of this performance, we issue Certificate Number 245 as evidence of the worthiness of the accessory.

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 Deresnadyne

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 by Felix Anderson
- The Vacuum Tube Question
- Pepping Up Your Reinartz Set
- Revitalizing the Neutrodyne
- A 3-Stage Audio Amplifier

*Maybe There's Something You Need in Back Numbers of "On the Air"!
Order Now!*

20c A Copy!

ON THE AIR
1322 Kimball Bldg.
Chicago, Ill.

"Low Loss" and What it Means

(Continued from page 31)

resistance is affected by objects near the conductor. So in radio work it is not sufficient merely to make a coil of heavy copper wire in order to give it a low resistance. By using a heavy wire we might get a coil of fairly low resistance, but we would find that the distributed capacity was high and that, too, is taboo. On the other hand, by using fine wire with the turns well spaced, we can obtain a coil of low distributed capacity, but in this case the resistance might be high. So, you see, between high resistance and distributed capacity the poor radio designer has had a difficult time of it—it is difficult to get both of these things in the same coil.

Let us discuss the theory of coil making for a few moments. In the first place, what is meant by distributed capacity? Distributed capacity is a property of a coil caused by each adjacent set of turns on the coil with whatever insulation there may be between them acting as a small fixed condenser. The effect is similar to that which we would obtain if we had a perfect coil with no distributed capacity (which is impossible, of course) and the connected small condensers between adjacent turns, as shown in Fig. 1.

It is evident then that the larger the wire the more surface there will be in these little condensers, and consequently the greater will be the distributed capacity. Of course, we can reduce the distributed capacity by increasing the spacing between the turns, but this decreases the inductance and we will need more turns for the same wave length range, so here too we are strictly limited. However, increased spacing does help and that is the reason for the Lorenz or basket weave type of coil. This type of winding reduces the distributed capacity and by selecting the proper size wire, can be made to have low resistance.

From this it must not be inferred however, that any tuner or coil which is not wound Lorenz fashion is of high resistance for nothing could be further from the truth. Basket weave coils, because of their greater turn spacing, require more wire for a given inductance and are therefore of higher resistance than single layer coils. Much depends upon the diameter of the coil and the size of wire used.

In a series of investigations on the basket weave type of coils, G. W. Pickard found that the use of very large wire (No. 14 and larger) produced coils of high resistance. He found that for wavelengths between 200 and 600 meters and when using coils about $3\frac{1}{4}$ in. in diameter a wire size of No. 16 or 18 B & S gauge gave the lowest resistance. While a size or two slightly smaller than Nos. 18 will not make a great difference, under no conditions should the wire size be larger than No. 16.

Bear in mind that these wire sizes apply only to basket weave coils. If straight coils are considered we find that with coils about $3\frac{1}{2}$ in. in diameter, wire sizes between Nos. 24 and 28 give lowest resistances over the broadcast range.

The importance of the advantage of using a good tuner cannot be over-emphasized. A bad tuner is much worse than a bad condenser. The tuner should be as nearly suspended in free space away from everything as possible, for it seems that everything we attach to it or place near it detracts from its efficiency. Use fairly large diameter coils with as little solid insulation in the field as possible. Be sure the wire size is correct for the type of winding employed. When mounting, keep the coils at least two inches away from any other part of the set and from the panel or cabinet. If you observe these simple maxims, you will get the most out of your tuner.

Now, as to Coupling

NOW before we leave the subject of tuners, a word regarding coupling. Coupling is one of the things which make for selectivity and you all know we need selectivity. I say it is one of the things—the other is low resistance in the secondary and that we have already discussed.

Assuming that we have selected a tuner of a size and wound so as to have a low radio frequency resistance over the wavelength range, we wish to work in (200-600 for broadcast) the next thing to watch out for is that there is sufficient distance between the primary or aerial circuit coil and the secondary to give the desired degree of selectivity. It may appear wasteful to one not familiar with radio frequency technique to remove the input or primary coil several inches away from the secondary, when what we are trying to do is to conserve energy. But when it is considered that the field due to the current in the antenna coil is sufficiently strong to act upon the secondary coil, even at distances of six inches or more, this should cause no perplexity. It is true a loose coupling may weaken the signal strength slightly, but this is of little consequence when the increase in selectivity is taken into account. We can readily amplify a weak signal but we cannot unscramble a half dozen simultaneous signals once they are impressed on the detector grid.

By keeping the primary coil sufficiently far away from the secondary, the effect of the high resistance antenna circuit upon the low resistance secondary will be minimized. The effect of a close coupling is to broaden the tuning and this is just what we want to avoid. So once more let me repeat, keep the coupling between the primary and secondary as loose as possible.

Little need be said here in regard to variable condensers. The variable condensers available today are for the most part excellent. The ones with metal end plates and strip insulation and also those with Bakelite end plates will be found satisfactory.

Avoid those with insulating bushings on the shaft. One thing to remember in selecting a variable condenser is to get one with a capacity no greater than that necessary to tune to the highest wave length you expect to receive. With the

couplers available today, a condenser of the so-called 23 plate size or to be more specific, one with a maximum capacity of 500 MMF. will be found amply large. A small condenser will also have a lower minimum capacity and that will be of advantage in working the low end of the wavelength range. It is well in any case to remember that the capacity varies as the square of the wavelength. This means that if we want to construct a set to cover a wave length of from 200 to 600 meters, a tuning ratio of 1 to 3, the capacity of the condenser required will vary in the ratio of 1 to 9. For example, with a condenser of 500 MMF. maximum capacity, the minimum capacity would have to be no greater than 500—9 or 55 MMF.

In connecting the secondary tuning condenser in the circuit it has become usual practice to connect the rotating element to the filament side of the secondary coil which is grounded. This is of considerable advantage in reducing body capacity effects.

As far as broadcast work is concerned, no special constructional features are necessary in such things as sockets, rheostats and the like. Any socket (providing it is not made of baked mud) which makes good electrical contact with the prongs of the tube will be found satisfactory and while it is well to get the best there is, there is no necessity for going to extremes in low loss construction.

Of far greater importance is the wire used in hooking up the set, the method of running the wiring and the efficiency of the soldered joints. Use solid wire and keep the number of soldered joints as low as possible. Every soldered joint in the set introduces a possible point of high resistance and it is often possible to continue the conductor from one part to several others without a break.

Ample Room Needed

ONE thing more. Give the various parts plenty of room. Don't expect to make a low loss set that will retain its low loss characteristics when squeezed into a match box. It can't be done. Remember that every piece of solid material in the vicinity of your coupler and other parts carrying radio frequency currents results in dielectric losses.

As to the audio frequency amplifier, that is a separate story and will not be discussed here. Once the signal has been detected it can be amplified to almost any desired degree. The audio frequency currents are of low frequency as compared with the radio frequency current ahead of the detector, consequently the extreme precautions necessary when handling radio frequencies need not be observed. Audio frequency currents behave more like ordinary electric currents with which we are familiar in power work and no difficulty is experienced in keeping them where they belong. Radio frequency currents on the other hand are more ambitious, as it were, and unless great care is taken, will jump all over the lot. It is true in the design of the audio frequency amplifier care must be taken to prevent distortion, but this is largely a matter of proper transformer or re-

sistance selection rather than of circuit design although even here common sense must be used.

In concluding, it may be well to repeat that the points covered in this article apply to any type of radio set. The term "low-loss," as stated before, does not apply only to the conventional tickler feed-back regenerative set as seems to be the popular impression, but may apply to any set regardless of its type. All sets have a detector, and it is to that part of the set between the aerial binding post and the grid of the detector or in radio frequency sets between the aerial posts and the grid of the first tube that low-loss principles should be rightly observed.

The detector of any radio receiver is a sensitive relay, that is actuated by the incoming pulsations of current. If you dissipate any of this input energy, it is evident that the reduced input will command a much reduced output current in the plate circuit.

