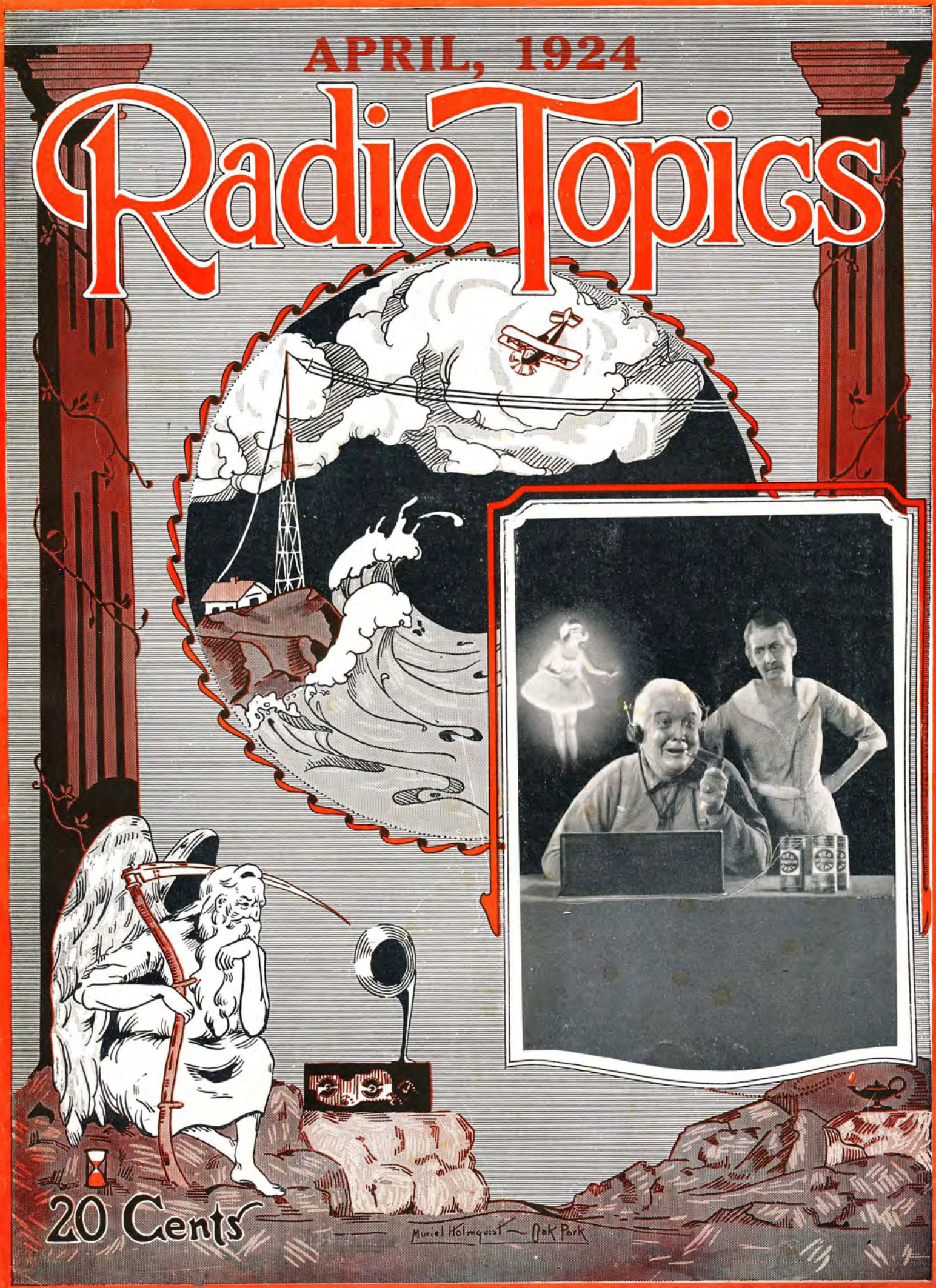
APRIL, 1924

Radio Topics



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Radio Topics

An Illustrated Monthly Devoted to Radio

Volume IV APRIL, 1924 Number 3

UNIVERSAL SCREEN STARS USE A GREBE

Even General Manager Julius Bernheim stops to enjoy the concert when King Baggot, famous screen star, and now a director, turns on a Grebe Broadcast Receiver CR-12 to entertain the members of the "Blackmail" Company at Universal City.

CONTENTS

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Vol. IV. April, 1924 No. 3

Free Radio—Can It Continue?

HOW much longer can the broadcasting stations of the country continue to give us bedtime stories, musical concerts and instructive lectures free of charge. This is a question that will have to be answered very soon. Already the union musicians of Chicago have demanded payment for playing at radio studios at the rate of $8 for each individual musician who plays three hours or less. The scale mentioned takes effect April 1.

Several broadcasting stations have announced that unless they can raise funds from listeners they will have to depend upon amateurs and hit-or-miss entertainers. Station WHB, Kansas City, is now soliciting funds to maintain its "Invisible Theatre," promising high-class talent in every line of entertainment.

Another organization in New York is gathering a music fund to obtain the services of the most famous opera singers and other musicians.

With a radio public of ten millions upon which to draw the assessment would not be a burden to anyone. Three plans have been suggested by the American Radio Association: (1) That a fund be subscribed by the radio industry for the support of musical programs. (2) That a fund be subscribed by the public. (3) That a low tax be placed upon the manufacture and sale of radio apparatus to be applied to a broadcasting fund.

The problem will soon be submitted to the radio layman with the request that he choose the plan best suited, in his opinion, to defray the expense of broadcasting. The A. R. A. will hold its first conference at the Waldorf-Astoria Hotel, New York, on April 16 and 17.

Brings a Test Case

THE legality of the stand taken by the American Society of Composers, Authors and Publishers in its fight with broadcasting stations who refuse to pay tax for copyrighted music is being questioned by the Chicago Board of Trade, who operate station WDAP.

The Board of Trade has filed an answer in federal court to a suit brought by the Forster Music Publishing Company. Station WDAP contends that the copyright law governs only sound waves in its regulation of the reproduction of music and does not cover the subsequently developed science of broadcasting music with the aid of electrical waves. It further contends that the American Society of Publishers is a combination in restraint of trade in violation of the Sherman anti-trust act.

The outcome of the suit will be watched with interest by the thousands of radio fans who nightly tune in on WDAP.

Movies by Radio

C. FRANCIS JENKINS, in testifying before the House Merchant Marine and Fisheries Committee during hearing on the White radio measure, predicted that in a short time we would have movies in the home by means of radio. He prophesied that people soon would be able to witness big league baseball games, feature pictures and weekly news reels through an attachment on radio sets and also see performances on distant stages.

Mr. Jenkins said he and his associates expect to establish a broadcasting station for transmitting photographs through the air similar to the experiments carried out between Washington and Philadelphia, although much improved over that trial.

Some Speed

THE recent attempts to measure the speed at which radio travels presented some amazing figures. It was found a distance of 8,500 miles was covered in fifty-four one-thousandths of a second. This is at the rate of 157,400 miles per second, which you will agree is some speed.

And those who were responsible for the tests state that if radio could have an absolutely unobstructed field it would move much faster. Radio moving around the earth does not have a clear path—it is retarded by ionized layers of the upper air and is reflected back and forth in its circuit.

They are going to broadcast the song of the nightingale in England, providing they can sneak up near enough to that capricious prima donna of the woods and induce her to sing in the microphone.

In Next Issue

RADIO TOPICS will publish in the May issue one of the most complete and instructive articles on the Super-Heterodyne ever written. This is undoubtedly the simplest and at the same time most powerful radio receiver ever constructed, and everyone interested will want to know how to build one of these 6 or 8 tube sets.

White Radio Bill Up Again

FOUR-DAY HEARING BEFORE RADIO SUBCOMMITTEE BRINGS OUT IMPORTANT TESTIMONY

RADIO fans everywhere in these broad United States are watching with interest the outcome of the hearings at Washington on Congressman Wallace White's radio bill. It is now in the hands of a subcommittee of the Merchant Marine and Fisheries Committee, and it is the general impression that it will be reported favorably to the full committee. Early action on the measure before the House will follow, it is freely predicted.

Secretary Hoover Says:

I AM in receipt of many requests for my views as to issues now before the courts bearing on the control of radio broadcasting. While it is impossible for me to express any opinion on particular issues that are before the courts or the Federal Trade Commission, I can state emphatically that it would be most unfortunate for the people of this country to whom broadcasting has become an important incident of life, if its control should come into the hands of any single corporation, individual or combination. It would be in principle the same as though the entire press of the country was so controlled. The effect would be identical, whether this control arose under a patent monopoly or under any form of combination, and from the standpoint of the people's interest the question of whether or not the broadcasting is for profit is immaterial. In the licensing system put in force by this department the life of broadcasting licenses is limited to three months, so that no vested right can be obtained either in a wavelength or a license. I believe it is safe to say, irrespective of claims under patent rights on apparatus, that broadcasting will not cease, and neither will our public policy allow it to become monopolized.

HERBERT HOOVER, Secretary of Commerce, appeared before the subcommittee at the opening of the session and read a report of the provisions of the bill and made a plea for proper legislation to control the situation. The meeting was presided over by Congressman White of Maine, the author of the bill.

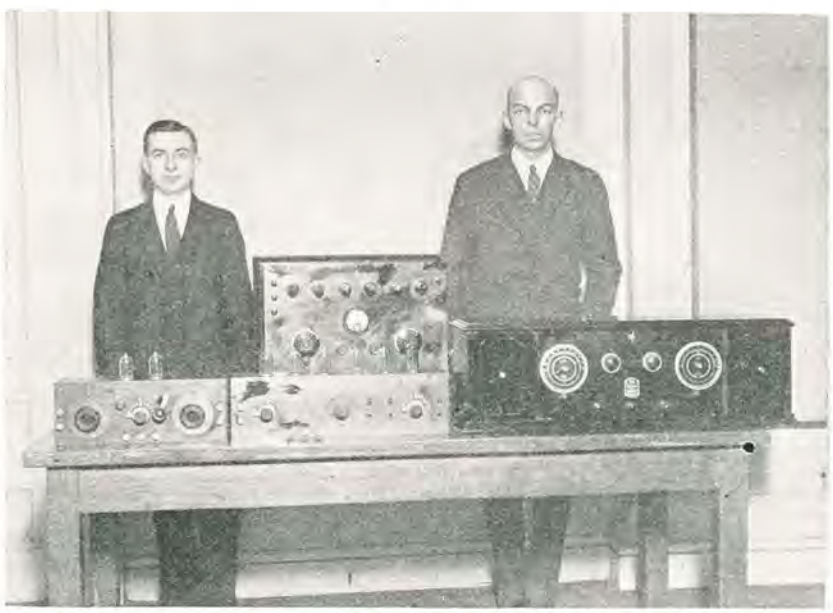
Secretary Hoover Testifies

Secretary Hoover said:

"The tremendous development in electrical communications is to a large extent due to the fact that individual initiative has not only been unhampered by the government, but has been encouraged to the extent of the government's ability and regulated so as to give the maximum service. The further legislation needed should in my view regulate only to the extent that is necessary in public interest for the development of the science itself, for the service of those who make use of it. It seems to me, therefore, that the fundamental thought of any radio legislation should be to retain possession of the other in the public and to provide rules for orderly conduct of this great system of public communication by temporary permits to use the ether. It should be kept open to free and full individual development, and we should assure that there can be no monopoly over the distribution of material.

"Radio communication is not to be considered as merely a business carried on for private gain, for private advertisement, or for entertainment of the curious. It is a public concern impressed with the public trust and to be considered primarily from the standpoint of public interest to the same extent and upon the basis of the same general principles as our other public utilities."

Secretary Hoover said it was unbelievable that the American people would allow radio to fall exclusively into the hands of a small group or combination of individuals. He was opposed to a radio monopoly. He also stated the secretary of commerce should have "discretionary power" in licensing stations and not be forced to issue licenses to all applicants. He stated a lack of funds had hampered the department from doing effective work.



MAJOR ARMSTRONG DEMONSTRATES HIS SUPER-HETERODYNE

Major E. H. Armstrong, one of the "fathers" of radio, giving a demonstration at the Engineers Society of his newest hook-up, the super-heterodyne. He employs only small loop aerial, built inside the cabinet, using dry cell batteries. The three types of super-heterodynes, left to right, are the original, the working model and the improved type developed by Major Armstrong and Harry W. Houck, who is on the left. (K. and H. photo.)

Paul B. Klugh, executive secretary of the National Association of Broadcasters, stated before the committee his organization represented seventy-eight of the leading broadcasting stations of the country. He was of the opinion the personnel of the advisory committee should include amateurs, manufacturers and broadcasters. He referred to the American Society of Composers, Publishers and Authors as an "Iniquitious monopoly."

Another witness was Charles Caldwell of New York, who appeared on behalf of the Radio Broadcasters Society of America, who referred emphatically to the American Telephone & Telegraph Company as a "radio monopoly." He said his society favored the White bill, the schedule of fees, etc. He was in favor of a $100 fee for entertainment stations.

Raymond Asserson, broadcasting supervisor of New York city, testified regarding the efforts of the city of New York to purchase a radio broadcasting set from the American Telephone & Telegraph Company. He stated the city had wanted a station for the last three years, but had been balked by the members of the "big five." Joseph A. Devery, corporation counsel of New York city, suggested that the authority to grant licenses should be lodged in a board of commissioners instead of with secretary of commerce.

Here's a Fan Who Means Business

IN A letter headed "Radio Fans Beware!" an Oak Park, Ill., radio fan has the following to say:

"No doubt you read the article in The Daily News on Friday, March 7, attacking the broadcasting stations.

"Do not go to sleep at the switch and not be able to tune in to anything you want except that which is dictated to you. Just think how cheap your entertainment is.

"If you were listening to WJAZ on Saturday night at about 11 o'clock, March 8, you would have heard that the American Telegraph & Telephone Co. refused to give them a special wire for telegrams for that contest. Another instance — about a month ago they also refused a special wire to Chicago to broadcast our president's speech. Some patriotism, I'll say!

"Now, let's get together and chip in say one dollar each to fight them.

"Yours for free air,

"ROBT. C. WEIMERSLAGE,
"621 Wisconsin Avenue,
"Oak Park, Ill."

"Cheerful Philosopher" on the Air

BURR McIntosh, one of the best known figures of the stage and screen, who arrived in Chicago last week to join the cast of "Blind Virtue," a film being made at the Atlas Educational Film Company, Oak Park, Ill., broadcast from WMAQ, the Daily News Station, Chicago, on Tuesday night, March 18.

On the radio McIntosh is known as the "Cheerful Philosopher" and gave an entertaining fifteen minutes of story telling, comedy patter and read some verse. He closed with an appeal for a soldiers' and sailors' club in every city and town, explaining that he had started a number of such organizations throughout the east since he has been broadcasting.

He is advocating an organization to which everyone will belong, former service men and women being honorary members. Others shall pay $5 a year, children $2, the money to be used for relieving distress among former service people and their families.

The club, to be in charge of a home town man and woman, would be a community center and there the gold coast would mix with the more lowly—just as in war times—and there the needy, or near-needy, would find refuge and instant relief in times of need —quietly, secretly, promptly.

Mr. McIntosh will broadcast again while in Chicago, and will probably be heard from stations surrounding Chicago while he is at the Atlas plant. He received hundreds of letters from radio fans all over the country following his talk on March 18. All extablish the soldiers' and sailors' and cheerful philosophy and commended him for his move to espressed delight with his humor clubs.

New York City Gets Radio Station

GROVER A. WHALEN, commissioner of plant and structures, New York, has announced that he accepted the offer of the Westinghouse Electric International Company for furnishing apparatus for a radio broadcasting station to be erected on the Municipal Building.

Commissioner Whalen stated that this station when completed will be the most powerful station in this section of the country.

"The Westinghouse Company," said Commissioner Whalen, "is to be congratulated upon their offer and their desire, which has been evidenced in many ways, to cooperate with the city in order to install and perfect a radio broadcasting station that will be a credit, not only to the city, but also to the Westinghouse Company."

The acceptance by Commissioner Whalen of the proposition made by the Westinghouse Company is the final official action necessary to insure the giant radio broadcasting station for the city.

Westinghouse radio engineers from that company will be assigned to work in conjunction with the radio engineers of the department of plant and structures. Work has already begun in the Municipal Building on the studio plans, and it is expected that the physical changes necessary in the Municipal Building, where the studio is located, will be completed by the time the radio broadcasting apparatus arrives from Rio de Janeiro.