"Behind the Mike" with Jack Nelson

(Continued from page 27)

except of course that the radio season is on, which naturally means more activity for me." Don't see how it could, "Holly." You and Joe Barnett (he's the Studio Manager of WOR) were doing anything but loaf when I saw you this summer. Hollywood is Publicity Director for that station and gets his "monicker" from the days when he was "press-agenting" movie stars.

The Announcer's Manual

(Continued)

II. Announcers should not cough or sneeze into the microphone while on the air because it is possible that on the following day wide awake publicity men will rush to get endorsements of cough drops or patent medicines which cured the cough or sneeze within twenty-four hours thus enabling said announcer to announce the next night and satisfy "his public." This warning is made because such a thing is an inconvenience and takes valuable time, and not because of any possible danger to the mike or transmitter tubes, or the effect on the listener's ears.

Don't forget this column is "at your service." We'll try and give you the best answer for all questions, especially those pertaining to prominent folks of the Radio Field, and anything "Behind The Mike" in radio studios. Just write a note and say, "How do they do this?", or "Why do they do that?", or "Why don't they do so and so?", or "How can they be so dumb?", or "Gee, wasn't that from WXYZ clever?", and "If so, why?". We don't profess to know everything, please get that QSA, but we'd like to attempt answering a lot of Q R K's. Send your epistles to Jack Nelson, care ON THE AIR, Kimball Building, Chicago. Also send poems, boosts, knocks or what have you? All contributions accepted in Ye Christmas Spirit.



MANY
EARN
\$50. to
\$250.
A WEEK
**Be a RADIO
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"On the Air"

Announces:

—That it has acquired the services of some of America's best known radio authorities, both technical and non-technical, as permanent contributors to its columns.

In addition to those writers already familiar to readers of ON THE AIR, another group will make its debut in the January issue, which will contain more of the up-to-date, authoritative information to be found in this number. This is in line with "On the Air's" new policy of offering "Something New" to its readers in every issue.

In the January Number,

Brainard Foote

who needs no introduction to radio fans, will compare "OCEAN WAVES AND RADIO WAVES," revealing some comprehensive information about these two factors, that you never dreamed existed.

AND

Armstrong Perry

for more than two decades a follower of modern scientific development, will offer "THE SILENT MAJORITY," a colorful, profusely illustrated story of the big group that makes up what we call "radio listeners." Mr. Perry's contributions will be a monthly feature of "ON THE AIR."

In addition, there will be exclusive articles by S. R. Winters, who is watching things for ON THE AIR down in Washington; Thomas L. Bayard; Golda Goldman, Felix Anderson, H. Frank Hopkins—and others—as well as the "Something New" feature which ON THE AIR promises you every month.

ALL

In the January Issue

At your news-stand, 15c.

Latest Government List of Broadcasters

KDKA	Westinghouse Electric & Mfg. Co.	East Pittsburgh, Pa.	309
KDLR	Radio Electric Co.	Devils Lake, N. D.	231
KDPM	Westinghouse Electric & Mfg. Co.	Cleveland, Ohio	270
KDYL	Newhouse Hotel.	Salt Lake City, Utah	250
KDZB	Frank E. Siefert.	Bakersfield, Calif.	240
KDZI	Electric Supply Co.	Wenatchee, Wash.	360
KFAB	Nebraska Buick Auto Co., 13th & Que Sts.	Lincoln, Nebr.	341
KFAD	McArthur Bros. Mercantile Co.	Phoenix, Ariz.	273
KFAE	State College of Washington	Pullman, Wash.	348
KFAF	Western Radio Corporation	Denver, Colo.	278
KFAJ	University of Colorado	Boulder, Colo.	360
KFAN	University of Idaho	Moscow, Idaho	230
KFAU	Boise High School	Boise, Idaho	271
KFAW	The Radio Den (W. B. Ashford)	Santa Ana, Calif.	280
KFBB	F. A. Buttrey & Co.	Havre, Mont.	360
KFBC	W. K. Azbill.	San Diego, Calif.	278
KFBG	First Presbyterian Church	Tacoma, Wash.	250
KFBK	Kimball-Upson Co.	Sacramento, Calif.	283
KFBL	Leese Bros.	Everett, Wash.	224
KFBS	School District No. One	Trinidad, Colorado	238
KFCB	Nielson Radio Supply Co.	Phoenix, Ariz.	238
KFCC	The First Congregational Church	Helena, Mont.	248
KFCF	Frank A. Moore.	Walla Walla, Wash.	256
KFCZ	Omaha Central High School	Omaha, Nebr.	258
KFDD	St. Michaels Cathedral	Boise, Idaho	252
KFDH	University of Arizona	Tucson, Ariz.	368
KFDJ	Oregon Agricultural College	Corvallis, Oreg.	254
KFDM	Magnolia Petroleum Co.	Beaumont, Texas	315
KFDX	First Baptist Church	Shreveport, La.	360
KFDY	South Dakota State College	Brookings, S. Dak.	360
KFDZ	Harry O. Iverson.	Minneapolis, Minn.	231
KFEC	Meier & Frank Co.	Portland, Oreg.	248
KFEK	Augsbury Seminary	Minneapolis, Minn.	261
KFEL	Winner Radio Corp.	Denver, Colo.	254
KFEQ	J. L. Scroggin.	Oak, Nebr.	268
KFEY	Bunker Hill & Sullivan Mining and Concentrating Co.	Kellogg, Idaho	233
KFFP	First Baptist Church	Moberly, Mo.	260
KFFV	Graceland College	Lamoni, Iowa	280
KFGB	Heidbreder Radio Supply Co.	Utica, Neb.	224
KFGC	Louisiana State University	Baton Rouge, La.	254
KFGD	Chickasha Radio & Electric Co.	Chickasha, Okla.	248
KFGH	Leland Stanford University	Starford University, Calif.	273
KFGS	Crary Hardware Co.	Boone, Iowa	226
KFHA	Western State College of Colorado	Gunnison, Colo.	252
KFHH	Ambrose A. McCue.	Neah Bay, Wash.	261
KFHL	Penn College	Oskaloosa, Iowa	240
KFI	E. C. Anthony, Inc.	Los Angeles, Calif.	468
KFIF	Benson Polytechnic Institute	Portland, Oreg.	248
KFIQ	North Central High School	Spokane, Wash.	252
KFIQ	First Methodist Church	Yakima, Wash.	242
KFIU	Alaska Electric Light & Power Co.	Juneau, Alaska	226
KFIZ	Daily Commonwealth	Fond du Lac, Wis.	273
KFJB	Marshall Electrical Co.	Marshalltown, Iowa	248
KFJC	R. B. Fegan (Episcopal Church)	Junction City, Kansas	219
KFJF	National Radio Manufacturing Co.	Oklahoma City, Okla.	252
KFJI	Liberty Theatre (E. E. Marsh)	Astoria, Oreg.	252
KFJL	Hardsacg Manufacturing Co.	Ottumwa, Iowa	242
KFJM	University of North Dakota	Grand Forks, N. Dak.	280
KFJR	Ashley C. Dixon & Son.	Stevensville, Mont.	258
KFJX	Iowa State Teacher's College	Cedar Falls, Iowa	280
KFJY	Tunwall Radio Co.	Fort Dodge, Iowa	246
KFJZ	W. E. Branch.	Fort Worth, Texas	254
KFKA	Colorado State Teachers College	Greeley, Colo.	273
KFKQ	Conway Radio Laboratories (Ben H. Woodruff)	Conway, Ark.	250
KFKU	The University of Kansas	Lawrence, Kans.	275
KFKX	Westinghouse Electric & Manufacturing Co.	Hastings, Nebr.	288
KFLD	Paul E. Greenlaw.	Franklinton, La.	234
KFLP	Everett M. Foster.	Cedar Rapids, Ia.	256
KFLR	University of New Mexico	Albuquerque, New Mexico	254
KFLU	Rio Grande Radio Supply House	San Benito, Texas	236
KFLV	Rev. A. T. Frykman.	Rockford, Ill.	229
KFLX	George Roy Clough.	Galveston, Texas	240
KFLZ	Atlantic Automobile Co.	Atlantic, Ia.	273
KFMB	Christian Churches	Little Rock, Ark.	254
KFMO	University of Arkansas	Fayetteville, Ark.	299
KFMR	Morningside College	Sioux City, Iowa	261
KFMW	M. G. Sateren.	Houghton, Mich.	266
KFMX	Carleton College	Northfield, Minn.	336
KFNF	Henry Field Seed Co.	Shenandoah, Iowa	266
KFNG	Wooten's Radio Shop	Coldwater, Miss.	254
KFNV	L. A. Drake Battery and Radio Supply Shop	Santa Rosa, Calif.	234
KFOA	Rhodes Department Store	Seattle, Wash.	454
KFOL	Leslie M. Schafbush.	Marengo, Iowa	234
KFON	Echophone Radio Shop	Long Beach, Calif.	234
KFOO	Latter Day Saints' University	Salt Lake City, Utah	261
KFOP	Rohrer Elec. Co.	Marshfield, Ore.	240
KFOR	David City Tire & Electric Co.	David City, Nebraska	226
KFOT	College Hill Radio Club	Wichita, Kansas	231
KFOX	Board of Education, Technical High School	Omaha, Nebraska	248
KFOY	Beacon Radio Service	St. Paul, Minn.	226
KFPG	Garretson and Dennis.	Los Angeles, Calif.	238
KFPL	C. C. Baxter.	Dublin, Texas	242
KFPM	The New Furniture Co.	Greenville, Texas	242
KFPR	Los Angeles County Forestry Dept.	Los Angeles, Calif.	231
KFPT	Cape & Johnson.	Salt Lake City, Utah	286
KFPW	St. Johns M. E. Church.	Carterville, Mo.	268
KFPY	Symons Investment Co.	Spokane, Wash.	283
KFOA	The Principia.	St. Louis, Mo.	264
KFOB	The Searchlight Publishing Co.	Fort Worth, Texas	221
KFOC	Kidd Brothers Radio Shop.	Taft, Calif.	258
KFOH	Radio Service Co.	Burlingame, Calif.	231
KFOP	G. S. Carson, Jr.	Iowa City, Ia.	284
KFOT	Texas National Guard.	Dennison, Texas	252
KFOU	W. Riker.	Holy City, Calif.	253
KFOW	C. F. Knierim.	North Bend, Wash.	248
KFOZ	Taft Products Co.	Hollywood, Calif.	240
KFRC	City of Paris Dry Goods Co.	San Francisco, Calif.	268
KFRU	Etherial Radio Co.	Bristow, Okla.	394