Commissioner Whalen in commenting upon the action which he took today said "that the Westinghouse Company's offer made last Saturday, and which he had accepted today, would give to the people of the city a radio broadcasting station under municipal control which would be free from any commercial influence that is evidenced in the present use of broadcasting stations today. "The Municipal Station," said Commissioner Whalen, "will be as efficient as the American Telephone & Telegraph station, known as WEAF."

Public Assured of Radio Broadcasting

THE American Telephone & Telegraph Company has backed down!

At a meeting held under the auspices of the Radio Trade Association in the Grand Ballroom of the McAlpin Hotel, New York City, on Thursday, March 13, to clarify the broadcasting situation, officials of the A. T. & T. made some frank promises and admissions, which halt for the time being any attempt at establishing a broadcasting monopoly.

W. E. Harkness, vice president of the American Telephone & Telegraph Company, said that the company he represented would license any broadcasting station that applied for one. In reply to a question as to whether he would license Station WHN, he answered "Yes."

Proposed License Fees

At a meeting figures were disclosed by Mr. Harkness regarding to cost of a license.

"The license fees are from $1 for a recognized educational institution to $2,000 for 500-watt stations operated by commercial concerns or other for their own benefit," he said. "The licenses are for the entire life of the patents. The patents referred to are the seven controlled by the A. T. & T. and the DeForest Radio Telegraph & Telephone Company, both parties to the suit now pending against Station WHN for alleged infringement.

The statement made by Mr. Harkness assures the American radio public that any person or organization which has received a license from the Department of Commerce to operate a broadcasting station can operate the station under the patents of the A. T. & T. on payment of a single fixed sum.

This is the first frank and definite statement from the A. T. & T. to the effect that any independent operators could obtain a license or stating the price of such a license, making the meeting called by the Radio Trade Association a memorable one in the industry.

To the question asked by Charles Pope Caldwell, attorney for Station WHN in the suit, as to whether the A. T. & T. would license any station over 500 watts, seeing that Station WEAF itself was 1,000 watts, Mr. Harkness replied:

"Our Station WEAF is not an argument. There never has been a set built like the set we have. It was done for experimental purposes and it cost us a lot of money. This station operates, moreover, on a special license from the Department of Commerce, whose terms can only be met by concerns which have a large staff of engineers and complicated equipment. If any of you men, however, want a 5-kilowatt set you can have it—if you are willing to pay for it. And it will cost you a pretty penny. It has cost us that."

Henry M. Shaw, president of the Radio Trade Association, urged the dealers to renew their efforts in selling radio sets during the summer in view of the dispersal of the clouds which had threatened the development of radio. "There will be no monopoly in broadcasting," he said, "because the public will not stand for it. There is a big radio season ahead of us all and we have got to tell the radio public of the enjoyment they can get from radio without any charge for the entertainment and without any fear of a monopoly."

MIDGETS TALK BACK TO MICROPHONE

These saucy little women of the Royal Sisters, Lilliputians, who are touring the U. S. A. with a European organization, faced the microphone in studio of WGY, N. Y., recently, when this was snapped. (K. & H. photo.)

Europe Part of U. S. Audience

By W. W. RODGERS
Of Westinghouse Electric and Manufacturing Company

EXPERIMENTS in short wave broadcasting by means of extremely high frequencies have reached a climax in the recent repeating of American broadcasts by British stations.

The feat whereby American broadcasts are repeated on these short waves and received and re-broadcasted by English stations, thus reaching the peoples of Great Britain, France, Germany, Belgium and the Scandinavian countries, is the outcome of two years experimenting and perfecting of high frequency apparatus by Frank Conrad, assistant chief engineer of the Westinghouse Electric & Manufacturing Company, the man who has done probably more in an engineering way to perfect radio than any living man.

The interference problem first brought into prominence about two years ago when so many broadcasting stations had been started and were operating on very similar frequencies first brought the idea to Mr. Conrad and his associates that extremely high frequencies held many possibilities for the perfecting of broadcasting. Mr. Conrad started experimenting with his own station from a short wave station installed on the roof of the Westinghouse plant, where the transmitting apparatus of KDKA is located.

Conducts Local Tests

The first experimenting with short waves under 100 meters were made between the station at KDKA and amateurs living in the Pittsburgh vicinity. Encouraged by the results of these tests, a receiving and re-broadcasting station was located in the Westinghouse building at Cleveland. The first of KDKA's broadcasts to be repeated were transmitted from the station, whose call letters are KDPM. Then tests were made between East Pittsburgh and Springfield, Mass., which, too, were successful and finally, short wave or high frequency receivers—both terms mean the same thing—were installed in the homes of amateurs living in 20 cities or more located so that they covered the country. All holders of these sets reported that reception on short waves was very favorable and that there were none of the drawbacks to broadcast reception found on the higher wave lengths.

These experiments covered a period of two years, nearly up to the time when KFKX, the first radio repeating station in the world, was started by the Westinghouse Company at Hastings, Nebraska. last October. This repeating station made use of the high frequency broadcasting and reception for the repeating of KDKA's East Pitsburgh, Pa., concerts and actually meant that KDKA's concerts were covering the entire country.

Co-operate With Great Britain

The KFKX station operated so successfully that negotiations were started with friendly concerns located in Great Britain to test the reception of high frequency waves. It was found the high frequency signals crossed the Atlantic with the same ease that they crossed the United States. The first test set in Great Britain was located in the plant of the Metropolitan-Vickers Co. at Manchester, England, which made very favorable reports at East Pittsburgh upon the reception of the repeated concerts.

Next the repeating was carried on with the British Broadcasting Company, which has a monopoly on broadcasting in Great Britain. Six or seven of this company's stations were tied together by means of telephone lines and the repeating of KDKA's concerts was started. The result of this was that the people living in Great Britain and eastern Europe heard American concerts as plainly as they could hear their own stations and with the same receiving sets. It was the greatest triumph that radio had made in the past year and has actually changed the whole future of broadcasting.

The high frequency transmitter

(Continued on page 37)

MOVIE STAR ENJOYS RADIO CONCERTS

Reginald Denny, the Universal star, while in bed for ten weeks following a near-fatal accident, relied on his radio for entertainment. The hero of "Sparkling Youth" said he got more of the city news while lying in bed than when he was up and about the streets of Los Angeles.

Illinois Farmers Have 20,000 Sets

SURVEY OF SEVENTY-THREE COUNTY BUREAUS SHOW TEN PER CENT HAVE THEM—DO NOT MAKE THEIR OWN

REPLIES from 73 Illinois county farm bureaus in a radio survey just completed by the Illinois Agricultural Association revealed that there are 20,845 radio receiving sets on farms in these counties. The survey would indicate that between seven and ten per cent of the rural population of the state have installed receiving sets.

"The survey was made for the purpose of determining the extent of the use of radio on farms, the type of programs most desired, practical benefits of the radio, and for the planning of programs to meet the demands of the constantly growing army of farm radio fans," state I. A. A. officials.

These farm radio sets tune in nightly on stations all over the United States. Chicago, Davenport and St. Louis are mentioned most frequently, because they are near and easy for a small set to pick up, but many reports were given stating that farmers tune in on Kansas City, Dallas, Ft. Worth, Jefferson City, Omaha, Pittsburgh, Philadelphia, New York and other broadcasting stations.

Twenty-five Per Cent Make Own

The counties near broadcasting stations naturally show the most sets. Madison county, in the vicinity of St. Louis, has 2,550 sets; Rock Island county, near Davenport, has 900 and in Henry county, also near Davenport, the report shows nearly one-half of the entire farm population has sets.

Only about 25 per cent of the farmers owning radio sets make their own, the rest being manufactured sets, the survey shows.

An increasing number of farm communities use receiving sets for their meeting programs. These are installed in schoolhouses, country churches or community houses. Logan county reports four rural schools having sets. In Greene county there are no regular community sets as yet, but private sets are frequently loaned and installed for community gatherings.

One of the questions asked in the survey was, "What sort of radio programs do such gatherings use the most and like the best?" The almost invariable reply to this was "Musical programs and occasionally good lectures."

Farmers Like Lectures

Replies from most of the counties indicate that many farmers tune in on the weekly farm lectures broadcast each Tuesday night from Station KYW, Chicago, under the auspices of the American Farm Bureau Federation.

Individual farmers, farm bureaus and banks tell of practical benefits from the daily market and weather reports. Montgomery county, near St. Louis, furnishes this example:

"The First National Bank of Raymond, Illinois, has a radio set and gets the opening livestock market at 9:30 a. m. The manager of the co-operative shipping association keeps in close touch with the market report at East St. Louis, and several times has received the market report at 9:30, called in one or two cars of hogs and hit a good market at East St. Louis the next day. On several occasions this made the farmers from $50 to $100 per car more money for their hogs."

The returns from Madison county state: "The reports keep the farmers in close touch with the markets and they are not the prey of buyers who may come along and offer below the market for hogs or cattle."

Want Early Programs

"What radio features of special interest to Illinois farmers do you think the I. A. A. might be instrumental in establishing?" was another question asked in the survey. News of pending legislation, crop reports, co-operative marketing, talks, farm organization news, market reports and short talks on good farming were the most frequent suggestions.

One point that was stressed was the necessity of having farm programs early in the evening, since the 10 o'clock programs are rather late for farmers. "Make it snappy" was also the advice given regarding farm programs. Plenty of jazz music, and talks that are short and to the point. It is as easy to tune out a tiresome speech as it is to tune it in, they said.

The human interest angle of the farm radio set showed through the survey. One man reported that "the women folks now divide the time formerly spent listening over the telephone with the radio." A report was given of a farmer who was neglecting his farm duties because he sat up so late listening in.

The rapidly increasing popularity of the farm radio is shown by the report from Coles county, which has had 100 sets installed in the last six months. This county is not located near any broadcasting station.

Popular Director

WILSON J. WETHERBEE
Director of Westinghouse Station KYW, Chicago

Sends Reports Via Wireless

FUNDAMENTALLY, Dr. MacMillan's polar expedition this year is to study terrestrial magnetism. The Carnegie Institute which Dr. MacMillan is representing in person, gave the "Bowdoin" its full equipment of delicate instruments for making observations and experiments. North of Etah is a little bay known as Refuge Harbor off Smith Sound, Dr. MacMillan and his crew, although "frozen in" for the winter, have been able to carry on their work without hindrance and have made some real progress thus far. Within easy reach of the Bowdoin stands a non-magnetic building, made of wood and tied together, and then covered with an insulation of balsam wool material and an insulation of a few layers of snow blocks. Not a nail, not a bit of metal in the makeup. Entrance is had by means of a sub-surface passage through an outside igloo. As we all know, igloos are constructed entirely of snow.

The only metal on the interior is that of the experimental instruments. Those who work there have no metal on their persons—guns and knives and the like are deposited outside.

A constant temperature is maintained in the wood structure both night and day by a non-metal heater using kerosene fuel. And at the same time, a fixed degree of very low light affords illumination.

Professor Richard Goddard, a representative of the Carnegie Institute, and one of the MacMillan party, informs us (by radio, of course—we don't have to wait for the return of explorers to get the news) that after entering this experimental structure, it takes all of fifteen minutes before his eyes become accustomed to the very dull light.

February 12, E. F. McDonald, Jr., of the Zenith-Edgewater Beach Hotel broadcasting station, in behalf of the Department of Research in Terrestrial Magnetism of the Carnegie Institute of Washington, spoke the following message:

Donald B. MacMillan,
Refuge Harbor, Greenland.

Radio January 10 from Amundsen's ship Maud states vessel drifting east and west about 75th parallel near 157° east longitude. Scientific work progressing splendidly, having obtained 140 reservations all magnetic elements first winter and thirteen daily absolute series potential gradient since October. Records from self-recording electrometer during winter when referred Greenwich time show results closely similar those obtained on Carnegie mean valve, being about 120 and mean range about 50. The importance of your magnetic electric program is further enhanced since the work of the Maud will supply invaluable, simultaneous data with yours, thus establishing a unique record for such high latitude stations. We were interested to learn from your radiograms of January 8 of the satisfactory temperature conditions attained in the observatory by the use of Balsam Wool. Best wishes to all.

MAGNETISM.

The occasion marks Carnegie Institute's first appearance in immediately checking observations taken by representatives of the department in different parts of the world. Curiously enough, observations simultaneously made by Amundsen's ship and MacMillan's ship, physically out of reach of each other, are being checked by the Institute thousands of miles away, but almost as quickly as experienced by the respective sources of information.

From Mr. McDonald, who accompanied the expedition as far north as Battle Harbor, Labrador, the last point from which he could get a mail boat back to civilization, we have it that at every port touched by the Bowdoin Mr. Goddard would go ashore with a little non-magnetic tent, set up his delicate instruments and make magnetic observations, which were immediately wirelessed back to Carnegie Institute. He made his first observation at Sidney, Nova Scotia. Others followed at Paraquet Island, Labrador, The Isle of God and Mercy, Dead Man's Cove and Battle Harbor, Labrador; Jack Lane's Bay, Labrador; Nain, Labrador; Godthaab, Greenland, and at Etah, Greenland.

"Sax" 90 Years Old Played At WLW

WHEN Oscar Saxe, a Belgian, invented his musical instrument which is now called a saxophone, he little thought that 90 years afterward music from it would be played in Cincinnati from the WLW broadcasting station and possibly heard through radio, in the town of its creation.

Some years ago Dr. Wagner purchased this instrument from the Norwegian government and had it in his Omaha home for some time. When Tom Brown, creator of the saxophone band, visited that city, the original Saxe instrument valued at $50,000 was given to him by the doctor. This saxophone is used in every performance given by Tom Brown in the Julian Eltinge-Tom Brown "Black and White Revue of 1924."

When the Tom Brown aggregation played in Cincinnati at the Grand Opera House, they were visitors to the WLW studio of the Crosley Radio Corporation, and through the courtesy of Henry Fillmore, leader of the local Syrian Temple Shrine Band, gave a midnight concert. This was the first time that Tom Brown and the original Brown Brothers saxophone sextette ever played for a radio audience and the telegrams and letters which were received were most enthusiastic. One of the most prized telegrams came from Doctor Wagner, who presented the original saxophone to the leader of the band. He heard Tom Brown play a solo on the instrument.

In addition to the saxophone band, Julian Eltinge, famous impersonator of femininity, sang and spoke to his friends throughout the country and received several messages from them.

Super-Heterodyne Made Easy

THE latest wrinkles in construction of Super-Heterodyne and the Ultradyne receivers, written by an expert, will appear in the May issue of "Radio Topics."

Sears-Roebuck Open New Station

WBBX ONE OF THE MOST POWERFUL BROADCASTING STATIONS IN THE WORLD—LOCATED IN CHICAGO

THE ONLY strictly agricultural broadcasting station in the world and one of the most powerful in the world will be completed by the Sears-Roebuck Agricultural Foundation about April 1. Preliminary broadcasting was commenced March 21 through Station WMAQ, Chicago Daily News. The new station will be known as WBBX and will have a wavelength of 448 meters. This station belongs to the farmer. It was built for one purpose—to give rural America a cross section of every line of thought in the nation and to present it in a manner that cannot fail to interest. A new type of program has been worked out, made up of features different from anything of their kind being broadcast today. They are agricultural woof and warf, woven from the experience of the dirt farmer, colored with the words of great farm leaders, made to fit the interest of every member of the farm family.

Edgar L. Bill has resigned as director of information for the Illinois Agricultural Association to direct the Sears-Roebuck Agricultural Foundation's programs. Mr. Bill was chosen for this difficult task in a new field because of his understanding of actual farm problems. He knows how the farmer's mind works. He is a farmer himself. His experiences include that of agricultural editor of a daily newspaper, associate editor of a leading farm magazine, director of publicity for the Holstein-Fresian Association of America, and a Farm Bureau educational director.

Realizing the need for better entertainment in farm communities, Mr. Bill gave several years' effort to the organizing of the only rural motion picture company in the United States—the Homstead Films Company, producers of all rural films used by the American Farm Bureau Federation. Out of these years of experience Mr. Bill has laid plans for an agricultural program unique in every feature, always bearing in mind the farmer as he knows him. Even the weather and market reports will be especially interpreted in the terms of dollars and cents rather than in the usual statistical form. Otherwise meaningless reports will be made to have an actual place in the world of farming.

* * *

An agricultural news digest is one feature planned for the new station. Arrangements are under way for establishing wire service between the Chicago station and all the leading agricultural newspapers of the country. The best in farm news from every state and county will be wired daily to the station, where the best of the news will be broadcast as a part of the program.

A special service will be offered to America's millions of members of various farm organizations. Addresses by the most noted agricultural thinkers, leading lawyers and financial experts will be broadcast. If a co-operative group in East Texas or Southern California, or from the coast of Maine is confronted by some perplexing problem, a wire to the Sears-Roebuck Agricultural Foundation for advice will bring an answer by radio within 24 hours.

* * *

Farm short course schools lasting from two to five weeks will be conducted throughout the year on a wide variety of subjects from dairying and poultry raising to farm crop marketing. These courses will be conducted by the best agricultural experts to be obtained in this country.

Famous men from all over the world come to Chicago every year. These men will address the farmers of America from the Sears-Roebuck Station. But talks by famous men will not make up

STATION 2LO, LONDON

How many American radio fans heard this station on the recent trials? The photo shows simultanous switchboard at 2LO, which establishes connection with various stations in the provinces.

the entire program. For the station is fundamentally planned to serve as a clearing house for farm experiences. Farmers will be asked to tell of the work of their particular communities in the field of improved marketing or livestock feeding and breeding. Producers from the cheese region of Tillamook, Oregon, will swap tales with the potato growers of the East.

One evening a week will be given over for an exclusive program for the farm Boys and Girls Clubs. Boys and girls who have made unusual records in some particular line of work will be invited to tell the members how they put those fat layers on the prize winning barrow or how they made the prize hen lay more eggs.

On Sunday religious programs will be sent out. Day after day farmers come in at evening too weary to dress, start the car and drive into town for a show or lectures. With the turn of a dial he can sit now at home and hear the talent of the world in his own sitting room. With the opening of the new station he can hear a program arranged just for him to the last detail. In an effort to make these programs all that the farm could wish, Mr. Bill is asking that farmers think up new features that they feel would be of more than usual interest and he will give them a trial, letting the rest of rural America judge their value.

* * *

The new station, centrally located and of sufficient size, can carry enough energy through the air to reach the most remote farm house. It is located on a 130 foot aerial post which is on the top of the Sears-Roebuck nine-story Chicago building. The other post will be the fourteen-story brick tower itself. It will be a 500-watt station, employing two motors, and will carry a Class B license which is the highest issued by the government. The studio will be located on the eleventh floor of the Tower, with the operating room on the fourteenth floor. In addition to the tower studio there will be another in the Hotel Sherman in the very center of Chicago's loop district. The downtown studio is being installed so as to make the broadcasting more convenient for the speaking talent visiting Chicago.

Commends "Topics" Editorial

W. E. DUCKWELL, of Hillsboro, Ohio, has several valuable hints for the beginner who has been accustomed to tune his receiver until it emits squeals and howls that not only throw his set out of tune but those within the radius of his power. Don't waste this energy of your batteries but conserve them, as Mr. Duckwell suggests:

To the Editor, RADIO TOPICS—I wish to commend your recent editorial on reradiation. With the rapid increase of radio listeners this nuisance is becoming too important to be longer ignored as the mistakes of beginners.

The tuning squeaks and squeals that come in from the neighbors are really the mistakes of beginners just as the wobbling bicycle or motor car indicate the novice and while not dangerous like the uncertain auto this wild and frantic tuning is annoying to others and is very unsatisfactory to the perpetrator of this crime against radio.

Their excuse is they do it to match a station.

As the current is turned on the tube soon reaches a stage of greatest efficiency and without "side whistles." Next is the stage of oscillation, the stage of shrieks and howls, after this the tube becomes paralyzed and only weak, distorted sound is heard.

Nothing is gained by burning the tube hot enough to produce side whistling, though perhaps no harm would be done if the receiver were set on a station and let alone. But no, the listener, during the pauses in the broadcasting, thinking his set is out of tune, begins frantically turning first one thing and another, annoying everybody around with shrieks and whistles, and when the music begins again his set is so out of tune he spends most of the time during the next number getting the set quieted down and working good again, probably not knowing he has spoiled the number for his neighbors' programs, also.

This is especially noticeable when KDKA is broadcasting its dinner concerts. There are rather long pauses between announcements and these pauses are filled with whistles and shrieks caused by the local novices trying to catch the station again, which they hadn't lost and couldn't lose if they would just sit steady. Reradiation from a properly working set well tuned probably is helpful, but this is a waste of energy from your batteries and may be a nuisance to others if you are a frantic tuner.

No one lets his set reradiate to annoy someone else. It is done through ignorance and carelessness, and is the mark of the raw beginner.

As I write I am listening in. There is a pause in the broadcasting and already the tuning whistles are coming in and have continued into the following numbers.

Regenerative sets will continue in use and so no doubt legislation will be less valuable than a campaign of education.

W. E. DUCKWELL.

Irish Radio Fan Logs WGY

Reception of WGY was so successful in Queenstown, Ireland, during the trans-Atlantic tests on the morning of November 27 that A. N. C. Horne was able to make a fifteen-second log, covering the transmission from the opening announcement to the "sign-off."

In his letter to the General Electric Company station Mr. Horne stated that reception was made on three valves—detector and two low frequency—with an aerial 25 feet high and 250 feet long, enclosed by tall trees. He explains that he has studied radio for the past ten years and that the highest degree of accuracy was aimed at in recording his observations.

His log is the very essence of neatness, and it is concise and readable. Every fifteen seconds he recorded the type of emission, that is speech or music, and then recorded the signal strength. The greater part of the WGY program recorded was reported "good" or "strong." This classification was particularly noted on the address of Owen D. Young, chairman of the board of directors of the General Electric Company, and the board of the Radio Corporation of America. The concluding number, "God Save the King," played by the WGY orchestra, was also "good," according to the log.

Mr. Horne sent records of WGY for November 22, 23, 24 and 25, indicating that he has little difficulty in picking up the Schenectady station whenever it is on the air. Accompanying the WGY records were logs on reception of English broadcasting station and it was observable that the WGY transmission faded less than that of the English stations.

Introducing Edgar L. Bill

EDGAR L. BILL, director of information of the Illinois Agricultural Association, has been appointed program director of the Sears-Roebuck Agricultural Foundation radio broadcasting station. Announcement also was made that the Loop branch of the broadcasting station will be located in the Hotel Sherman, from which the entertainment features of the program will be broadcast. The Hotel Sherman studio will be on the mezzanine floor, adjoining a reception room for those who will take part in the program. The broadcasting will be done in full view of the public, as glass windows will permit those interested to watch the broadcasters at work.

Mr. Bill was chosen for the place because of his understanding of actual farm problems. He knows how the farmer's mind works. He is a farmer himself. His experience includes that of agricultural editor on a daily newspaper, associate editor of the Orange Judd Farmer and director for the Holstein Fresian Association of America. Realizing the need for better entertainment in farm communities, Mr. Bill gave several years' efforts to the organizing of the only rural motion picture production company in the United States—the Homstead Film Company, producers of all rural films used by the American Farm Bureau Federation. Mr. Bill is not only a farm leader, but owns a large farm in southern Wisconsin.

The program plan upon which he has started to work will be made up of features different from anything of the kind being broadcast in the United States, Mr. Bill announced. Even the weather and market reports will be especially interpreted by farm leaders in the terms of dollars and cents, rather than in the usual statistical form. Otherwise meaningless reports will be made to have an actual place in the world of farming. The station will serve as a clearing house for farm experiences.

Farmers will be asked to tell their particular community in the field of co-operative marketing and livestock breeding and feeding. Farmers from the cheese region of Tillamook, Oregon, will swap tales with the potato growers of Maine. Several special features new in the field of broadcasting will be ready by the opening date of the new station.

"We are going to give the farmer a real program from music to statistics," Mr. Bill declared. "A large part of the entertainment will be given by farm talent, the best to be obtained."

Mr. Bill believes that by the development of a new type of forensics particularly made to fit the farm, more good can be done for agriculture in one year than can be accomplished in any other field in ten.

EDGAR L. BILL

Hoover Cup Goes to Minneapolis

The Hoover cup has this year been awarded to Donald C. Wallace of Minneapolis, operaor of amateur station 9ZT. The award, known as the "department of commerce cup," is presented annually by Herbert Hoover to the owner of the best all-around amateur station, home designed and constructed.

Announcement of the winner has just been made, following decision of the special committee of judges appointed by Charles Stewart, vice president of the American Radio Relay League and manager of the Atlantic division. The judges were Charles A. Service, assistant secretary of the A. R. R. L.; Howard P. Mason, department editor "QST," and Arthur L. Budlong, editor Current radio department.

Since the passing of amateur station 9ZN, Chicago, formerly operated by R. H. G. Mathews, manager of the central division, 9ZT has been recognized by amateurs as one of the most reliable relay stations for handling code traffic destined across the continent. The "hub of amateur radio" in this country is centered in Chicago and Minneapolis.

Wallace's station, as the owner puts it, is the "near realization of a lifelong ambition," and, like all stations that have been considered worthy of the requirements of this award, represents what is best in amateur radio.

Third Annual Radio Show

THE week of October 2 to 8 is the date and Grand Central Palace, New York, the place of the 1924 National Radio Show.

Announcement to this effect comes from the Fifth Avenue office of the American Radio Exposition Company, which conducted the big National Radio Show of 1922 and 1923 and which, at the request of many of the radio manufacturers and of radio fandom, has decided to make the National Radio Show an annual event.

With the latter intention the exposition company recently secured seven-day leases of the ground floor and mezzanine balcony of Grand Central Palace for dates in 1925 and 1926 corresponding to the October week during which the 1924, or Third Annual National Radio Show will be conducted. Having secured such leases, J. C. Johnson, vice president and general manager of the company, and his staff of assistants began a six months' campaign to give to the radio world the finest exposition possible. As it was under Mr. Johnson's direction that the past two shows were conducted with such great success it is reasonable to suppose that the coming radio get-together will surpass in every particular anything hitherto attempted.

"No expense or effort will be spared in making the 1924 National Radio Show the greatest of its kind," declared Mr. Johnson. "Our last year's experience conclusively proved that radio expositions of the character of the National Show can be conducted profitably for the public, the press and the manufacturers, and the better and bigger is the show the greater is the benefit to all concerned.

"Approximately 100,000 persons attended last year's exposition and with increased show space and greater facilities that number will be doubled or tripled this year.

"Potential exhibitors will be interested to learn that the profit-sharing plan put in force last year will be continued—the exhibitors to receive fifty per cent of the profits of the show divided among them in proportion to the space contracted for. Last year the exhibitors received a return of nearly twenty-five per cent of their show space fees and there is assurance that a still better return will result this year, for a much more extensive advertising and publicity campaign is contemplated, as well as a highly entertaining and instructive show.

"Radio trade papers and the daily press will derive substantial benefits through the advertising campaign, and the radio public will be treated to a program which will be superior to any yet attempted.

"New and novel contests open to radio amateurs and the general public will feature each day of the exposition. One of the several definitely decided upon is a speed assembling contest, the details of which will be announced at a later date. Artists of world wide fame will meet the radio public and broadcast from the exposition station. And in addition to the entertaining and competitive features there will be a program of educational and instructive talks and demonstrations by means of which exposition patrons may gain a better understanding, not only of the science and mechanics of radio, but with the particular apparatus in which they are interested.

"With the latter aim in view, it is proposed that the exposition lecture hall shall be available at certain hours each day for the manufacturer to summon users of his apparatus for a course of instruction in the employment of such apparatus.

"Service is to be the keynote of the exposition, and, during the week of October 2 to 8 the American Radio Exposition Company, through the Third Annual National Radio Show, expects to achieve results which will tremendously increase the general interest in radio and thereby open the most profitable season in radio history."

Mr. Johnson, general manager, American Radio Exposition Company, has established his headquarters at 522 Fifth Avenue, New York.

Against Big Black Bear Stories

From the land where wild game is still plentiful has come a request to WGY, the Schenectady, N. Y., broadcasting station, that child-eating bears be deleted from bed-time stories for the children. In a country where bears are a frequent sight such stories, it is explained, put fear in the hearts of children.

The letter came from F. J. Lee, a resident of Lee Valley, seven miles from Massey Station or New Ontario, Canada. Mr. Lee is the first settler of the place which is named after him. He is well over seventy years old and has lived at Lee Valley for thirty years.

"I want to file a protest," writes Mr. Lee, "against the bedtime stories for the children about bears eating up little boys or wanting to. Remember that stuff goes to this new country where there are bears. There are few children going to school who haven't seen a bear. Boys eight or ten years old only laugh at such stuff here but the little tots are made afraid."

Mr. Lee explains that he has a five-tube Neutrodyne set and always gets WGY best. "We have church services at our house every Sunday evening. Sometimes there is a houseful of friends. Last night fifteen neighbors were in."

WOC on Air Monday Evening

Several important changes have been made on the broadcasting schedule of Station WOC at Davenport, Iowa. The changes are all on the evening programs. The 10 o'clock program which the Davenport station has been giving on Wednesday evening has been changed to the same time Monday evening. This change was made to conform with Silent Night in Chicago and at other points.

The Thursday evening program by The P. S. C. Orchestra has also been advanced to 7 o'clock, Central Time, instead of 8, as heretofore, and the Sunday evening concert which started at 9 o'clock, will not begin until 9:30.

The latter two changes are made to conform with the schedule of the new broadcasting station, WHAA, at Iowa City, with which WOC is dividing time on 484 meters.

Broadcasting on Ten Meters

By S. R. WINTERS

BY MEANS of a network of wires, spaced at regular intervals, suspended from a frame fastened by a rope between two poles, the Radio Laboratory of the Bureau of Standards, United States Department of Commerce, has successfully conducted directive radio telephone and telegraph communications on a wavelength of 10 meters.

This is the shortest wavelength thus far employed in the sending of wireless messages. Broadcasting stations, for the most part, operate at frequencies ranging between 300 and 500 meters.

The interference existing between the approximately 595 broadcasting stations assigned a narrow band of frequencies, prompted the Radio Laboratory of the Bureau of Standards in making experiments in the transmission of directional communications on a wavelength of 10 meters. Of course, radiating systems which are restricted to the hurling of electric energy in one particular direction are not suitable for the dispersion of music, speech, weather, market and crop reports. Antennas with directional characteristics, however, can be used for the reception of the offerings of the burdened ether. Moreover, directional antennae may be employed for both the transmission and reception of radio telephone and telegraph communications; that is to say, signaling carried on from one transmitting station to one receiving station.

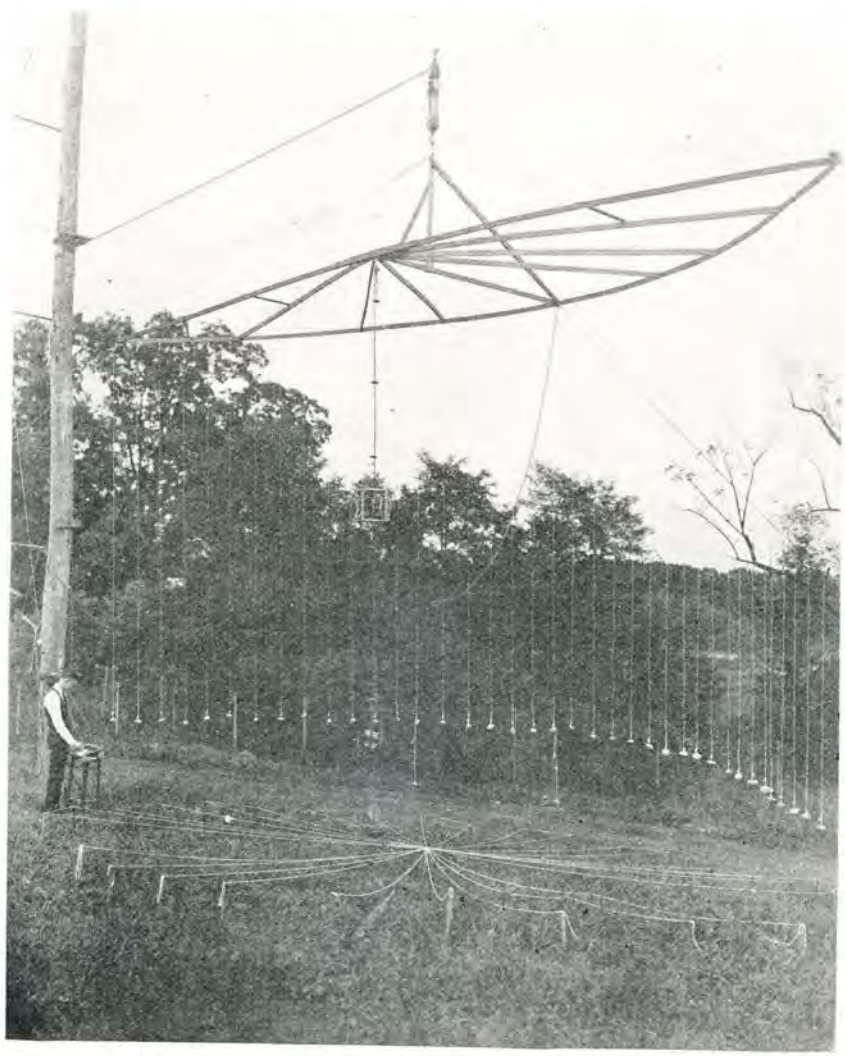
Directing Magnetic Waves

When radio communications are confined to a particular direction, some system of guiding the electric waves with respect to north, south, east or west, is necessary. The experiments at the Bureau of Standards involved the use of a reflecting system in the form of a section of a parabolic cylinder. The electro-magnetic waves emitted from this network of wires behave in a manner similar to that of a parallel wave of light passing through an opening in an opaque screen. In these experiments 75 per cent of the radiated electric energy was circumscribed within an angle of 40 degrees.