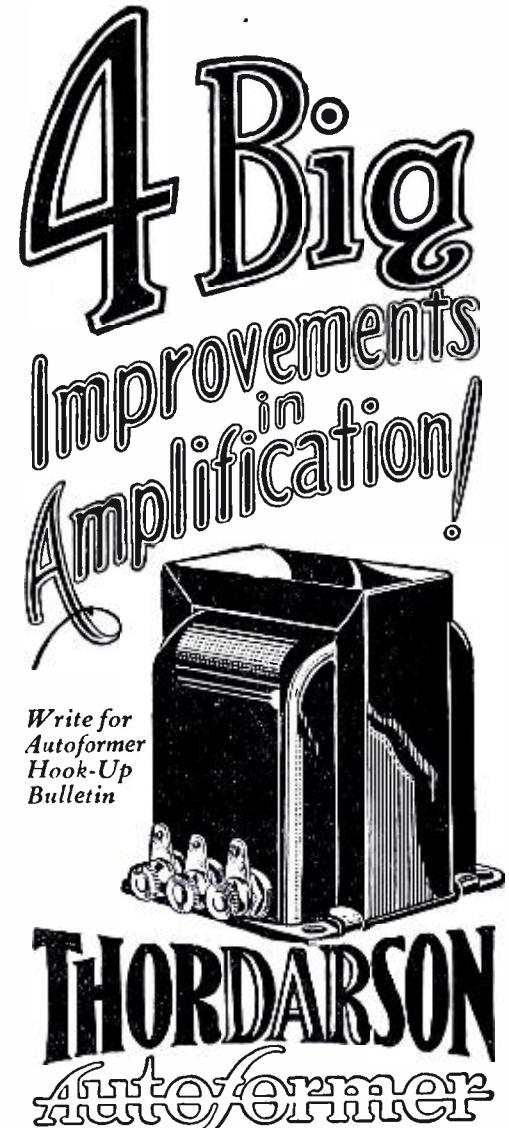
Tell them you saw it advertised in On the Air.