As may be seen by an examination of the photograph reproduced herewith, the framework takes the form of a parabolic. From the suspended frame, made secure by fastening it with a rope to two poles, dangle 40 wires of equal length. Each wire is tuned to 10 meters wavelength and the wires are spaced one foot apart. The suspended wires are insulated from the frame and from each other. The peculiar shape of the frame is in the interests of maintaining proper phase relations and as a means of insuring maximum reflection. The reflector may be rotated through 360 degrees.

A 50-watt vacuum-tube generating outfit was employed for the transmission of radio telephone and telegraph messages on the extremely abbreviated wavelength of 10 meters. The coated-filament type of electron tube was selected, since it operated at a higher frequency than any other audion tested—30,000 kilocycles—which is equal to 10 meters. The well-known Hartley electric circuit was used.

The coil for the plate coupling consisted of a single turn 17 centimeters in diameter, and a similar coil was employed for the grid coupling. The capacity between



Parabolic Reflector for directive transmission on a wave-length of ten meters. (Photo by Bureau of Standards.)

the elements of the three-electrode tube-filament, grid, and plate, together with the two coils, constituted the oscillatory circuit.

Antennae Two Sets Wires

The antennae was coupled to the 50-watt generating equipment by the use of a coil similar to the one used for the plate and grid couplings. The antennae was composed of two sets of vertical wires connected by a coil. Each group consisted of a half of a dozen wires arranged in a circle. These wires, 1.8 meters long, were spaced three centimeters apart. The electric energy was radiated from the generating set by these vertical, multiple-wire conductors, one set of these wires placed above and one below the 50-watt generating unit. The latter, together with the vertical conductors, were suspended in the focal axis of the reflecting system, described in a preceding paragraph.

The wireless receiving appaplate tuning condenser with a capacity of 20 micro-microfarad, which was placed in series with the loop; a thermocouple and a galvanometer. The 5-ohm thermocouple was connected to the terminals of the loop, and the output of the thermocouple was connected to a galvanometer. If the radio signals were to be received at a distance exceeding 150 feet, a wireless receiving outfit comprising a detector and two stages of audio-frequency amplification was employed. An external heterodyne was used for the reception of continuous wave signals. Moreover, if tests with radio telephony were made a modulating circuit was identified with the 10-meter transmitting set. A single wire was used as an antenna at the receiving point.

Signaling over a distance of two miles was accomplished by means of a heterodyne receiving outfit and a single-turn coil antenna six inches in diameter. The use of this system of directive radio transmission at a frequency of 10 meters, completely eliminated "straps" and other forms of interference which are commonly annoying at certain periods of the year.

Vanity Case Radio

RADIO TOPICS has from time to time published photos of small but practical radio receivers. Now comes the vanity case radio, a complete, compact little receiver that can be carried by anybody or packed away in a suit case and used wherever one wants to listen to the latest cooking lessons, bedtime stories or music.

The case that contains all of this is 7 inches by 4 inches deep and 4 inches wide. It looks like the vanity cases carried by the ladies and weighs about as much. The receiver has but one control and when plugged into an electric light socket is capable of giving as clear and loud signals as the most expensive set.

The telephone is held to the ear by means of a neat handle, and the two little compartments hold all that is necessary to bring in music, stock reports, or anything that is on the air.

Boon to Salesmen

The salesman or saleswomen making a house to house canvas can gain entre at once by means of this little outfit carrying his or her own orchestra, lecture or other entertainment. By tuning in on the local station he can get the prospective customer in good humor.

Lenore Ulric, star of "Kiki," the Belasco production, recently found considerable amusement between scenes in her dressing room with her De Luxe receiving set. Miss Ulric was most enthusiastic over the wonderful results and immediately ordered several sets for her friends on the road.

Stood Up Under Tests

The De Luxe vanity case radio set is the invention of Lewis B. Hagerman of Chicago, and it is proposed to have one in the hands of every lady in the land before summer has waned. It has been subject to the severest tests and under the most unfavorable conditions, in large steel office buildings, boiler rooms and the center of Chicago's downtown business district, the voice of KYW's announcer could be distinctly heard several feet away from the phone.

Because no outside wires are necessary, the set can be put in operation at a moment's notice, any place, any time. This feature of the little set is one of its greatest selling points.

Loop Not Adaptable

Loop aerials will not operate one tube sets. And it is seldom that even three tube sets will bring in stations on any loop. When attempting to use a loop aerial have a set that is designed for use on a loop and do not expect great distance reception.

MILADY HAS A VANITY RECEIVER

Here's the latest thing in a portable radio set—a selective ever-ready receiver put up in a 4x4x7 case—which will doubtless prove a boon to the ladies.

Department of RADIO ENGINEERING

Radio Topics Institute

NANKO C. BOS, Chairman Advisory Board

Look for the Approval Seal

The above approval seal will be furnished free of charge by RADIO TOPICS, and any article bearing same has been approved by the Institute Laboratory.

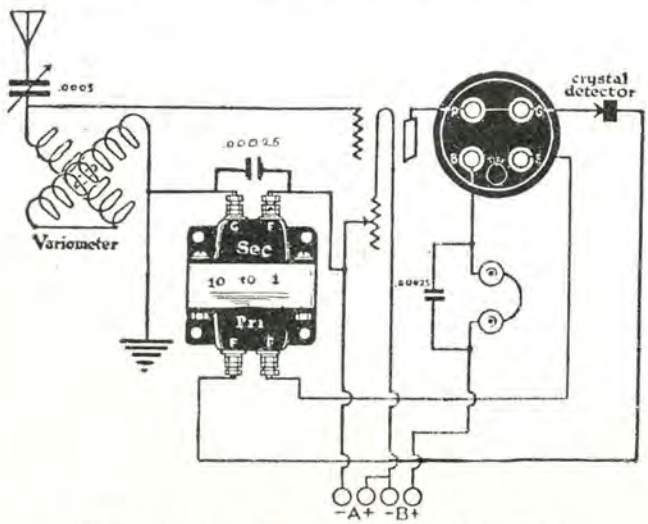
We will be pleased to receive and test any materials that are offered on the market and give them our endorsement where same meet all Institute tests. Send materials to RADIO TOPICS INSTITUTE, 1112 North Boulevard, Oak Park, Ill.

DX On Loud Speaker—One Tube

AN EFFICIENT REFLEX OUTFIT THAT GIVES GREAT VOLUME AND DISTANCE

ONE of the most popular single tube circuits among amateurs today is the Reflex. This efficient hook-up, unlike most of the new circuits, was not ushered in with loud fanfare, but made its appearance gradually and soon became very popular with the boys anxious to get volume and distance.

It uses only an average antenna and is very economical, using but one tube to do the work of two or three. This circuit will bring in local stations with such volume that a loud speaker is easily operated and not only that but the selectivity is excellent. Many amateurs in Chicago have received stations at far distant points with sufficient volume to operate a loud speaker, and these stations are easily tuned in.



Single-tube Reflex Circuit that operates loud speaker.

Easily Constructed

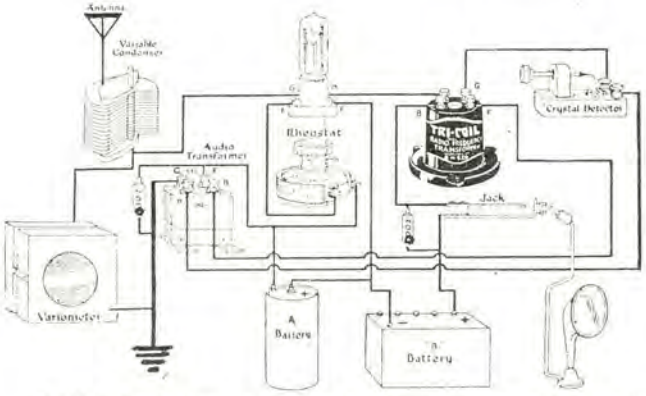
By reference to the diagrams herewith one can easily understand the mechanical and electrical details and in a few hours be able to assemble a long distance getter that is surprising.

First you will need the following materials:

7x9 panel	$ .95
7x9 baseboard	.25
7x7x9 cabinet	2.00
1 variometer	3.50
1 23-plate condenser	3.00
1 socket	.50
1 30-ohm rheostat	1.25
2 .00025 condensers	.70
2 dials	1.00
1 crystal detector (fixed)	1.25
1 radio frequency transformer (Tri-coil)	2.00
1 10 to 1 audio frequency transformer	4.25
6 binding posts	.50
6 lengths bus wire	.30

The connections for the reflex circuit are clearly shown and it is well in selecting variable condenser and variometer to get the best to insure against parts becoming shorted or inoperative.

Choose good condensers and to avoid a whistling sound in the re-



Tri-Coil Single-tube Reflex Circuit that gives great volume and is very selective.

ceivers solder all connections. Place the one .00025 condenser across the secondary of the audio frequency transformer, between terminals marked G and F, and this will clear up any distortion.

Good Crystal Necessary

If a crystal detector of the fixed type is used choose one that has a good piece of galena and is sensitive over its entire surface. Because of the necessity of mounting the transformers back of the panel a baseboard is necessary, so that you may slide the panel in and out of the cabinet and get at it easily.

The batteries used depend upon the tubes employed. C-301-A or the UV-201-A will give the best results, but of course greater battery power must be used with these. The writer has used the UV-199 and the WD-11 (which required but one dry cell) with satisfactory results.

This circuit is very selective and permits of the use of a large antenna. Fifty to 100 feet is not too great.

Wiring the Set

From the diagram it will be seen how each connecting wire must be located and the layout on your panel is easily arrived at.

The antenna circuit consists of a condenser and variometer and the larger your dials the greater will be your volume and selectivity. One condenser, or bypass, is placed across the phones. The circuit may be divided into four groups. The positive "A" battery is connected to the negative "B" battery binding post. A wire runs from this to socket post marked "F" plus.

From the negative "A" battery run a wire to the terminal of the rheostat and from the other terminal of the 30-ohm rheostat run a wire to the minus "F" post on the socket. This completes the filament circuit.

For the antenna grid circuit run a wire from the antenna to the terminal of the variable condenser. The other connection from the variable condenser runs to post "G" on socket and to variometer. From the other binding post on variometer run a wire to the ground binding post, and to terminal of the audio-frequency transformer marked "G." The terminal of the audio frequency transformer marked "F" is connected to "A" minus binding post. The grid circuit is then complete.

The plate circuit has but four connections, one from the socket post marked "P" to radio frequency transformer post "P" and from the same transformer's post marked "B" run a wire to one of the phone terminals. The other phone terminal is connected to "B" plus battery post.

The detector circuit is next. Connect the radio transformer terminal "G" to one side of the fixed crystal detector and the other post of the detector to the audio frequency transformer post marked "P." From the audio transformer post "B" plus run a wire to radio transformer post "F."

By careful tuning using the several combinations of settings, DX reception is easily accomplished. Set the stator of the variometer at right angles to the primary and when you have located your station with the variometer, sharpen the signals by slightly tilting the secondary of the variometer.

A 3 A. M. Concert

WTAM, the broadcasting station of the Willard Storage Battery Co., Cleveland, O., is planning a special three o'clock in the morning program for listeners-in west of the Mississippi, particularly those in the Pacific coast states.

This program was put on the air beginning at 3 a. m. Eastern Time, Saturday, February 9. This hour was decided upon because at that time there will be little or no interference from far western stations.

By consulting a comparative time chart, it will be seen that the concert will come in at midnight Pacific Time, 1 a. m. Mountain Time, and 2 a. m. Central Time.

Radio fans on the west coast should have no trouble in hearing WTAM, as the station has been heard clearly in the Hawaiian Islands. Broadcasting on storage battery power alone, as WTAM does, there is a clearness to the signals, when received at long distances, that marks it as distinctly different from stations using other kinds of power.

Far western stations are heard regularly in the east. Usually they are distinct although faint. Interference set up by eastern stations does not block the western stations, for nearly all eastern broadcasting is over by midnight, Eastern Time, at which time western stations are going strong.

Officials at WTAM thought turn about would be fair play, so the concert was arranged when there would be no broadcasting either east or west. The Willard Storage Battery Co. encourages those that hear this special concert to report back on how it was received.

Thoughts by Ether

Recently three eminent psychologists attempted to transmit thought via radio from station WJAZ, Chicago. The experiment was not exactly a success. One of the tests was this: The professor stated he was thinking of a wild animal and asked those listening to sketch it and place a number on it. The correct answer was a zebra, but 10,000 answers came back an elephant.

CORRESPONDENCE WITH THE INSTITUTE

THIS department is conducted by C. R. Bluzat, Technical Editor, RADIO TOPICS. Any inquiries addressed to him will be answered promptly, provided stamped and self-addressed envelope is enclosed with inquiry.

Please make your questions as concise or brief as possible.

This is your department. Use it freely.

TECHNICAL EDITOR, RADIO TOPICS,
1114 North Boulevard, Oak Park, Ill.

TECHNICAL EDITOR:

Will greatly appreciate the following information on the Neutrodyne hookup.

Have hooked this up as per the attached sketch using parts as listed. The diagram used shows connections to ground from first Neutroformer and Neg. A, but the circuit refused to operate with these and worked nicely when they were eliminated. Oscillations in the tubes were troublesome until the outer tube on the "perfect" neutralizing condensers was cut down in length and the wiring to these shortened somewhat. With these changes the range and volume jumped up and was able to get loud speaker volume from the east and west coast, but not exceptionally loud, however. Distortion was not present. A "C" Battery was then put in the circuit as shown and this reduced the volume somewhat and also started the tubes to oscillating when signals came in loud on close-by stations. Have hesitated to remove the "C" cell, however, as I have been informed that the Neutrodyne circuit is exceedingly hard on "B" batteries without this bias. Reports have it that this circuit will kill two "B" sets a month without the "C." Cannot understand this, as there does not appear to be any leakage path but through the tubes and I am inclined to doubt that this drain would be sufficient to ruin the "B" so rapidly. All grid leads have been kept very short and direct, and low and high voltage leads are widely separated. Suspect the neutralizers, as these seem to be very large and of high capacity for the purpose. As adjusted at present these are set with the sliding sleeve at the extreme point closest to the grid of the tube and any movement toward increased capacity causes strong oscillations in the tubes. Would you suggest cutting these down still more (have removed about ¼" from the sleeve on each) or shortening the points inside the glass tube to reduce the capacity? What is the purpose of the ground leads which I have marked in the diagram with an X? No body capacity is noticed in tuning and the tuning is very sharp on stations farther off than Chicago. On local and Chicago stations it is possible to tune clearly to a certain point in volume when the whole works suddenly seems to choke up and squeal. Am using Apex Tubes of the A type and these seem to be O. K. Can the fixed condensers be of incorrect value for the circuit? How can this be determined?—J. R. P., Milwaukee, Wis.

ANSWER: In answer to your interesting letter, the negative A and neutroformer should be tied together but not to ground. The action of a C bias battery is to eliminate distortion. Since you did not have distortion you can remove the C battery. The drain on your B battery will not be appreciably affected. The "C" battery ought not to start the tubes to oscillating if the negative is connected to the grid side of the tube. The 001 condenser that you show between the two windings of your transformer should be across the primary of such as I show on your diagram that I am returning. If you want to cut down the capacity of your Neutrodons you can do as you propose or you can do it by adding in series with these a condenser made of two insulated wires twisted together as I show on your hook-up. On local stations due to the high potential impressed on the tubes they have a tendency to oscillate; this you can eliminate by slightly detuning your circuits or reducing your volume.

RADIO TOPICS INSTITUTE:

Which of the following Radio sets is best, and in what way, as we do not know which of them to buy? Fada 5-tube set assembled by licensed mechanic in a Radio store, or the Fada one sixty 4-tube set, or the Sleeper Monotrol 4-tube set.—F. S., Morrisville, Pa.