A Magazine of Radio

KFRW	United Churches of Olympia	Olympia, Wash.	220
KFRX	J. Gordon Klemgard	Pullman, Wash.	217
KFRZ	The Electric Shop	Hartington, Neb.	222
KFSG	Angelus Temple	Los Angeles, Calif.	272
KFSY	The Van Bariicon Co.	Helena, Mont.	261
KFUJ	Hopper Plumbing and Heating Co.	Breckenridge, Minn.	242
KFUL	Thomas Goggan & Bros. Music Co.	Galveston, Texas	258
KFUM	W. D. Pyle	Colorado Springs, Colo.	242
KFUO	Concordia Seminary	St. Louis, Mo.	549
KFUP	Fitzsimmons General Hospital	Denver, Colo.	234
KFUQ	Julius Brunton and Sons Co.	San Francisco, Calif.	234
KFUR	H. W. Peery and C. Redfield	Ogden, Utah	224
KFUS	Louis L. Sherman	Oakland, Calif.	233
KFUT	University of Utah	Salt Lake City, Utah	271
KFUU	Colburn Radio Labs.	San Leandro, Calif.	231
KFUZ	Y. M. C. A.	Virginia, Minn.	244
KFVD	McWhinnie Electric Co.	San Pedro, Calif.	202
KFVE	Film Corporation of America	St. Louis, Mo.	245
KFVF	Clarence B. Juneau	Hollywood, Calif.	208
KFVG	First M. E. Church	Independence, Kansas	236
KFVH	Whan Radio Shop (Herbert Whan)	Manhattan, Kansas	218
KFVI	Headquarters Troop, 56th Cavalry	Houston, Texas	248
KFVN	Carl E. Bagley	Welcome, Minn.	227
KFVO	F. M. Henry	Kirksville, Mo.	226
KFVR	Moonlight Ranch	Route 6, Denver, Colo.	246
KFVS	Cape Girardeau Battery Station	Cape Girardeau, Mo.	224
KFVY	Radio Supply Co.	Albuquerque, N. M.	250
KFVZ	Glad Tidings Tabernacle	San Francisco, Calif.	234
KFWA	Browning Bros. Co.	Ogden, Utah	214
KFWB	Warner Bros.	Hollywood, Calif.	252
KFWC	L. E. Wall	Upland, Calif.	211
KFWV	Wilbur Jerman	Arkadelphia, Arkansas	206
KFWD	Arkansas Light & Power Co.	St. Louis, Mo.	214
KFWF	St. Louis Truth Center	Chico, Calif.	254
KFWH	F. Wellington Morse, Jr.	South San Francisco, Calif.	220
KFWI	Radio Entertainments, Inc.	Oakland, Calif.	224
KFWM	Oakland Educational Society	Avalon, Calif.	211
KFWO	Lawrence Mott	Brownsville, Texas	214
KFWP	Rio Grande Radio Supply House	Pineville, La.	238
KFWU	Louisiana College	Big Bear Lake, Calif.	203
KFXB	Bertram O. Heller	Santa Maria, Calif.	210
KFXC	Santa Maria Valley Railroad Co.	Logan, Utah	205
KFXD	L. H. Strong	Waterloo, Iowa	236
KFXE	Electrical Research & Mfg. Co.	Colorado Springs, Colo.	250
KFXF	Pikes Peak Broadcasting Co.	Tacoma, Wash.	252
KGB	Tacoma Daily Ledger	Oakland, Calif.	361
KGO	General Electric Co.	Honolulu, Hawaii, Waikiki Beach	370
KGU	Marion A. Mulroney	Portland, Oreg.	491
KGW	Portland Morning Oregonian	Lacy, Wash.	253
KGY	St. Martins College (Rev. Sebastian Ruth)	Los Angeles, Calif.	405
KHJ	Times-Mirror Co.	Seattle, Wash.	273
KHQ	Louis Wasmer	Seattle, Wash.	384
KJR	Northwest Radio Service Co.	Los Angeles, Calif.	293
KJS	Bible Institute of Los Angeles, Inc.	Independence, Mo.	441
KLDS	Reorganized Church of Jesus Christ of Latter Day Saints	Oakland, Calif.	242
KLS	Warner Brother Radio Supplies Co.	Oakland, Calif.	508
KLX	Tribune Publishing Co.	Denver, Colo.	283
KLZ	Reynolds Radio Co.	Shenandoah, Iowa
KMA	San Joaquin Light & Power Corp.	Fresno, Calif.	243
KMJ	Love Electric Co.	Tacoma, Wash.	256
KMO	Los Angeles Evening Express	Los Angeles, Calif.	337
KNX	General Electric Co.	Denver, Colo.	323
KOA	New Mexico College of Agriculture & Mechanic Arts	State College, N. Mex.	348
KOB	Monarch Manufacturing Co.	Council Bluffs, Iowa	278
KOIL	Detroit Police Department	Detroit, Mich.	286
KOP	Hale Bros.	San Francisco, Calif.	428
KPO	Pasadena Presbyterian Church	Pasadena, Calif.	229
KPPC	Houston Post-Dispatch	Houston, Texas	270
KPRC	Apple City, Radio Club	Hood River, Oregon	270
KQP	Doubleday-Hill Electric Co.	Pittsburgh, Pa.	270
KQV	Charles D. Herrold	San Jose, Calif.	226
KQW	V. C. Battery & Electric Co.	Berkeley, Calif.	275
KRE	Kansas State Agricultural College	Manhattan, Kans.	341
KSAC	Post Dispatch (Pulitzer Pub. Co.)	St. Louis, Mo.	545
KSD	Radio Service Corp. of Utah	Salt Lake City, Utah	299
SSL	Tenth Ave. Baptist Church	Oakland, Cal.	216
KTAB	American Radio Telephone Co., Inc.	Seattle, Wash.	306
KTCL	New Arlington Hotel Co.	Hot Springs, Ark.	375
KTHS	First Presbyterian Church	Seattle, Wash.	455
KTW	Examiner Printing Co.	San Francisco, Calif.	246
KUO	State University of Montana	Missoula, Montana	244
KUOM	Union Pacific Railroad Co.	Omaha, Neb.	270
KUPR	Portable Wireless Telephone Co.	Stockton, Calif.	248
KWG	Wilson Duncan Studio	Kansas City, Mo.	236
KWKC	City of Brownsville	Brownsville, Texas	278
KWWG	Electric Shop	Honolulu, Hawaii	270
KYO	Westinghouse Electric & Mfg. Co.	Chicago, Ill.	535
KYW	Preston D. Allen	Oakland, Calif.	242
KZM	Valdemar Jensen	New Orleans, La.	263
WAAB	Tulane University	New Orleans, La.	275
WAAC	Ohio Mechanics Institute	Cincinnati, Ohio	248
WAAD	Chicago Daily Drovers Journal	Chicago, Ill.	286
WAAM	I. R. Nelson Co.	Newark, N. J.	263
WAAW	Oamah Grain Exchange	Omaha, Nebr.	285
WABA	Lake Forest University	Lake Forest, Ill.	227
WABB	Harrisburg Sporting Goods Co.	Harrisburg, Pa.	266
WABC	Ashville Battery Co., Inc.	Asheville, N. C.	254
WABI	Bangor Railway & Electric Co.	Bangor, Me.	240
WABL	Connecticut Agricultural College	Sorrs, Conn.	283
WABO	Lake Avenue Baptist Church	Rochester, N. Y.	283
WABQ	Haverford College, Radio Club	Haverford, Pa.	261
WABR	Scott High School, N. W. B. Foley	Toledo, Ohio	270
WABW	College of Wooster	Wooster, Ohio	234
WABX	Henry B. Joy	Mt. Clemens, Mich.	270
WABY	John Magaldi, Jr.	Philadelphia, Pa.	242
WABZ	Coliseum Place Baptist Church	New Orleans, La.	263
WADC	Allen T. Simmons (Allen Theatre)	Akron, Ohio	258
WGBU	Florida Cities Finance Co.	Fulford By-The-Sea, Florida	278

(The foregoing comprises about half of the U. S. Broadcasting Stations, corrected up to November 1. The remaining half will be published in the January issue of ON THE AIR, corrected up to the time of going to press. Watch for it and save the December and January issues for permanent reference.—THE EDITOR.)

Tell them you saw it advertised in On the Air.



- 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



Earn \$25 to \$100 a week, part or full time. Everyone a prospect. Complete line standard sets and accessories, \$5 to \$90. Write today for illustrated catalog and exclusive selling plan for live dealers and community agents. 20TH CENTURY RADIO CO. 1271 Ocoee Bldg., Kans. City, Mo.

Eastern Advertising Representative of ON THE AIR,
A. H. GREENER,
118 W. 39th St., New York, N. Y.

Let Our 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.

How "On The Air" Can Help You

It is to serve those readers who want expert technical counsel that ON THE AIR has installed a research laboratory in its offices—the most efficiently equipped and modern radio laboratory of its type to be found anywhere. A group of seasoned radio 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 below, indicate your needs, and by return mail will come a detailed analysis of your problem and a helpful list of suggestions that will enable you to pick the best receiver or parts for your own needs. Take advantage of this opportunity—an offer never made before by any radio publication.

Clip This Coupon Today!

On the Air Research Laboratory,
1322 Kimball Building,
Chicago, Ill.

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

(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

12-25

Cuba Organizes Communications

Cuba has created a department of communications which will handle matters pertaining to radio, telegraphy, posts, railway, ship and air lines, Minister Crowder reports to the Commerce Department. Radio itself appears to be under the administration of the Director of Telegraphs. The Government of Cuba, a member of the international convention, controls eight commercial stations and all radio except broadcasting, which being operated for entertainment and not for gain, is permitted to be carried on in private hands. Thirty-six broadcasting stations are in operation; among the larger is that owned by the telephone

company, PWX. Another is operated by the tobacco monopoly. There are but ten with 1100 or more watts power, yet many fans in the States are familiar with these Cuban calls, which begin with a number, like our amateur calls. For example, 6KW; "When you hear the coo of the Cuckoo, you know you are in tune with Tuinicu".

The Estonian radio committee has removed all wavelength limitations in broadcasting, which, it is believed by American experts, will permit the admittance of all types of radio receivers. Formerly only certain wavelengths could be used in broadcasting, and consequently the scope of reception in receivers was restricted.

Mastering the Super-Het Problem

(Continued from page 32)

oscillator) is not important. The grid condenser may have a capacity of .00025 or .0005 Mfd. with equal results, as the set is not critical in operation. The negative "B" should be connected to the negative "A" lead, as this will protect the tubes from burning out should any shorts occur, while the set is in operation.