ANSWER:—In answer to your query the Sleeper Monotrol is a very good set, fairly selective. Due to the dual operation of the tubes as radio and audio amplifiers, it is equivalent to a seven-tube set. It is very easy to operate, but is apt to get noisy.

A Neutrodyne set such as the Fada is a very selective set, has a very good range, is more complicated to operate than the Sleeper. When properly neutralized, will give very clear reception. I advise you to have these different sets demonstrated and judge for yourself the one that suits the most of your requirements.

TECHNICAL ENGINEER:

As a new reader of your very interesting RADIO TOPICS *magazine, I would appreciate your clearing up several points which I am unable to understand in the article "How to Build a Real DX Set," by H. H. Hallgren, R. E., which appeared in the December, 1923, number. In the third paragraph, what is meant by "tuned plate" and "tickler coil" and how are they used?*

In the list of parts required, are any of the tubes suitable for dry cell current? Please explain the symbol "OHM," C. R. L. grid leak (variable) .00025 grid condenser. Also the above list does not mention transformers, the small diagram at the bottom of the page (23) shows trans. 10 to 1, trans. 3 to 1, please explain.

Now if I have not already long overstayed my welcome, in the third column page 23, bottom complete paragraph, you speak of the location of apparatus shown in the drawings (the circuit and which wires will come in first). Would you be good enough to send me the back number which apparently contained more detailed information of the DX hookup?"—F. J., Hamilton, Ont.

ANSWER: In answer to your query would state: The plate circuit is tuned to the wavelength to be received by means of the "tickler" coil. "OHM" is the unit of resistance. When you buy a rheostat you must state the maximum resistance value of it; so we have a 6-ohm rheostat, a 20-ohm rheostat and so on.

G. R. L. is a trade name for a variable grid leak. A "Bradleyleak" is another good grid leak. You should buy audio transformers of stated ratios 10 to 1 and 3 to 1.

I am enclosing a hook-up of the DX set. Any information will be gladly furnished.

TECHNICAL EDITOR:

I am a reader of your RADIO TOPICS *and was interested in the Superdyne hook-up in the January book. I am not very good at the reading of the drawing and am asking you for a plainer drawing of it.*

Are the taps taken off of the coils, hooked up to any taps or where do they go?

And where do the wires go from the detector that are not hooked up.

Are twenty-three plate condensers all right?

I have made a drawing and am sending it with this letter to have you check it up and see if it is right.—E. R., Chicago.

ANSWER: In answer to your query, the taps taken off the coils go to switch points on the panel. A switch enables you to use all or part of the turns of the windings. The wires shown from the filament go to positive and negative terminals of the A battery.

The two wires designated "to Audio Amp" go to the primary of an audio transformer. The 23-plate condensers are all right. Your sketch is all right. I just added to it a ground lead which in recent tests proved beneficial; try with and without it. Keep grid and plate leads at right angles. Connections must be as short as possible. The minimum distance of tickler to adjacent end of grid coil is ½ inch. Determine the best spacing before mounting it permanently.

TECHNICAL EDITOR:

On page 23 of the December issue of RADIO TOPICS *you had an article on how to build a "Real D. X." receiving set.*

Will you please send me a hook-up for this set using one-stage of radio-

frequency, detector and one-stage of audio-frequency?

I have all the necessary parts ready to assemble and would like to use the hook-up you intended with this set.—E. R. L., West Elizabeth, Pa.

ANSWER: In answer to your inquiry, I am sending you the Hallgreen's hook-up under separate cover.

TECHNICAL EDITOR:

In January RADIO TOPICS *your article dealing on the Superdyne Receiver has interested me very much, and I would like to build one. The wiring of the set is not clear to me. I would greatly appreciate help as to correct parts and hook-up.*—C. J. K., Washington, D. C.

ANSWER: In answer to your inquiry, we would not advise you to build a Superdyne if you have not had already a good deal of experience with other sets. We are sending you an enlarged and up-to-date diagram of the circuit along with a panel layout.

You will have to wind the coils or have them made on order. Follow exactly the specifications. Two 23-plate condensers will be necessary. An audio-stage amplification will be sufficient. For some tubes a grid leak may be of advantage. It must be connected between the grid side of the grid condenser and the positive filament terminal of the socket. A lead from "A" battery to ground will stabilize the set.

Note that this circuit is in the experimental stage and that the operation will be a bit puzzling.

WBZ Gets Under Way

THE first broadcast from the Boston Herald-Traveler Westinghouse radio station WBZ, Boston, Mass., was given on Sunday night, March 3, at 8:15 o'clock. This followed on Monday night by the formal opening of the Brunswick Hotel studio at Boston with a program of addresses by state and municipal officials, representatives of the Boston Herald-Traveler, the Westinghouse Electric & Manufacturing Company and the Brunswick Hotel, music by Leo Reisman's orchestra, theatrical features and recitals by famous Boston artists.

The new Boston station WBZ, located on top of Brunswick Hotel, and operated by the Boston Herald-Traveler.

In order to make this broadcasting station successful it has taken three months of intensive work in building a model studio on the Brunswick Hotel, in constructing a special telephone line between Boston and Springfield, and in installing a super-broadcasting station at Springfield.

The studio of the Brunswick Hotel, in itself, is an immense undertaking, and this is just one of the three main factors that were necessary. On the roof of this hotel a building was built that would embody the last word in broadcasting studios.

A mammoth undertaking was successfully accomplished in the building of a hundred mile telephone line from the Brunswick Hotel in Boston to the radio station at Springfield by the Western Union Company. Radio broadcasting is so exacting that an ordinary telephone line of this length could not be used. The line goes directly from the studio on the Brunswick Hotel through cable along the Boston & Albany railroad until it is out of the city and then is supported on telegraph poles until it reaches the radio station at Springfield.

Station WBZ at Springfield, the medium that will be used for broadcasting the Boston programs, is more or less known to radio listeners. Although located only 100 miles from Boston, fans have had, in the past, some difficulty in picking up the program. All this is changed now and WBZ is heard in Boston with the clarity and loudness of a local station.

This was done by greatly increasing the efficiency of WBZ and results obtained in the last few days have shown that there is no better in the country.

The Springfield radio station, which supplies the power for station WBZ, the Boston Herald-Traveler radio station.

Importance of Good Aerial and Ground

By DR. FULTON CUTTING
Vice President Cutting & Washington Radio Corp.

THE radio user who desires efficiency, volume, range and selectivity cannot attach too much importance to insulation of the aerial and ground.

As the collector of feeble radio impulses, the antenna is of supreme importance, and on a par with it, in carrying away the waves after they have been through the receiving apparatus, is the ground connection.

An analysis of radio broadcasting will, very probably, explain this most clearly. The wave that is sent out from a broadcasting station travels over an ever widening area, gradually becoming weaker and weaker as it goes hundreds or perhaps thousands of miles through more or less absorbing atmosphere and over imperfectly conducting ground.

The receiving antenna may be pictured in the mind as the "fingers of the air." To make use of this feeble impulse, the aerial must be sensitive. Once the wave strikes the wire, it begins a journey to the receiver that may be as weakening as the projection from the distant broadcasting station.

Poor Insulation

The main cause of this weakening is poor insulation. A point of poor insulation is a point where there is a "leak." That is, the current is able to flow off the aerial wire and into the roof or the walls of the house. This envolves a loss which manifests itself in weaker signals.

Impulses picked up by a distant receiver are so very minute that the most effective collective device possible should be used, and every possible method of insulation be utilized in order to give them a "clear track" into the set. When an antenna is on the roof, the lead in should be held away by insulation from the sides of buildings. The lead in should also be run through the wall or window with a porcelain tube or like insulation.

Inside the room short leads are best, but regardless of whether the lead is long or short, it should be insulated just as well as the wire on the outside of the house or apartment. The popular theory that inside or outside wooden, stone or brick walls will not deduct from the efficiency of an aerial is false. The radio listener who has his lead in tacked to the surface of a building may not think that power is diminished, yet there is probably a loss here that is reducing his range and selectivity. Even if the wire has an insulating covering it should not be run directly against a wall. The very proximity of the wall may cause a loss.

After passing through the receiving instruments the signal currents flow into the ground, and here insulation is again highly important. At first sight it seems unimportant by what path the impulses get into the ground. One would think that the more paths that were provided, the better. This, however, is not the case. Only one ground should be provided and that one the best ground available.

Good Ground Necessary

The important thing about the ground connection is that it have as low a resistance as possible. High resistance reduces the signal strength. The singular thing about radio currents is that they do not follow the path of least resistance. The word resistance is here used in its technical sense of electrical resistance. They follow the easiest path to be sure, but this is not necessarily the path of least resistance. The easiest path for radio currents is the shortest path. We can, therefore, have the following queer condition.

Suppose a radio receiving installation has two ground connections, one near the receiver and the other at some distance from it. Most of the signal current will flow into the ground through the nearer ground connection. Very little of it will flow through the distant ground connection. If, therefore, the nearer ground connection happens to have a large resistance, the signal strength will be reduced. Now, if the nearer ground is removed the current must flow through the distant ground connection—it has nowhere else to go, and if the resistance of this ground is low the signal strength will be greater than when there were two grounds.

The practical application of all this is to be sure to support the ground wire on insulators up to the point where it is connected to ground. Water pipes are about the best thing onto which to connect the ground wire, and the connection at this point should be as positive as possible.

Radio Finds 'Em

As an efficacious means of locating people in an emergency, radio is demonstrating its ability with repeated success. A clear-cut instance has just been brought to the attention of WGY, the radio broadcasting station of the General Electric Company, located at Schenectady. This station received a request not long ago from Fort Ann, N. Y., that a message be broadcast notifying Miss Ruby Wood, a health nurse from the health department at Albany of the serious illness of her mother in Iowa.

The announcement was broadcast the same evening it was received, and was heard by Miss Donald of the Albany Hospital, who was listening in to the program of the evening. She is an acquaintance of Miss Wood, whom she succeeded in locating in Albany and advising her of the message. Miss Wood at once started for her home in Iowa.

Have You Heard WJAX?

UNION TRUST COMPANY'S STATION AT CLEVELAND, OHIO, HOLDS LONGEST RADIO CONCERT

THE Union Trust Company, Cleveland, Ohio, which owns and operates Station WJAX, hung up a record on its opening night, February 26. It probably was the longest single radio concert ever given, beginning at 7:30 o'clock Tuesday night, February 26, and continuing uninterrupted until 5 o'clock in the morning of February 27.

New Union Trust building, Cleveland, Ohio, atop of which is located station WJAX, recently opened.

The new studio is located upon the twentieth floor of the new 20-story Union Trust building, the largest bank and office building in Cleveland, which is shortly to be occupied by The Union Trust Company itself.

The moving of the broadcasting station to the new building was simply the forerunner of the moving of the entire bank. The story of the actual moving of the broadcasting station is an interesting one. It was located upon the tenth floor of the Citizens building, Euclid avenue and East 9th street, Cleveland. The task was to move the entire plant down ten stories to the ground level, across Cleveland's busiest corner at Euclid and East 9th, and up twenty flights to the new studio on the twentieth floor of the new Union Trust building, diagonally across the street from the Citizens building.

On Thursday, February 21, the last concert to be broadcast from the old studio was completed at 10:29, and exactly one minute later Jim Thorburn, the radio engineer of WJAX, and Elmer Johnson, WJAX announcer, were busy with a gang of men and the moving was already under way. At 6:30 the next morning Don Knowlton, radio manager of WJAX, was awakened by a telephone call from Jim Thorburn, engineer. "Plug in on your set for a minute, Don," said Jim. When Knowlton plugged in, he heard Johnson's voice saying "Good morning, Don. Well, we're all moved and set up. We did the job in a period of only eight hours. I guess that's a record, eh?"

The first person to perform from the new studio was Miss Clarice Balas, Cleveland concert pianist, and her piano selections were followed by a brief address by George A. Coulton, senior vice president of The Union Trust Company.

"Possibly many of you have wondered," said Mr. Coulton, "why a bank and financial institution like The Union Trust Company, Cleveland, should operate a radio broadcasting station, and I simply want to tell you how it came about. It happened in this way: The Union Trust Company, as you know, is a very large bank. It is the fifth largest trust company in the United States and it maintains banking relations with many banks and businesses outside of Cleveland. In fact, it has customers scattered throughout the State of Ohio and in many adjoining states. It occurred to us that by means of radio broadcasting, we could keep our down-state customers and friends in touch with the business market, giving them bond and stock quotations, live stock, grain market

(Continued on page 27)

This is the Vitales Park Theatre Orchestra appearing at the New Union Trust Company station WJAX, Cleveland, Ohio, on the opening night.

Function of Loud Speaker Horn

By C. R. HANNA

Of Research Laboratory, Westinghouse Electric and Manufacturing Company

THE popular conception of the function of a horn on either a loud speaker or a phonograph is erroneous. We hear that a horn "resonates," or it "concentrates the sound," or it "amplifies," and many other explanations, all of which are vague and most of them incorrect. It is true that a horn resonates at certain frequencies, and for that reason increases the amount of radiation at those frequencies. Any form of resonance, however, is undesirable because it is impossible to increase the amount of radiated energy uniformly at all frequencies within a wide range by this method. If a horn is not to distort, its walls should be non-vibrating and its air column resonances, within the range of frequencies used, should be slight.

If we think of the term "amplification" as meaning the increasing of any form of response by supplying energy from another source, we see at once that a horn cannot amplify because it cannot supply energy. It should be evident, therefore, that a horn merely loads the diaphragm in such a way as to cause more sound energy to be radiated into the surrounding space from the diaphragm. A simple analogy is found in the electric motor. When the motor has no load connected to it, all the energy supplied is used up as losses in the machine. If a load is coupled to the motor, it draws more power from the line in order to supply energy to the load. When the load is light the efficiency is low, as the load is increased the efficiency is raised. So it is with the diaphragm; without a horn the efficiency is low, and with a horn the efficiency is increased. The horn may be thought of as analogous to a lever which gives the diaphragm a better grip on the surrounding air. And so the term "radiator" more accurately describes the action of a horn.

Diaphragm Radiates Uniformly

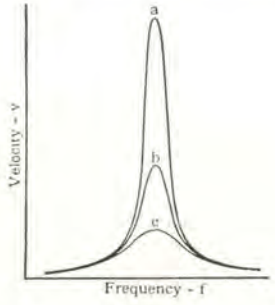
A good horn, therefore, is one which causes the diaphragm to radiate almost uniformly at all frequencies within the desired limits. This condition is more easily attained in a phonograph than in a loud speaker. In the phonograph the diaphragm is forced to follow the vibrations of the record except for the slight spring of the needle; while in the loud speaker the diaphragm is not impelled to follow the variations of current in the windings because there is no rigid connection between the two. In the phonograph it is necessary only that the horn shall radiate uniformly at different frequencies for a given root mean square velocity of the diaphragm. In the loud speaker the horn must fulfill this condition, and also help to cause the diaphragm to vibrate at a nearly uniform velocity when the same current at different frequencies is passed through the windings.

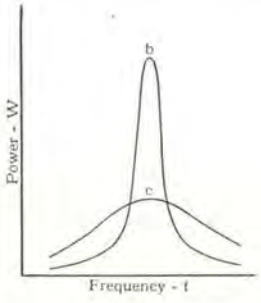
The first problem is to find a horn shape that with a given air velocity in a traveling wave at its throat, the same amount of power will be radiated at different frequencies over a wide range. By air velocity in a traveling wave is meant the instantaneous average velocity of the molecules at a given point. It is this velocity that transmits the pressure to the air ahead. Also, it is pressure that gives velocity to the air ahead. The velocity and pressure are thus dependent upon each other; neither can exist without the other.

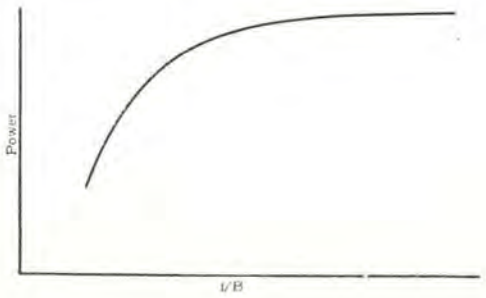
A frictionless straight tube of infinite length has this uniform radiation characteristic. We must get the sound into the surrounding air, however, and this necessitates cutting the tube off somewhere. The tube would then no longer have this characteristic, because of the effect at the end known as reflection, the cause of all air column resonances. This effect becomes less pronounced if the tube is flared out gradually so as to make the final opening quite large. Later it will be shown that the initial opening should be small. These two requisites are the reasons for a flaring horn.