The best tone quality is obtained when low ratio transformers of fairly good quality are used in the audio circuit. The better audio transformers usually reproduce more faithfully, the higher and lower notes, so often lacking in the cheaper grades. On the secondaries of the audio transformers a "C" battery can be used to advantage, the positive side of which is connected to the negative "A" and the negative side to "F" terminals on both audio transformers.

Connect the "A" battery and test out one tube in each socket, before connecting the "B" batteries. If it lights and is controlled by the rheostat, connect up the "B" batteries and again, with one tube, try out each socket. When you are sure everything is O.K. light up all the tubes with both "A" and "B" batteries connected. Now plug in the loop or connect antenna and ground wires, as the case may be, and plug in the loud speaker. The potentiometer arm should be turned about three-quarters of the way toward the negative side.

A good vernier dial for the condenser is an absolute necessity in the tuning of this set, due to the selectivity. Start tuning by turning the oscillator condenser, slowly one degree at a time. For each setting of this dial, turn the first dial at the left which controls the loop or antenna, slowly, in either direction. If no station is heard, advance the oscillator dial another point and follow up with the same procedure on the wavelength dial. At some point you will hear a station operating, should any be on the air. Now carefully rotate the oscillator dial until you are right in the middle of the wave, at which point the signals will be the strongest. You are now ready for the final adjustment of the wavelength tuning dial.

As some tubes are poor oscillators, it may be necessary to make another adjustment of the oscillator rheostat to bring in stations on the higher wavelengths.

The varying of the detector voltage is sometimes advisable should a hissing sound be produced when the potentiometer is turned to the negative, or full on position. After a fairly distant station is tuned in, the changing around of the tubes may result in better reception. Certain characteristics of the tubes make some better amplifiers than detectors and vice versa. Local and powerful stations, close by, stations will usually be heard more than one point of the dial. This is to be expected on Super Heterodyne sets; however, the design of our transformers reduces the number of harmonics to a minimum. (Turn the page)

While this process seems a long and complicated one, in reality, it takes but a few brief seconds, and it is but a question of a few nights working the set, before one finds himself so familiar with the process, that he is able to go from one station to another, without further ado. The tuning in of distance follows out much in the same order, with the exception that still greater care must be exercised, and it is necessary to tune VERY SLOWLY, keeping both circuits in resonance. In the great majority of cases, it will be found that both the oscillator and the wavelength tuning dial will read about the same for a given station. Increase in volume is accomplished by turning the potentiometer to the negative side.

DX Requires Intelligent Adjustment

ON EXTREME long distance signals, a careful adjustment of the rheostat on the intermediate amplifiers should be made. Roughly speaking, the rheostat should be turned about three-quarters of the way to full "on" position. Once the rheostats are adjusted on a fairly distant station, no further adjustment will be necessary.

Regeneration, with a 3 tap loop and .000045 variable condenser, is very easily added to the Victoreen set. This is done by drilling a hole for the binding post just above the loop jack on the panel. A larger hole is drilled above this to mount the .000045 variable condenser. Care should be taken in the centering of these holes so that the general appearance of the panel layout will not be destroyed.

After the binding post and small condenser is mounted, the wire connecting one side of the "pick up coil" of the oscillator to the wavelength condenser is removed. This lead is replaced by a wire connecting the binding post, which is used for the center tap of the loop, to the pick-up coil of the oscillator. A connection from the rotor plates of the wavelength condenser is now made to the stator plates of the .000045 condenser and from the rotor plates of the small condenser, a lead is connected to the "P2 terminal of the first detector socket, which is connected to the input transformer. The small variable condenser, when once adjusted needs no further attention. You will find that the set will be more selective, which results in necessary adjustments of the loop. This is done by pointing the loop in the direction of the broadcasting station which the operator desires to tune in. The No. 160 antenna coupler is not required when regeneration is used.

The operation of a set using regeneration is more difficult and it is questioned whether regeneration is really an advantage to a Victoreen set, as the selectivity should be satisfactory without the use of regeneration.

May I suggest that the standard circuit be first used and should greater selectivity be desired in congested localities, the regeneration may be added.

The number of tubes to use in a Super Heterodyne set has been discussed quite frequently. No doubt, you have heard of 7, 6, and even 5 tubes "super hets."

(Turn to page 63)

"Hilco" Fixed Condensers are Guaranteed to be Accurate!

THE HILCO FIXED CONDENSER is unreservedly guaranteed to be within 5% of its rated capacity; it is constructed entirely of brass and mica, and will retain its capacity regardless of temperature changes or other abuses to which it might be subjected. Each piece of India Ruby Mica in this condenser is individually micrometered for thickness, and the entire condenser given a voltage test of 500 alternating current volts, after which it is bridged on a Direct Reading Capacity Instrument, which determines whether it is to be accepted or rejected. With the advent of the super-heterodyne receivers, there has been a demand for condensers whose capacities are accurate, and during the current radio season, in which every one is insisting upon lo-loss construction, whether it is lo-loss or not, this condenser meets the demand for a really guaranteed precision instrument, scientifically made. All ranges in size from .00005 to .008, and prices from 3¢ to \$1.00. Your dealer will show you the complete line.

The Super HILCO-Dyne Receiver—a 7-tube set superior and different from the usual Super-heterodyne type set, can be constructed from the

\$30.00 "Super Hilco-Dyne" Kit

SELECTIVITY—Even in large cities you can tune in and out all nearby high-powered broadcasting stations and get the station you want—when you want it.

DISTANCE—Coast to coast reception the rule, not the exception.

VOLUME—You can dance or entertain with a concert, lecture, etc.

Loud speaker reception from all stations.

DISTORTION—Virtually eliminated. True tone qualities.

TUNING—Easy, quick, only two dials, station located today may be again obtained next month by turning dial to same position.

WAVE RANGE—From 190 to 600 meters.

RADIATION—No squeaking or howling. Does not radiate.

ANTENNA—Either outside, inside or loop.

TUBES—Either dry cell or storage battery tubes.

SIZE—Very compact for 7-tube set. Panel 7"x28".

CONSTRUCTION—24-page book, illustrated with full size blue-print makes building and tuning a SUPER-HILCO DYNE RECEIVER easy.

Special Hilco Short Wave Coupler—(\$5.00 extra). Range 15 to 600 meters.

Other "Hilco" Precision Apparatus

Other unique precision apparatus manufactured by the makers of "Hilco" fixed condensers and the "Hilco-Dyne" include the Hilco "Handykans," containing a valuable assortment of screws, nuts, lugs, etc.; the M. F. Transformer Replacement kit; oscillator and Short Wave couplers; Grid Leak mountings, and Lattice Wound Inductances. See your dealer or use the coupon for detailed description and prices.

A. E. HILL MFG. CO.

Dept. OA12

Atlanta, Ga.

COUPON

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Dept. OA12, Atlanta, Ga.

Gentlemen:—At no obligation to me, please send me complete information and prices of "HILCO" Precision Apparatus, including the Hilco Fixed Condensers, the SUPER-HILCO-DYNE KIT, and other HILCO Products.

Name.....

Address(12-25)

Western Sales Representatives
The RADIOPHOTO Co.
210 E. Ohio St., Chicago

Write for proposition
for dealers and jobbers

STATEMENT OF THE OWNERSHIP, MANAGEMENT,
CIRCULATION, ETC., REQUIRED BY THE ACT
OF CONGRESS OF AUGUST 24, 1912.
Of ON THE AIR published Monthly at Mount Morris, Illi-
nois, for October, 1926.
State of Illinois } ss.
County of Cook } ss.