Shape of Horn

Now we must consider how rapidly and according to what law the area shall be increased. It looks reasonable that a horn in which the area is doubled during the first inch, and increased by only a few per cent during the last inch would not be the best, and yet there are many horns on the market having this kind of a flare. Suppose we have a horn such that, in advancing an inch







along its axis, the area is increased by a certain percentage. If this percentage increase per inch is the same all along the horn, we have what is known as the exponential shape:

$$A_o = Aoe\ Bx$$

Where A_o=the area at the beginning, A=area at a distance from the beginning, and B is a constant depending on the rate of increase of section. It can be shown matematically that between two openings of different size, the propagation of air pressure in a traveling wave will be the most complete if the rate of increase of area is according to the exponential law.

Let us disregard the end effect for the moment, and consider only the effect of changing from a straight tube to a horn having the exponential shape. If a given air pressure (in a sound wave) is applied to the throat of the exponential horn, the amount of power transmitted is a function of frequency and also a function of the rate of increase of section which is determined by B in the equation. Mathematically it can be shown to vary with f/B according to the curve in Fig. 1, where f is the frequency of the wave. If B is zero, the power corresponds to that of a straight tube. If B is finite, the power is somewhat less and decreases with decreased frequency. If the allowable variation in power is fixed, the minimum of f/B is determined. Knowing the lower limit of f, we can find the greatest value that B can have. Usually this will correspond to not greater than 20 per cent increase in area per inch travel along the horn. Smaller rates of increase make for more uniform radiation at all frequencies.

Large Opening Necessary

It was stated that a large final opening is necessary to reduce the reflections at the end. Reflections are the cause of air column resonances, and these should be small above the lower limit of frequencies to be reproduced. The rate of increase of area of the horn having been fixed by assigning a value to B, it can be shown that the reflection diminshes rapidly as the horn is extended to the point where the final radius r=2÷B. This corresponds to a 45 degree slope between the sides of the horn and the axis. If extended farther, little reduction of reflection may be expected. When "B" is very small, however, the final opening may be too large for good appearance if carried to the 45 degree point. If the final diameter is over 14 inches, good results may generally be expected.

What has been said up to this point applies to loud speakers and phonographs. The correct initial opening is a problem which concerns the loud speaker to a greater extent than the phonograph. Without a horn, the velocity of the diaphragm in a loud speaker plotted against frequency, assuming a given current in its windings, is as shown in curve a, Fig. 2. If we attach the average well-designed horn having, say, a five-eighths inch opening at the throat, the diaphragm will be loaded a certain amount, and the velocity will be reduced to that of curve b, Fig. 2. At very low frequencies and very high frequencies the velocity will be affected only slightly because the diaphragm stiffness and inertia, respectively, are the main factors which limit the velocity in these regions. At and near resonance, however, the damping is the factor which limits the velocity, and so to increase this is to reduce the motion, as shown. Damping is an opposing force proportional to and in phase with the velocity of the diaphragm. We shall represent the component of damping per unit velocity due to the loading of the horn by x. It represents sound radiation, the power being given by,—

$$W = V_2 L$$

This is shown in Fig. 3b. Now if the horn could be designed to make x larger, v would be as shown in curve c, Fig. 2, but W would be as in curve c, Fig. 3, i. e., greater than before at the low and high frequencies and less at resonance. Thus by increasing x a more uniform response is obtained without sacrificing the average response over the whole frequency range.

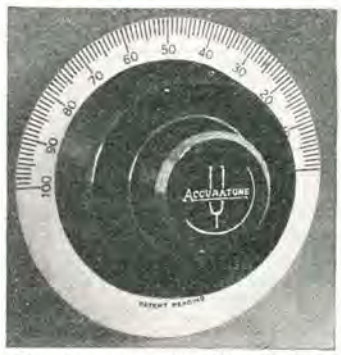
Quantity Increased by Small Opening

The quantity x can be increased by making the initial opening of the horn smaller. It can be shown that x varies inversely as the area of the throat. Improvement in quality of reproduction is very noticeable with horns made in this way. Below one-quarter inch diameter, however, the frictional losses apparently become so great that further improvement by reduction of opening is not justified because of the lessened average response.

With such small throat areas it is necessary that the volume of the air chamber immediately above the diaphragm be reduced to as small a value as possible. If the chamber is large, the air, instead of being forced out into the horn, will be compressed in the chamber. This effect is greater at high than at low frequencies. Hence a small air chamber is more necessary if the high frequencies are to be reproduced accurately.—Electrical Journal.

Gives Fine Tuning

The Accuratune, manufactured by the Mydar Radio Co., Newark, N. J., is the latest thing in superior control of tuning devices. The manufacturers claim for the Accuratune:



The Accuratone for Fine Tuning

First, an accurate tuning instrument that functions as an actual micrometer control.

Second, to make it possible for anyone to tune a radio receiver with the precision of a radio expert and do it with perfect ease.

Third, to eliminate the expense and necessity of vernier condensers and make any condenser operate ten times as efficient.

Fourth, to give the home made receiver distinctive individuality and to the standard set added beauty.

The Accuratune is made of genuine bakelite (highly polished, black or brown) with beautiful silvered dial and neatly engraved graduations. Fits both 3-16 or ¼ inch instrument shafts. Dial 4 inch diameter. Guaranteed by the manufacturer.

Have You Heard WJAX?

(Continued from page 24)

and cattle market quotations, financial news, weather reports and the like, accurately and, in many cases a whole day or two earlier than they would otherwise receive this information. So we installed our radio station to give the down-state business men, merchants and farmers a radio financial news service which would help them in a purely business way. The hundreds of letters which we have received, particularly from the farmers, bankers and cattle dealers, in or near the small towns, have proved that they have found our broadcasting of real service to them.

The opening program was arranged entirely by the Cleveland News. About 125 performers appeared upon this program. Besides soloists of every description, both vocal and instrumental, there were four different dance orchestras, a male chorus of 35 voices, and an entire scene from a play, "Abie's Irish Rose," given by the players themselves, who came up to the studio after the show was over at the Colonial Theater, Cleveland.

Offered Prizes

The prize contests, which formed a part of this program, added to the excitement of the evening. There were four different contests, and each one was announced hourly throughout the program. Prizes for these contests were contributed by Cleveland radio dealers and manufacturers, and their value mounted well over $1,000. As the contests were announced during the course of the program, many Cleveland companies phoned in and contributed additional prizes, until by the close of the evening the total of prizes offered was over 30.

The first contest was one for distance reception. Prizes were offered for the telegrams coming from the most distant point. Well over 400 telegrams were received during the course of the evening, the prize winning telegram coming from J. R. Root of Portland, Oregon. Other prizes went to radio fans in Texas, Florida and Louisiana.

A unique contest was the one announced as a "Midnight Contest" in which Announcer Johnson drew from a hat the names of certain states, the first telegram from those states, following the drawing of the name, to receive a prize. The most interesting contest, however, and one which has probably never been attempted in the radio field before, was a contest for clearness of reception. This contest offered prizes for the best two hours detailed account of the program of WJAX. It was simply a proposition of taking down what came through the loud speaker or the ear phones, word for word, minute by minute, with the time properly indicated.

Standard Wavemeters

TO serve as a standard of radio frequency the Bureau of Standards has two specially constructed wavemeters covering the frequencies in more general use from 18 to 4,600 kilocycles per second (16,650 to 65 meters). These standard wavemeters are used in calibrating wavemeters belonging to he Radio Inspection Service, manufacturers, colleges or others in need of standards of frequency, in radio measurements and in adjusting the radio transmitting set which is used to transmit standard frequency signals.

Each standard wavemeter consists of a variable air condenser of special design, four fixed mica condensers, a number of interchangeable inductors or coils, and a resonance indicating device. The majority of the inductors are wound with high-frequency cable in a single layer upon a skeleton frame of laminated phenolic insulating material, sometimes called bakelite.

The wavemeter is tuned to a source of radio-frequency currents by varying the air condenser and obtaining the maximum deflection of an indicating instrument which is connected to two turns of wire and loosely coupled to the inductor in the wavemeter circuit. Either of two indicating instruments may be used, a thermogal vanometer or a d. c. milliameter and crystal detector. The d. c. milliameter and crystal detector are used when more accurate indications are desired than are possible with the thermogalvanometer.

Milwaukee Fans Have a "Night"

A "BROADCAST Listener's Night" at which some of the country's foremost radio experts spoke, was the big feature on the last month's program of the Milwaukee Radio Amateurs' Club, Inc. At a regular Thursday evening meeting in the Trustees' Room of the Milwaukee Public Museum with an audience overflowing the hall, E. T. Flewelling, Chicago, of flivver super-regenerative circuit fame; David Grimes, New York and Minneapolis, known for his inverse duplex and reflex circuits; H. J. Marx, technical editor of "Radio Digest"; Milo Guerney, the "mystery man," and F. D. Pearne, chief electrical instructor of Lane Technical High School, Chicago, addressed the gathering on various topics.

Mr. Grimes discussed the history of radio telephony, dating back to the work of Mr. Alexander G. Bell, Mr. Flewelling and Mr. Marx dwelt on the efficiency of modern apparatus and circuits, Mr. Pearne told what Mr. Grimes wouldn't about inverse duplex circuits, and the "mystery man" gave a humorous talk.

Periodically, events of this kind are staged to encourage the friendliness of B. C. L.s, who, though invited to all meetings, find that these special gatherings are of more interest inasmuch as the programs are not as technical nor confined wholly to the interests of the transmitting amateur.

Other meetings have included such talks as "The Development Work of Sodium Vapor Tubes at the University of Illinois," given by Ben J. Chromy, 9CJO, an electrical engineering student. R. E. Lathrop, 9ATX, of the Technical Committee, has presented reports entitled "The Application of the Mercury Arc Rectifier to Radio Telegraphy" and "The Construction of Electrolytic Filter Condensers." Another regular program feature is the description of local stations by their owners. Stations 9ATO, which was recently in contact with WNP near the North Pole, 9CKW and 9ELD were recent ones described with the aid of stereopticon slides.

For Central Division Directorship in the American Radio Relay League, the Milwaukee radio club, which is a local section of the A. R. R. L., has nominated one of its best-known members, Clarence W. Crapo, 9VD, and a strenuous campaign is being waged in his favor by Wisconsin men. C. E. Darr, 8ZZ, Detroit, incumbent director, is said to have the greatest backing in the present race but in view of the Milwaukee operations will find keen competition for votes in Wisconsin if not all over the Division.

Power line interference and its mitigation has somewhat superseded Commercial Spark QRM in the attention of the Traffic Committee, but with this trouble it is found that the electric light and power company must do most of the work, aside from some locating tasks, which amateurs may do.

Teaches Dancing by Radio

If you want to learn to dance, or knowing how to dance, wish to learn a few new steps, tune your radio set to WGY, the Schenectady station of the General Electric Company, Tuesday evenings, beginning January 29.

Arthur Murray of New York, dance master supreme and maker of the stars of the ballroom and the stage for many years, will personally tell you how to do the modern dances. Seated at the microphone, he will explain in slow, distinct words the correct steps of the correct dances, outlining the figures so that you in the privacy of your home, free from the embarrassing presence of others, may follow his instruction. His description will be supplemented by music and if you stumble a bit don't let it worry you for there is no one around to laugh at your mistakes.

Mr. Murray will give a series of six lessons. The talks have been carefully prepared. A bit of humor is interjected here and there. The dancing instructor also answers the questions of correspondents, particularly on the subject of ballroom etiquette. A part of each evening's talk is devoted to answering some of these inquiries. The talks will begin at 7:15 o'clock and will continue until 7:45 p. m. Those who wish to follow the lessons will be greatly helped by diagrams which Mr. Murray will supply free. Address him at 801 Madison avenue, New York.

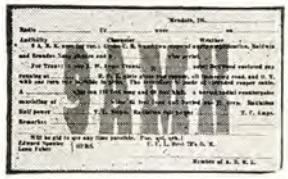
Could Not Hear England

The first attempt to broadcast a musical program from England by combining nine of the high power British stations on March 12, was not a complete success. One, two or three persons in this country heard the music. W. G. Finch, radio editor of New York American, states he heard faintly strains of "I Love You" announced from London. Mr. Lynch used a set on a wavelength of from 365 to 370 meters.

Radio Call Cards Are Popular

INDIVIDUAL radio call cards and radiograms are becoming all the rage. Radio Printers, Mendota, Ill., have introduced a new radio call card which is made especially to fit each station. It contains the name, address and station of the individual.

The card is printed in black, with the station in large red letters. The A. R. R. L. emblem is added when requested by members. The cost per station is only $1.75 for 100 cards with red call and 35 cents extra with blue, green or brown call. They furnish



government post cards when desired at an extra charge of one cent per card.

The individual radiograms are equally popular. These, too, show the name, address and station and are furnished at $1.75 per 100. This company is also making radio stationery with name, address and station, and A. R. R. L. emblem when requested. This individual idea is carried out on logs and other printed matter for the amateur and novice. Radio Printers is making a specialty of catering to those interested in radio.

New and Novel Radio Patents

RADIO RECEIVING SYSTEM

(Patent No. 1,483,383, issued to Henry K. Sandell, Chicago, Ill., under date of February 12, 1924.)

The present invention relates to improvements in radio receiving systems and will be fully understood from the following description illustrated by the accompanying drawings, in which—

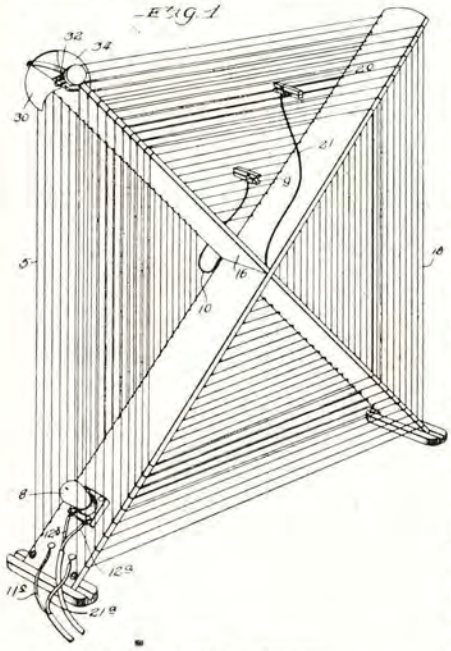
Figure 1 is a perspective view of the loop aerial and the plate circuit loop, together with their mounting.

Figure 2 is a plan view of a condenser mounting used in connection with the device of Fig. 1.

Figure 3 is a sectional view on the line 3—3 of Fig. 2.

Figure 4 is a diagrammatic view illustrating the circuits employed in accordance with the present invention.

In the drawings the numeral 5 indicates a loop or spiral aerial, preferably with its coils in a single plane. It is connected at one end through the condenser 6 with the grid 7 of a vacuum tube or audion 8. From



Radio Receiving System

any selected point on the aerial 5 a connection may be made by the clip 9 and flexible conductor 10 with the connector 11 leading to the grounded connector 12b. A filament heating circuit 12 including the connector 12a, the battery 13, the variable resistance 14, and the connector 12b is provided for filament 15 of the audion 8. The loop aerial 5 is mounted upon a suitable cross 16, the arms of which are formed of members of equal width. The coils of the aerial 5 are inserted in slots 17 formed in the edges thereof. In the opposite edges of the arms of the cross mounting 16 are similarly inserted the coils of a second loop or spiral 18, which are thus maintained parallel to and spaced from the coils of the aerial 5. The loop or spiral 18 is connected at one end through a connector 19 to the filament 15 of the audion 8. From a selected point on the loop or spiral 18, connection is made through a clip 20, flexible connector 21, connector 21a, variometer 23, receiver 24, battery 25 and connector 21a with the plate 22 of the audion 8. From the aerial 5, connection is made through a conductor 26, a variable condenser 27 and a conductor 28 to the coil 18.

As illustrated in the drawings, the condenser 27 may suitably be mounted on one of the arms of the cross 16 which serves as a mounting for the two loops. A slot 29 may be cut angularly in the arm of the cross 16 and a condenser plate 30 of generally semi-circular shape is secured to the end of the actuating shaft 31 so as to be movable in the slot 29. The shaft 31 is journalled in a suitable bearing 32 secured to the arm of the cross 16, the shaft being likewise provided with a knurled head 33 for convenience in operation. The other condenser plate 34, which may likewise be of semi-circular shape, is mounted on the arm of the cross 16 adjacent the slot 29, the movement of the condenser plate 30 varying the capacity of the condenser.

In the form of construction shown, both loops are conveniently mounted in proper spaced relation and in parallelism upon the cross 16. The condenser 27 and the audion 8 are likewise mounted on this cross. The battery 13 and resistance for the control of the filament circuit and the variometer 23, receiver 24 and battery 25 connected in the plate circuit are removed to a suitable point for the remote control of the set. The connectors 12a and 12b are brought to the remote control point in a single cable, as are the plate circuit connectors 18a and 21a. This is indicated in the construction illustrated in Fig. 1. It is found that by carrying these connectors in single cables in the manner set forth, an improvement in sensitiveness and clearness of reception results.