Before me, a Notary Public in and for the State and County aforesaid, personally appeared Henry J. Meister, who, having been duly sworn according to law, deposes and says that he is the Publisher of ON THE AIR and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, ON THE AIR PUBLISHING CO., Henry J. Meister and Burke C. Bradner, 306 South Wabash Ave., Chicago, Ill.; Editor, R. H. Hopkins, 306 South Wabash Ave., Chicago, Ill.; Managing Editor, Henry J. Meister, 306 South Wabash Ave., Chicago, Ill.; Business Manager, Henry J. Meister, 306 South Wabash Ave., Chicago, Ill.

2. That the owners are: ON THE AIR PUBLISHING CO., 306 South Wabash Ave., Chicago, Ill., Henry J. Meister and Burke C. Bradner, 306 South Wabash Ave., Chicago, Ill.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more total amount of bonds, mortgages, or other securities are: (if there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stocks, bonds, or other securities than as so stated by him.

HENRY J. MEISTER.

Sworn to and subscribed before me this 31st day of October, 1925.
(Signed) JOHN VANDERBERGEN,

Notary Public.

Berne, Switzerland, the headquarters of the International Telegraph Convention where international regulations and calls for all radio stations are made, and assigned, is to have its own broadcasting station, according to reports reaching the Department of Commerce. It seems strange that the home of the telegraph union should go so long without a local station. The new station is to be erected by the Radio Club of Berne through public subscription, which has already reached 111,000 francs out of the total 200,000 francs required.

The Department of Commerce in a tip to radio exporters points out that they should not ship radio receivers abroad to countries where the proper style of tube is not available. The consignment of certain radio sets, requiring a special tube, to Singapore recently caused embarrassment to both the distributors and the consumers, since no suitable tubes or adapters for them were available. Equipment for use in connection with electric light sockets, such as antenna plugs, must also be of a type which can be used in the foreign sockets, it is pointed out.

Malaga, Spain is having a broadcasting station erected, the first in that section of the country. A radio boom is anticipated in about two months or as soon as the pioneer station goes on the air. Considerable interest in radio is already shown by Malaga fans, but without a local station, and with bad static interfering, even foreign station reception was poor.

Steps are again being taken in the Irish Free State toward the establishment of the first home broadcasting station. The Minister of Telegraphs recently announced the perfection of a plan for the erection of a £9,000 station.

European Nations Try Regulating Radio

The broadcasting situation in Europe had become so difficult to handle and interference was so great with each country authorizing broadcasting on such wave lengths as it saw fit, that an international organization to regulate broadcasting has been effected. The organization is known as the International Radiophone Union. The situation was presented to the League of Nations last spring; a standardized scheme was later considered by a conference between delegates from most of the European governments and tested out practically recently. Although the results are not yet reported, it is understood that the tests were successful and that most of the governments are cooperating toward decreasing interference which was fast becoming unbearable. Approximately 120 stations took part.

One of the first steps taken was the standardizing of testing apparatus and the setting of all transmitters on scheduled wave channels, somewhat after the method employed here. All waves within the band from 200 to 600 meters were assigned stations in the order of their importance, although a certain priority was accorded those long established. Consideration was first given to stations of international import, so that good channels might be reserved for the long-distance broadcasters. No stations of four hundred watts or over within 1500 of each other were permitted to operate on the same wave length. Each country was guaranteed at least one exclusive broadcast channel in the band between 300 and 500 meters; the larger the country and the greater the number of stations, the more channels allowed.

As in the States, the separation between wave channels was set at ten kilocycles. Although engineers pointed out that a 20 kilocycle separation would be far better—it reduced the possible number of channels far below the number now necessary to insure the continuation of broadcasting by existing stations. The presence of harmonics and the deviation of a transmitter of more than one third of a meter from its assigned wave length will not be tolerated. No new stations using the arc or spark system will be permitted, if the final regulations are adopted, and ships are forbidden to operate on channels between 300 and 400 meters when near the coast lines. Power allocated amateurs is to be restricted and they will not be permitted to operate on broadcast wave lengths during the broadcasting hours.

The final plan has been transmitted to the League of Nations committee on communications in an effort to insure its adoption by the several countries. In its recommendation to the League the framers of the new regulations point out that broadcasting is exceedingly important both nationally and internationally, but that it will not develop unless the several governments take steps to enforce necessary regulation on the broadcasters, and secure the cooperation of the commercial and military communication services.

ON THE AIR for December

"On The Air" Presents Something New

(Continued from page 8)

the cell, they are being used at present by astronomers and have proven of untold value, particularly in Stellar Photometry. A recent demonstration of its value was made in Paris. A photoelectric cell constructed by G. Rougier was used. The elements of this cell were enclosed in an evacuated glass bulb having a diameter of about six centimeters; see Figure 1. The inside of this glass bulb was silvered, except for a small aperture, which was to admit the light. Opposite this aperture was placed a hydride of potassium deposit, which we will call the grid element. A ring-shaped anode was placed in front of this grid element, so that it would not intercept the light or cause a shadow to fall on the grid element.

This Photo-Electric cell was then connected into an electrical circuit of a vacuum tube amplifier. The anode or plate element of the cell was connected to the grid of an amplifying tube. The negative filament of this amplifying tube was connected to the grid element of the photo-electric cell through a battery (see Figure 2), supplying the usual difference in potential between the plate and filament elements of the tube. When a light was induced into the photo-electric cell, electron emission was caused. This emission was absorbed by the anode, or plate element of the cell, and in turn gave the grid element of the amplifying tube a negative charge, resulting in the filament plate current being reduced. This variation corresponding to the intensity of light applied.

The variation in plate current of the amplifying tube was found to be 1,000 times the intensity of the photo-electric cell current, and from this it was possible to measure the electrical values of given light intensities. With the known values at hand, it is simply a matter of mathematics to determine the intensity of the most faint light or the shadow effect of the most light vapor, and many other things heretofore impossible.

In conclusion, it would be well to mention another use that this cell is being put to; that is, to record the exact time that a star or planet of the solar system passes a meridian. This use may not seem of value to the layman, but it is a most welcome asset to the astronomer and the navigator, because it removes the personal equation and error that had to be considered as final data until this cell was introduced.

What other practical uses this cell will adapt itself to, only time can tell. It has opened up a new and vast field which will be of benefit to all, and its value can only be estimated at this time.

(The foregoing is the first of "On the Air's" surprise articles calculated to introduce "something new" in radio every month. Each article in this series comes direct from the inventor's laboratory and is thoroughly substantiated by "On the Air's" own investigations. Watch the January issue for the next feature of a really "new" radio development.)

Men Who Are Making Radio History

(Continued from page 14)

ence; an associate member of the American Institute of Radio Engineers; and a member of the Chemists' Club of New York, the Mohawk Club and Mohawk Golf Club of Schenectady.

In 1912, Dr. Langmuir married Marion Mersereau of East Orange, N. J. They have two children, a son, Kenneth, and a daughter, Barbara. Their home is at 6 Stratford Road, Schenectady, N. Y.

Dr. Langmuir is particularly fond of mountain climbing and Winter sports, such as skiing and skate sailing. He has climbed the Alps in Switzerland, the Canadian Rockies and all points of interest to be found in the Adirondacks and Catskills, in his home state. He has made winter ascents of Mounts Marcy and Washington and many other mountains on skis.

This is the first of an interesting series on "Men Who Are Making Radio History," to be published regularly in "On the Air." Another outstanding radio personality will be a feature of this section in our January issue.

Five Years an Announcer and Never Late!

(Continued from page 22)

who is visiting in town has been extended the courtesy of appearing on the same program. If the soprano originally scheduled must give up some of her time to the visitor, it will mean that she cannot sing some of the songs which she has spent so much time rehearsing, and the singer objects that friends will be so disappointed because they will not hear certain of these songs. Perhaps the announcer will "read between the lines" a professional jealousy, or a reluctance to put her voice to the test of comparison with the rival through both broadcasting from the same station during the same program.

"A sense of judgment and tact combined with an appreciation of the feelings and temperament of an artist is probably one of the greatest attributes to the success of an announcer," Mr. Arlin says.

The duties and responsibilities of an announcer are not confined to the microphone. By virtue of his position, he typifies the ideals and character of the station. He must interpret the policies of the station, maintain discipline, order and quiet in the studio, answer questions of an ever curious public, and carry out the execution of his program.

Radio Paper in Mexico

The first publication in Mexico to be devoted entirely to radio has just been issued in Mexico City under the title of "La Radio Revista," a monthly. It is brimful of the latest American hookups, and helpful hints on the care of radio receivers and accessories. Louis G. Marin, formerly a radio editor of El Excelesior, Mexico's biggest daily newspaper, is one of the editors of the Revista, which naturally is printed in Spanish.

Settling the Super-Het Problem

(Continued from page 61)

The radio public is sadly misinformed if they believe that the results and satisfaction of an 8 tube set can be equaled by using a lesser number of tubes, through reflexing or the use of crystal detectors. It is true that the super heterodyne principle may be used with less than 8 tubes, but is selectivity, range, volume, clarity, as well as stability in operation assured? The small additional cost of adding the extra tube or tubes is well worth the investment.

The question of the type of tubes to use might well be discussed here: I have always found the C301A or the UV 201A to be most satisfactory, not only in the Super Heterodynies that I have experimented with but in any other circuits employing the familiar three elements. The use of tubes, operated by dry batteries, of course, reduces the volume somewhat, but there are times when the taking along of a bulky and weighty storage battery on an automobile trip, is bothersome and in such portable sets, the UV 199 type of tubes can be used with some sacrifice in volume. One need not worry, however, about not obtaining loud speaker operation when these tubes are used, because it must be remembered, that a greater signal voltage is impressed upon the grid of the last detector in the Super and this in turn is amplified in two stages of audio, which will produce at least as much volume as any other set of equal number of tubes. A further reason for using the storage battery type tubes, lies in the fact that the latter tubes have a much longer life, affording more stable operation. So, wherever possible, use the storage battery tubes and success will be assured.

Personally I prefer to use a loop to an antenna on a Super, but for those who wish to use the antenna during the D. X. season, let me say it should not be longer than 40 or 50 feet, including lead in. Due to the extreme sensitivity of this set, it will naturally tune somewhat broader on an antenna, than with a loop.

In conclusion, let me add that the Super Heterodyne is a worthy investment to any radio experimenter or broadcast listener. It will be somewhat more costly at the outstart in collecting the necessary parts, but when completed and you are ready to connect your batteries, you can rest assured that you have the best in radio receivers and your visits to the radio centers for more costly parts are at an end. Then you, too, will join the already great army of super heterodyne supporters.

In the January Issue

—of "On the Air," an enlightening article on "Instruments for Radio Testing" will be published. Close study of this article will enable the average fan to know exactly what he must do to test his receiver and the accessories such as batteries, tubes, etc., without going to a great deal of expenditure in the way of purchasing elaborate instruments. An authoritative article by a well known engineer at KDKA.

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



\$3.25 RADIO Storage "B" Battery

12 Cells
24 Volts
Economy and performance unheard of before. Recharged at a negligible cost. Approved and listed as Standard by leading Radio Authorities, including Pop. Radio Laboratories, Pop. Sci. Inst. Standards, Radio News Lab., Lefay, Inc., and other important institutions. Equipped with Solid Rubber Case, an insurance against acid and leakage. Extra heavy glass jars. Heavy, rugged plates. Order yours today!

SEND NO MONEY! Just state number of batteries order is received. Extra Offer: 4 batteries in series (96 volts), \$12.75. Pay expressman 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 Batteries.
Prices: 6-volt, 100 Amp. \$11.25; 120 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, WSBC, Chicago. Watch for announcements.

FREE RADIO STAMPS

168 beautiful copper etched American, Canadian, and European stamps, each with the call letters of a station, FREE with Ideal 48-page Radio Stamp Album and Log. Also contains complete list of stations both alphabetically and by call letters. As you hear new stations, just put the proper stamps in your album. Album and stamps become a permanent and interesting record of the stations you receive. You and your children will enjoy it. Complete album, 8"x11", heavy board covers, \$1 plus postage.

Send No Money

Just pay postman after album and stamps arrive. We prepay postage if you prefer to pay with order. **MONEY REFUNDED** if not DELIGHTED. Send order today—NOW. Postal will do. IDEAL CO., Dept. 2219 366 Wrigley Bldg., Chicago



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 first half of which was printed in this issue of *ON THE AIR*. Watch the January issue for the last half, and following numbers for latest additions and corrections.

Keep Your Radio Log Up-to-Date!

How to Get the Programs You Want



"Encouragement is everything to us," says Jack Nelson, announcer-director of WJJD and conductor of the "Behind the Mike" Section of this magazine.



"Our work seems much more worthwhile when we get a little applause from our listeners," says Polly Willis, popular staff artist from KYW. She has been performing over the radio more than any other feminine entertainer at KYW.

You can get your personal choice of favorite artists on the radio (just as at the theatre) by applause!

JUST stop for a minute and consider the broadcasting station and the artists supplying you with the finest entertainment in the world. The different artists rendering the selections over the radio are all working for your pleasure.

The studio must be quiet, hence doors must be kept closed; a studio must be heavily draped and padded in order to secure the proper acoustical effects for broadcasting. It is surely true that no one would like to hear the roar of an elevated train accompany Jack Nelson while playing one of his favorite selections on the piano.

The Orchestra gets tired out, both physically and mentally and yet the announcers, artists and personnel often endure discomfort in order to entertain you while you sit in your comfortable chair enjoying Radio in your own house. These people deserve credit and acknowledgment.



IT'S up to you radio listeners to drop them a card telling how much you appreciate a number or a selection on a program. The average radio artists receive nothing for performing before the "mike" and they should receive some reward from you and there is nothing that will please them more than ten or twenty applause cards in the morning's mail.

So send in your applause cards and let them know you appreciate their work. *Let us send you our selection of applause cards;* each card has a picture of one or more prominent radio artists or announcers that makes it one of the most attractive applause cards—maybe you would like to have a collection of our cards with the pictures of well known favorites. Among the pictures you will find the following well known people.

Jack Nelson	WJJD
Ford & Glenn	WLS
George Hay—Solemn old Judge	WSM
Graham McNamee	WEAF
Merry Old Chief Fitzpatrick	WJR
Wendell Hall	WEAF
Duncan Sisters	KYW
Jerry Sullivan	WQJ
Harry Geise	WIBO
Paul Greene	WSAI
Bill Hay	WOK
Karl Bonawitz	WIP
Bert Davis	WQJ
H. W. Arlin	KDKA
Dennis Sisters	WEBH
Harmony Girls	WLS
Paul Ash	KYW

MAIL THE COUPON FOR A CHOICE SELECTION OF BEAUTIFUL APPLAUSE CARDS

FREE

ON THE AIR,
Kimball Hall,
Chicago, Ill.

Enclosed find \$1.50. Send me "ON THE AIR" for one year and the collection of Applause Cards Free.

Name.....

Address.....

12-25

Just send \$1.50 for one year subscription to "ON THE AIR" and we will send you absolutely free of charge a selection of twenty beautiful applause cards, each with pictures of radio artists. Write at once while the supply lasts. Address ON THE AIR, Kimball Hall, Chicago, and enclose \$1.50 for 12 months' trial subscription, and the applause cards will be sent all charges prepaid—Don't delay your order!

Short Waves Encircle the Globe

(Continued from page 11)

report to the station, in describing how he first picked up the station. "I sat up two mornings, and got—nothing. But on the morning of my birthday, and with a new set of smaller coils, I struck a carrier wave which I eventually resolved into telephony and heard a voice with a very American accent informing all

and sundry that Pittsburgh had beaten another ball team 13 to 7 or something of that sort. Then I knew that if my imagination was not playing tricks, I was across the herring pond."