SPACE CURRENT DEVICE

(Patent No. 1,479,256, issued to Henry K. Sandell, Chicago, Ill., under date of January 1, 1924.)

The present invention relates to vacuum tubes, or space current devices, and particularly to those capable of use as detectors, amplifiers, or the like, and to the arrangement of circuits wherein such vacuum tubes are used.

Fig. 1 is a vertical, sectional view through a device embodying the invention;

Fig. 2 is a vertical sectional view of the device through a plane at right angle to the plane of Fig 1;

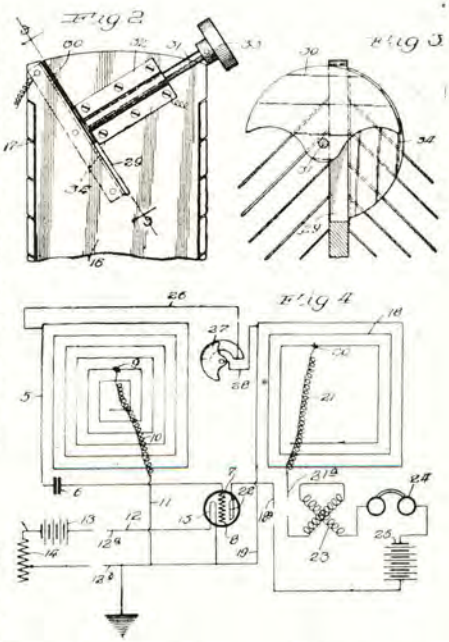
Fig. 3 is a horizontal section on line 3—3 of Fig. 1;

Fig. 4 is a horizontal sectional view on line 4—4 of Fig. 1;

Fig. 5 is a perspective view of a plate electrode, removed from the device;

Fig. 6 is a diagrammatic view of an arrangement of circuits employing the vacuum tube of the present invention.

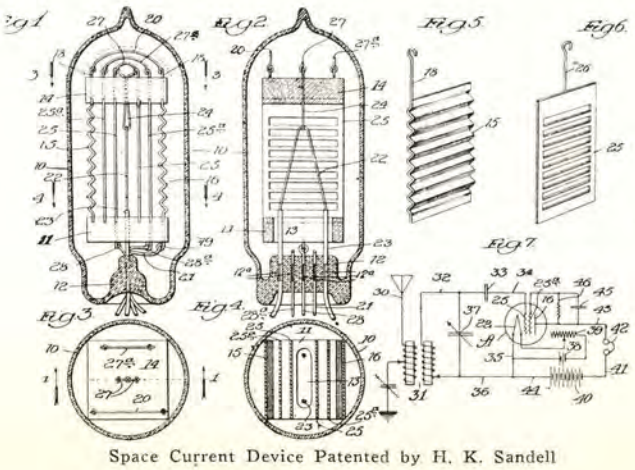
Referring more particularly to the drawings, the numeral 10 indicates an evacuated, sealed tube, the lower portion of which is adapted to be secured in a base plug (not shown) of any desired construction. Within the tube 10 a block 11 of suitable insulating material, such as lava, is mounted upon the relatively heavy connectors 21 and 28 attached to the leading-in wires 12a sealed in stem 12 formed integral with the body of the tube. The block 11 which fits closely within the tube (see Fig. 4) is provided centrally with an elongated opening 13, intended for the passage of the filament electrode supports, as hereinafter described.



H. K. Sandell's Radio Receiving System

A second block 14, of insulating material such as lava, is supported within the tube in spaced relation to the block 11, and likewise fits closely against the wall of the tube (see Fig. 3). As shown in the construction illustrated the supporting and spacing means may be constituted by the grid and plate elements of the tube.

The metallic plate elements 15 and 16 of the tube are preferably rectangular in shape. The central portions thereof may be formed with undulations or corrugations extending, if desired, substantially the entire distance between the supporting and spacing blocks 11 and 14. The plates 15 and 16 are secured in suitable slots 17 in blocks 11 and 14 and are privided with connecting stems or wire 18, shown in full lines in Fig. 5 and in dotted lines in Fig. 1, extending through the outer block 14. Where more than one interconnected plate is utilized, as illustrated in the drawings, at least one plate 16 is provided with a connecting stem or wire 19. A suitable metallic conductor 20 may be employed to connect the projecting stems 18 of the plates 15 and 16, and a suitable leading in conductor 21 passes from the projecting end 19 of one of the connected plates 16 through the stem 12 of the tube to the exterior.



Space Current Device Patented by H. K. Sandell

MULTIPLE REGENERATIVE LOOP

(Patent No. 1,479,638, issued to Vladimir K. Zworykin, of Kansas City, Mo., under date of January 1, 1924.)

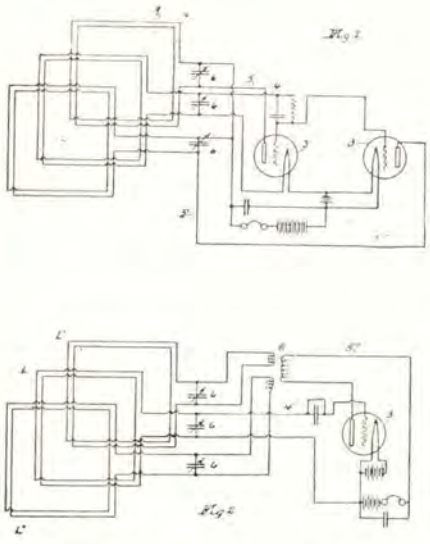
The present invention relates to radio receiving apparatus, and aims to devise a novel multiple receiving loop construction adapted to produce a regenerative effect and also to afford a simpler and more convenient means for tuning.

To this end I provide a plurality of antenna loops, all designed to act as receiving loops and so arranged as to mutually influence each other for creating a multiple regenerative effect. The arrangement of the loops is also designed to enable the tuning of the receiving circuit to be carried out without affecting the directional properties of the loops or interfering with each of them receiving the maximum energy of the signals.

Figure 1 is a diagrammatic view showing the circuit of a receiving apparatus, including a multiple receiving loop structure embodying the present invention; and

Figure 2 is a similar view illustrating a modified arrangement of the receiving loop connections.

Referring to the drawing in detail, this illustrates a receiving circuit including a pair



Multiple Regenerative Loop Antenna and Circuit

of vacuum tubes 3 and a set of three receiving loops, namely a main receiving loop L, in the grid cricuit 4 of said tubes, and two loops L′ and L″ in the plate circuits 5 and 5′ respectively, all three loops being permanently coupled in proper relation, the shape and particular relative mounting of the loops being immaterial so long as each loop is properly tuned and directed to the signals being received. For this purpose each loop may be provided with a variable condenser 6, although a single variable condenser can be used in connection with the main receiving loop L and constant condensers in connection with the loops L′ and L″, the loop L being permanently close-coupled with the two other loops and all three mutually influencing each other.

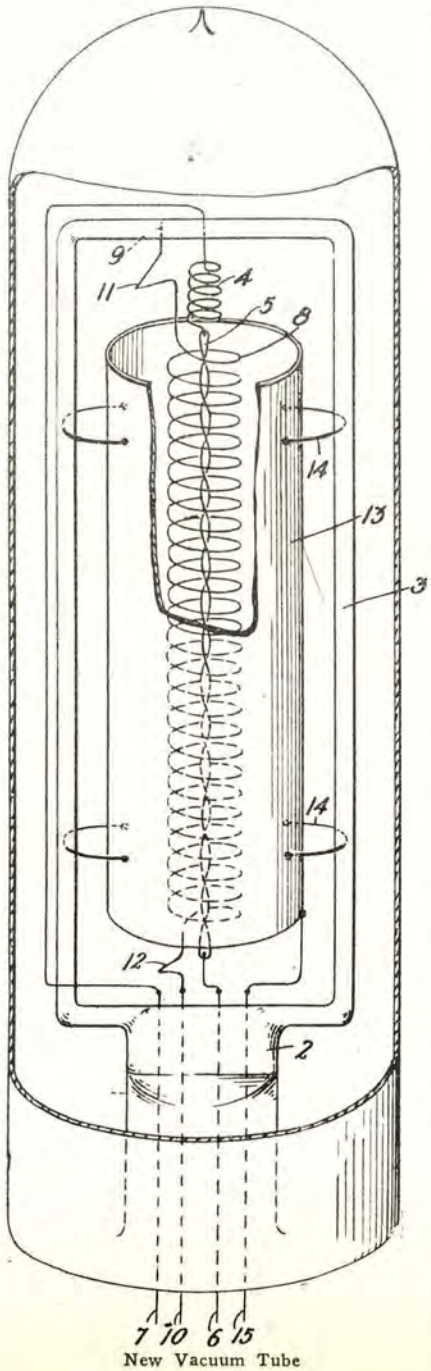
By means of this circuit a novel regenerative effect is produced in a manner which is not simply a modification of the well-known regenerative circuit. In the ordinary circuit the energy received is fed back to the main circuit for producing the regenerative and heterodyne effect, while in the present case the energy is received by all the loops, respectively, and these influence each other and produce multiple regenerative actions, according to the number of loops employed. By the circuit just described, the two-tube connection provides a double regenerative effect, and by the use of a single variable condenser 6 for the loop L the tuning of the entire apparatus may be properly carried out without interfering with the directional property of the loop set or the efficiency of each loop for responding with maximum effect to the full strength of the signals.

VACUUM TUBE

(Patent No. 1,480,219, issued to Alexander McLean Nicolson, of New York, N. Y., issued under date of January 8, 1924.)

This invention relates to improvements in vacuum tubes for instance, of the audion type which may be employed as amplifiers, detectors, modulators, oscillators, etc.

An object of the invention is to increase the efficiency of such tubes so that a better control of the electron stream in the tube may be secured. This is done by providing a novel form and space relation of the electrodes. In this case a straight filament is symmetrically surrounded by a helical input electrode which serves as the grid. The output electrode is a cylindrical shell concentric with the grid electrode. The electrons pass in all radial directions from the filament through the interstices of the helical grid to the surrouding cylindrical output electrode. Thus the electrons pass to the output electrode no matter what path they may take from the filament, and all of the electron paths are intercepted by portions of the helical grid, with this arrangement of electrodes, the space current flowing between the filament and output electrodes is efficiently controlled by the input potential applied to the filament and grid electrodes.



New Vacuum Tube

The invention further resides in the means for mounting the electrodes in the relation above stated.

The audion shown in the drawing comprises an evacuated bulb 1 having the usual squash or press 2 from which rises the glass rod support 3. As shown in the drawing, the squash 2 forms the upper part of a tubular stem which is sealed into the lower end of bulb 1. Sealed in the top of the glass rod 3 is a spring 4 of nickel wire, for instance, to the lower end of which is fastened a filament 5 of twisted platinum wire, which may be coated with an alkaline earth compound in order to increase the thermionic activity of the filament. Current may be supplied to the filament through the leading-in wire 6 connected to the lower end of the filament and through the leading-in wire 7 connected through the spring 4 to the top of the filament. Surrounding the filament is a helical input electrode or grid 8, supported at 9 in the top of the glass rod 3. Electrical connection may be made to the grid 8 by means of the terminal 10 connected to the lower end of the grid. This grid is preferably mounted under axial tension to compensate for any sagging of the grid that might otherwise occur when the same becomes heated under operating conditions. This tension of the grid 8 and also the proper adjustment of this grid with respect to the filament 5 may be secured by kinking the outer terminals of the grid 8 as shown at 11 and 12. Concentrically surrounding the grid and filament is the output electrode or anode 13 which is in the form of an open-ended cylindrical shell. The output electrode 13 is suitably supported by wires 14 which are soldered to the cylindrical shell and which are sealed in the glass rod 3. Electrical connection may be made to the output electrode 13 by means of the terminal 15 electrically connected to the lower end of the electrode 13.

Amateurs Are Future Radio Scientists

"The assurance of the success and further development of radio largely depends upon the continued world-wide interest of the amateur," said Owen D. Young, chairman of the board of the General Electric Company, and chairman of the board of the Radio Corporation of America, in a recent talk from WGY in Schenectady, N. Y.

"I consider that one of the greatest assets of any new art is to have the youth of the world confident in its future. And what an immense resource this promises to be. This fact alone gives us assurance that radio is here to stay.

"History records clearly that the greatest inventions have been made by men under thirty years of age. Literally hundreds of thousands of the youth of our country are now interested and at work on radio problems. We have then the future inventive genius of the world already preparing to add to its great contributions. Many of the present great inventions have been made by such young men lured on by the unique and romantic characteristics of their subject.

"Mature scientists are seeing the latent possibilities of radio and are making great progress. The amateurs of today will be the scientists and radio engineers of tomorrow. Not only from the great research laboratory, but from that little spare room in the attic and that old workbench in the cellar will come great new discoveries."

Tuned Radio Frequency For Distance

By ALVIN RICHARD PLOUGH

THE question of which is the most popular circuit to have in a radio receiver comes up hundreds of times in the minds of the prospective purchasers of radio equipment. He is faced by a multiplicity of circuits and usually relies upon the advice of a friend or the salesman in his ultimate purchase.

There are many good circuits to be found in modern equipment but a recently prepared chart shows that tuned radio frequency has been rising from the lowest position in the list of hook-ups to that of the highest. This graph shows eleven circuits and tuned radio frequency is disclosed as the last in July, 1923, and in the forecast, it is first in July, 1924.

Why should there be this gradual increase in the demand for tuned radio frequency? Is it because the radio fans have tired of the freak circuits or is it a better understanding of the principles and efficiency of the T R F hook-up? It surely must be the latter reason.

Simplicity of Tuning

This trend of popularity for the T R F circuit in a radio receiving set is no doubt due to the simplicity of tuning this type of receiver. In the accompanying diagram, it will be seen how easy it is to operate a set of this description.

There are a great many other reasons for selecting a receiver of this type and one of the most essential, is its selectivity. A receiver which is not capable of tuning out a station not desired, is of little value in these days of fine programs from the broadcast stations. The old-fashioned receiver will not tune sharply enough to overcome the annoyance of hearing undesired stations. In the Crosley Model XJ, for example, it was possible to tune out local stations and receive with fine volume, the distant broadcasting stations.

Distance alone is hardly worth the trouble of purchasing or making a tuned radio frequency set, for with this distance, there should be volume. As previously stated, the experiment made with the Crosley set showed a fine quality and sufficient volume to operate a loud speaker, picking up a distant station while a local one was in operation.

Perhaps it would be well at this time to give a brief outline of tuned radio frequency amplification. When the antenna accumulates the high frequency currents, it is the function of a radio frequency amplifier to increase the intensity before they are impressed upon the detector for rectification. In this way, the incoming wave from a distant station may be made as strong as that from a local station, compensating for the weakening of the wave due to distance.

Antenna Tuning Necessary

One would immediately assume that radio frequency amplification can be accomplished in the same way as is done with audio frequency amplification. Transformers for radio frequency amplification are available but their limitation lies in the fact that broadcasting stations operate at different frequencies or wavelengths and the design of such transformers must be a compromise which means reduced efficiency to cover the necessary band of wavelengths. If, however, a tuning unit is used, composed of a condenser and inductance, as in the case of antenna tuning, maximum efficiency may be obtained over the entire range of the receiving set. This tuned radio frequency amplification was first put on a commercial basis in Crosley apparatus.

The term radio frequency current is applied to those currents oscillating at frequencies between 20,000 and several million cycles each second. Providing a telephone receiver would vibrate at radio frequencies, it would be impossible to hear the signals or music, as the human ear will not register signals having a frequency greater than about 2,200 cycles.

These technical descriptions, however, are hardly necessary for the average person who is seeking a radio receiver and wants to know which one is best for his particular use. Perhaps a few experiences with a tuned radio frequency receiver might be interesting.

When the Baltimore and Ohio Railroad officials desired a radio receiver to place on their train between Cincinnati and Louisville in an experiment to determine the possibility of such a service to their patrons, it was a tuned radio frequency set that successfully picked up broadcast concerts which were heard by the passengers as the train was in motion.

Another experiment which will show the power of the radio waves to penetrate steel and concrete was made in a vault in the Bank of Commerce, Memphis, Tennessee. A tuned radio frequency receiver, similar to the one illustrated, was used. Representatives from the newspapers, bank officials and J. L. Woods were locked in the vault, whose door weighs nearly seven tons, and with a loop aerial, broadcast concerts were heard.