"Short wave reception is so full of absolute self-contradictory facts," says another Johannesburg wireless enthusiast,

Tell them you saw it advertised in On the Air.

A. J. Jacobs. "For instance, in our summer, when daylight approaches, KDKA almost vanishes accompanied by considerable 'mush' or distortion, while KFKX picks up at daylight, also with 'mush'. In winter, KDKA picks up enormously as daylight approaches, and becomes even clearer than before, while KFKX sinks, also much clearer." Summer in South Africa, it should be noted, is winter in North America, while dawn in South Africa is about 10 p.m. Also, the wave used by KFKX in short wave experimental work is considerably shorter than that used by her sister station, KDKA.

W. Grant Dalton, another electrical engineer of Johannesburg, has sent to the Pittsburgh station a detailed log covering the reception over considerable lengths of time. One of these reports said that beginning with a certain program, the reception of the short wave transmission had not been as strong as it had previous to that date, but that what the signals lost in strength, they had gained in clarity and modulation.

What had happened was that the antenna at the station had been changed at this particular time to give directional effects towards England, at almost right angle to the direction of South Africa, at the same time that adjustments were made in the set to make the program more clear. The reports from England showed that the signals received there were stronger, as well as improved in quality, while in South Africa they were weaker, but of better quality.

The directional effect was secured by the arrangement of the antennae at the station. The KDKA short wave antennae, instead of being of the conventional flat top cage type, are made up of one and a half-inch copper tubing mounted rigidly in a horizontal position on tall wooden poles. There are from three to six of these antennae grouped near the station building, only one of them being coupled to the transmitter. During short wave transmissions only two antennae are used at one time, this one coupled to the set and another which is energized by induction. The others are made inoperative by breaking the continuity of the top and bottom parts of the copper tubing. When the two antenna in operation are separated by exactly half a wavelength, the signal is strongest in a direction at right angles to a line drawn from one of them to the other. When the antennae are separated by a quarter of a wavelength, the signal is strongest in the direction of the intersecting line.

In ordinary broadcasting, the fading occurs in periods that are perhaps two minutes long, that is, two minutes between the maximum signal and the minimum one. In short wave work, the fading periods are only a few thousandths of a second. That means that the fading itself can give an audible note, really a tremolo. One report from abroad speaks of hearing a cello solo in which this fading kept exact time with the tempo of the solo for several measures, causing a very weird effect. If the fading is fast enough, it makes its own note, which interferes with reception.

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

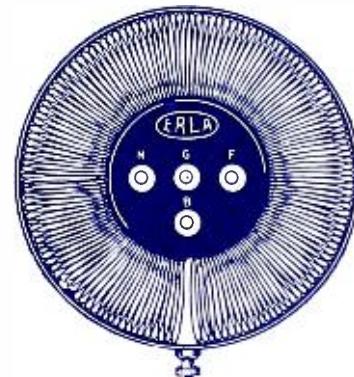
The heart of this new-type receiver is a new and revolutionary coil—the Erla *Balloon *Circloid. It is found alone in Erla Circloid Five receivers. None other,

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

(1) *Greater Distance.* Circloids 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.

(2) *Better Selectivity.* Stations separated by only a few meters wave length can be tuned in or out with surprising ease. Find any station previously logged in 20 seconds. Because circloids have no pickup qualities of their own, as have ordinary coils, only signals are built up to which the antenna circuit is tuned. Incidentally static is surprisingly minimized.

(3) *Increased Volume.* Higher radio



New Erla Balloon Circloid Coupler and Transformer

frequency amplification gives concert volume to distant signals but faintly audible with ordinary receivers.

(4) *Finer Tone.* Ends completely fuzziness and blurred tones. Circloids' 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.

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 Circloid 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.

ELECTRICAL RESEARCH LABORATORIES,
CHICAGO, U. S. A.

*Trade Mark Registered

FREE—THIS UNIQUE TEST

ELECTRICAL RESEARCH LABORATORIES,
2500 Cottage Grove Ave., Dept. 100, Chicago, Ill.

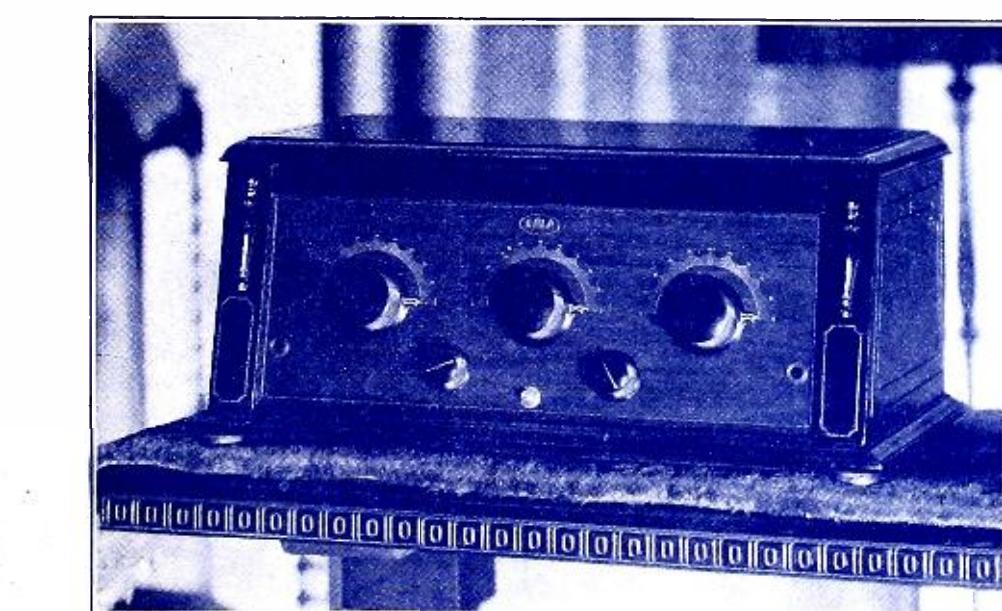
Gentlemen:

- 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.....



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 distributor 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.

Tell them you saw it advertised in On the Air.

For some—a “radio”

For others—**Zenith!**



Super-Zenith IX
Built-in Zenith loud-speaker;
ample compartments for dry
and storage batteries.

Super-Zeniths priced from \$240 to \$355.
DeLuxe Art Model Cabinets from \$500 to \$2,000
Other Zenith Sets \$100 and \$175



New Zenith De Luxe Chinese Model
Equipped with two built-in loudspeakers, Bates
Rotary Log, illuminated dial, single control
specially constructed Zenith Radio Circuit.

Some prefer the blare of a circus band—or the friendly jangle of a hurdy-gurdy. To them it is the only music.

Those who delight in blare and jangle do not need a Zenith—but they will find that even such music rings truer to their ears brought in by Zenith radio.

Others go breathless at the golden notes of a lyric soprano—or the rapturous harmonies of a great symphony.

Such people—born with a love for music—should never content themselves with any radio instrument less fine than Zenith.

Zenith's appeal to the eye is instant—and enduring. Its clear, sweet tone is a revelation.

To see and hear one of the new Super-Zeniths for the first time is a memorable experience. Yet that experience is yours for the asking—in your own home if you so desire.

Simply telephone your nearest Zenith dealer.

Again Commander Donald B. MacMillan chose Zenith for his Arctic Expedition. When human lives may depend upon the reliability of radio performance, only one reason can explain his choice: Zenith has proved to be the best obtainable at any price.

ZENITH RADIO CORPORATION
Straus Building, Chicago

ZENITH
TRADE MARK REG.
LONG DISTANCE TRADE MARK REG.
RADIO

**It Costs More
But It Does More!**