There could be written many other interesting experiments with a tuned radio frequency receiver, but space will not permit their telling.

Short Aerial Cuts Down Interference

When interfering is annoying do not get wave traps, as it is seldom that the average fan can operate them successfully. It would be better to use a shorter aerial or improve the set to a more efficient one. An aerial 25 feet long will often make an unselective set extremely selective.

Knock-Down Neutrodyne Set for Mechanics

IN ORDER to help the radio fan who wants to build his own set and yet isn't sure about all the necessary parts and how to put them together, the WorkRite Manufacturing Co. has recently put on the market their WorkRite Neutrodyne Outfit.

This contains all the necessary parts for a five-tube Neutrodyne receiving set, even including a drilled panel, baseboard, mounting angle so that transformers will be set at right angle, and a complete instruction book. If desired for a small additional cost this outfit will be furnished in a mahogany cabinet suitable for use in building the set.

For the benefit of those fans who desire to shop around for their parts and yet want to be sure that the most necessary parts are of the right kind, the De Luxe model WorkRite Neutrodyne kit at $25 has been added to the Workrite line. The kit contains variable condensers, neutrodyne transformers, Neutrodons, and dials as well as mounting angle, full size panel layout, and complete instructions.

Anyone who intends to build a Neutrodyne set should find one of these assemblies of WorkRite parts of great help to them. A circular with complete information may be had by writing to the manufacturer, the WorkRite Mfg. Co., Cleveland, Ohio.

Many Stations Use Willard Batteries

Events move quickly in the radio world.

Radio broadcasting station WTAM, at Cleveland, Ohio, boasted last fall, when it opened, that it was the only station without a generator hum, and the only station using storage batteries for transmission power exclusively.

There are now 16 stations scattered throughout the country that have installed Willard broadcasting batteries as their only source of power. This is said to be on the strength of WTAM's success with these batteries.

Besides the 16 stations there are 101 more using Willard broadcasting batteries in connection with their generator or rectified A.C. power for voice modulation and other purposes.

The radio staff at WTAM has been reading the handwriting on the wall and in order to maintain the reputation for excellence of transmission, gained when WTAM was the only battery powered station, have turned their attention to improving other features of the station. If you hear a strong station broadcasting under the call letters 8XG, it is WTAM trying out some new broadcasting stunt to improve transmission. The experimental call letters of the Willard Storage Battery Company are 8XG.

Movies and Radio

Whether or not the "radio fad" is really just a fad, motion-picture producers frankly admit that the widespread enjoyment of radio programs is making a difference in the attendance at motion-picture theaters, says the Los Angeles Times.

"Oh, we know when there is a fine radio program," admitted Marcus Loew, president of Metro, when he was in Hollywood a fortnight ago. "When there is to be a broadcasting of a speech by someone really notable, attendance at the theaters slackens, unless the pictures shown are of really fine quality.

"No, radio competition does not worry us. There is an obvious way to meet it—to make only good pictures. In times past people went to picture shows whether they were good or bad. Now they'd rather hear a good radio program than to see a poor picture. It's up to the producers, you see. A great musician, a great statesman on the air—these will always keep some people at home. But good pictures will not be neglected in favor of merely average radio programs.

The WorkRite Kit Assembled

Directive Type of Radio

Recently an airplane flew to Dayton from a point a hundred miles away, the pilot depending for guidance entirely upon the signals received from a new type of radio beacon. In his receiver he heard the letters A and T (- — --) repeated over and over. As long as he flew along the correct course both letters were equally loud, but the moment he got off the course to one side or the other one letter became noticeably louder than the other and showed him which way to get back. An ordinary airplane receiving set was used.

This beacon, which was developed by the Bureau of Standards, Department of Commerce, in cooperation with the U. S. Signal Corps and the Army Air Service, consists of two coil antennas placed so as to cross each other at an angle of 135 degrees. Each consisted of a single turn of wire 100 feet long and 50 feet high. The transmitting set is automatically connected first to one and then to the other, one letter of the signal being sent over each. The signal from an antenna of this type varies from a maximum in the plane of the coil to almost zero at right angles. A receiving set located along the line bisecting the angle between the coils will therefore receive signals of equal intensity from both, and the ship or airplane carrying the receiving set can thus be guided along without regard to conditions of visibility.

Vibrationless Tube Socket

There is a new vacuum tube socket on the market. It is known as the Cle-Ra-Tone, and is manufactured by the Benjamin Electric Manufacturing Co., Chicago. It is quite unique in construction. The tube-holding element of the socket floats on light springs which act as shock absorbers and neutralizes all interfering vibrations which ordinarily would cause "tube noises." The general effect is clearer reproduction, it is said.

Vibrations which interfere with clear reproduction by the radio tube are of two kinds: (1) that caused by jar such as might occur from striking the receiving set with the hand or clicking the switch lever from one point to another; and (2) probably the more offensive kind called microphonic. These microphonic vibrations might be produced by footsteps in the same or adjoining rooms or by street cars passing nearby or other such noises which are often, in large cities, noticeable only by their absence as in the stillness of the night. Noises of this kind set the tube filaments in motion and are reproduced as very offensive disturbances over the phone.

It is the ability of the new Benjamin Cle-Ra-Tone socket to eliminate these microphonic noises which makes it of great value. This shock-absorbing feature also protects the lamp and is therefore excellent for portable receiving sets which are subjected to shocks in moving from place to place.

The shock-absorbing feature is in no way interfered with by stiff bus wiring because the wiring terminal base is separated from the tube-holding element by the tight springs mentioned above.

The Benjamin radio socket is made in two sizes—one for standard base tubes and the other for UV-199 types.

Body Capacity Eliminated in Condenser

THE Crosley variable condenser has been so designed as to provide direct positive metallic contact with the charging plates of the condenser, thus eliminating the serious contact resistance which is introduced by spring and friction contacts in the usual form of variable condenser. The internal resistance caused by imperfect contact between the plates and spacing washers of the rotary and stationary members of an interlocking condenser is entirely eliminated in the Crosley condenser.

Not only has the Crosley type condenser many factors designed to improve the overall electrical efficiency but the arrangement of the plates is such that a minimum electric field is produced around the condenser. This condition is of most importance where condensers are employed in circuits which require very delicate and precise adjustment.

With condensers of the usual type the stray electric field is quite strong for a distance of three or four inches from the plates. When the operator's hand is placed in this field the capacity of the condenser is naturally altered, thereby preventing the proper resonant adjustment of the receiving circuit to the most efficient position. In the Crosley condenser, however, this objectionable feature is completely removed. A demonstration of the fact can be made by moving the hand over the condenser while sharply tuned to a transmitting station without the least reduction in signal strength.

The Crosley Condenser depends upon a thin sheet of high di-electric material as insulation between the plates. As there is no friction from the opening and closing of the plates, the insulation will last as long as the condenser.

Tests have shown the maximum capacity to never be less than .0008 Mf. This frequently runs better than .001 Mf. It is conservatively rated at .0005 Mf.

Each Crosley Variable Condenser is carefully tested to withstand one thousand volts before shipment.

The heart of any receiver is the variable condenser. The superiority of the Crosley book-type variable condenser over the old type interlocking plate air condenser is now generally admitted for the following reasons:

1. Rugged construction that prevents damage.
2. Freedom from short circuits.
3. Permanent metallic contact with plates eliminates sliding contacts.
4. Minimum stray electrostatic field eliminates body effects when tuning.
5. Liberal leaking paths through condenser.
6. Grounded frame provides electrostatic shield.
7. Minimum high frequency resistance or energy loss.
8. Maximum variation in wavelength with fixed coil.
9. Maximum mechanical and electrical efficiecy.
10. Minimum cost.

The substitution of a Crosley condenser for any other type of commercial receiving condenser, in any receiving set or circuit, will greatly increase the range, volume and simplicity of tuning.

Repeater Phones Give Service

THERE are many new makes of headphones on the market, priced all the way from $2.98 up to $15, which give varying degrees of satisfaction, but we have yet to find among the low priced phones a better one than the Repeater Phones, put out by Moss-Schury Manufacturing Company, Inc., of Detroit.

These phones are made in their own factory and their output at the present time is 500 pairs a day. It is not an assembled proposition but every part is manufactured in the Moss-Schury plant, and only the best of materials and workmanship enter into it.

Of particular interest is the coil construction, which is wound directly on the round center pole piece. Before the magnet is wound however, the pole piece is Parker rust-proofed and then treated with an insulating lacquer. Over this is placed a layer of waxed insulating paper. The poles are wound with No. 40 enameled wire of 1,200 ohms each. These phones are well matched and due to the few parts cannot get out of order. They are practically foolproof.

New List of Radio Stations

A revised and up-to-date list of all broadcasting stations licensed by the government is in the March issue of the Department of Commerce's "Radio Service Bulletin." This pamphlet was on sale by the Superintendent of Documents, Government Printing Office, Washington, March 12, for five cents.

The February issue of about 20,000 copies, which contained the first complete list of stations broadcasting entertainments, issued since last June was almost immediately exhausted, and at the request of the Public Printer the list is repeated in the March issue and 20,000 copies ordered.

Another feature of the March number is a history of the development of radio, with important events listed in chronological order. The yearly subscription to the Service Bulletin is 25 cents a year.

Europe Part of U. S. Audience

(Continued from page 10)

that does the repeating is located on top of a nine-story building in the Westinghouse plant at East Pittsburgh, Pa.

A Sensitive Set

Because of the fact that high frequency sets are sensitive and can be thrown off their wave easily, the whole set is mounted on springs to guard against jars. To prevent the swinging of the antenna, it is drawn taut between its uprights and the down leads consist of copper tubing. The various inductances on the set are wound on rigid forms with copper forming all leads.

The transmitting set consists of three panels as follows: The rectifier panel, the modulator panel and the oscillator panel. All the equipment represents the last word in transmitting apparatus with water-cooled tubes and special condensers.

The short wave transmitter is almost an exact duplicate of the big transmitting unit at KDKA with the changes necessary to efficiently work on the high frequencies.

One of the most striking things about the short wave transmitting set is the extremely short antenna used. The antenna at KDKA for use with the short wave receiver is slightly in excess of 35 feet. When the size of this antenna is compared to the 200 feet lengths of the antenna used for regular broadcasts the result is striking. That this small antenna will be sufficient to send broadcasts over the ocean is scarcely believed by many who see it.

Small Antenna Used

In England the law prohibits large antenna, with the result that most antenna are under 40 feet. The result of this is that radio frequency receivers are the common apparatus used, so that the reception of the short wave signals is ideal on the continent.

The great difference in frequency between the short wave broadcasts (under 100 meters) and the common wave length band, approximately 360 meters, can be noted by comparing the kilocycle frequency of two such waves.

East Pittsburgh commonly transmits to England on a wavelength of 94 meters, which is a frequency of 3200 kilocycles. At the same time KDKA is broadcasting to its regular broadcast audiences of 326 meters which is a frequency of 960 kilocycles. This difference in frequency tells much of the story of the short wave broadcasting.

Tests have proved that the high frequency broadcasts go farther with the same power input than the ordinary broadcast waves. It has also been proved that daylight has little effect, if any, on this carrying power. These two qualities of the short waves are what is going to affect the future of broadcasting and bring a new broadcast era in the New Year just started.

The latest thing in christenings was the dedication by radio of the Lincoln Yacht Club, Chicago, by Capt. Donald B. MacMillan, Arctic explorer, from a point eleven degrees below the North Pole.

Breaks World's Radio Speed Record

NEW YORK.—The world's speed record for copying of radio telegraph code signals was shattered when A. E. Gerhard received straight copy at the astounding speed of 59½ words per minute, at a contest held at the Fourth Annual Convention of the 2nd District Executive Radio Council at the Pennsylvania Hotel, March 7th.

Gerhard is an operator in the employ of the Radio Corporation of America, and his remarkable feat of raising the former world's record of 56 words per minute has given him the plaudits of the entire radio world.

What a remarkable accomplishment this is can best be appreciated, perhaps, when one figures that his record is three times as fast as the usual speed used in ship radio communication. Mr. Gerhard is here shown holding the treasured trophy awarded by the 2nd District Executive Radio Council to the winner of the contest.

Hunters Use Radio

A radio set has become as important and necessary a part of the duffle-bag equipment of a hunter as matches or a hand axe. Frederick S. Jones and Judge Sanford L. Fogg, residents of Augusta, Me., recently returned from a hunting trip in Maine, wrote WGY, the Schenectady, N. Y., broadcasting station, that the evenings after hard days in the woods were passed in listening to radio concerts from many parts of the United States. They also picked up the news items from WGY, and felt as well informed on the news as though they had been at home. The radio set was equipped with diaphragm for loud speaker, but had no horn. A sheet of tarred paper torn from the side of an adandoned tent was rolled in the shape of a horn and made an excellent loud speaker, so the hunters claim.

Long Distance Record

Using an indoor aerial of lamp cord, Jose Franco Frazao of 16 P. de Rio De Janeiro, Lisbon, Portugal, heard WGY, the Schenectady, N. Y., broadcasting station, January 22. The signals, picked up on three tubes, operated a loud speaker.

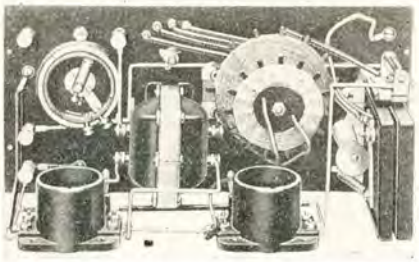
New Two-Tube Receiver

THE new Crosley Model 51, incorporating a tuning element made famous in the Model V receiver used by Leonard Weeks of Minot, N. D., in his consistent handling of traffic with

New model 51, made by Crosley, which has detector and one-stage of audio-frequency amplification. This is proving a very popular set.

McMillan's Expedition at the North Pole, has met with instantaneous success since it was first placed in the hands of distributors by the Crosley Radio Corporation.

This new set sells for $18.50, and consists of a detector using the genuine Armstrong regenerative tuning and detector circuit, with the addition of one stage of audio-frequency amplification.



Rear view of Crosley 51 receiver, showing two-tube Armstrong regenerative hook-up. One multistat operates both tubes.

This makes it possible to use a loud-speaker upon local stations that have exceptionally high power transmitters. One Multistat takes care of both filament voltages in the two tubes used. Provision is made for a "C" battery and a grid leak if the owner desires to use them. A two-step audio frequency amplifier may be used in connection with this set. Production of this set reached over 500 a day within twenty-four days after the set was made from a suggestion by Powel Crosley Jr., who conceived the idea while on a hunting trip in Tennessee.

WHAZ Holds Record

So far as reported to date no radio telephone broadcast has circled the globe, but the spoken radio message and music have been heard nearly half way around the earth. When the latter is actually accomplished it may be said that the world has been circled by the radio wave, which, of course, travels in both directions. During the present season of best radio transmission in the northern hemisphere, which is practically the third season for general radiophone broadcasting, an increasing number of American radio stations are reporting long distance reception that is truly remarkable, and each in turn is putting forth claims to the distance record.

A few weeks ago WJAZ, at Chicago, which claims to have been the first of the several stations in the United States whose broadcasts have been picked up by the Donald MacMillan polar expedition now frozen in within the Arctic Circle, reported that one of its broadcasts was logged in the Samoan Islands, a distance of about 7,000 miles from Chicago. During the Brazilian exposition early last year the Westinghouse station erected on the mountain overlooking the bay at Rio de Janeiro was reported picked up by a receiver in Hawaii, an air line distance somewhat in excess of the Chicago broadcast. About the middle of February the Twin City Radio central WLAG at Minneapolis-St. Paul, Minn., received notification of the reception of its broadcast in Batum, Russia, 6,623 miles away. At about the same time station WGY at Schenectady, N. Y., received a letter from Capetown, South Africa, that its program on the night of January 4 had been recorded by a listener there. The airplane distance from Schenectady to Capetown is 7,880 miles, or about one-third the distance around the earth.

But the real long distance record for radiophone broadcasting of both spoken words and music, which still remains unbroken, was established by station WHAZ at the Rensselaer Institute, Troy, N. Y., more than a year ago, when during the first week of February, 1923, special programs broadcast during the early hours of the morning, were clearly heard on four successive days by L. R. Steele, official Awarua receiver at Invercargill, New Zealand, an airline distance of 9,577 miles from Troy, or nearly 2,000 miles further than any other radiophone broadcast has yet been received.

Get a Job Like These

Earn $3500 to $10,000 a Year

in the Big Pay Field of ELECTRICITY

20 Years Old—Makes Almost $500 a Month

Harold Hastings of Somers, Mass., says: "The profit on my electrical business amounts to $475.00 a month. My success is due entirely to your instruction. You make your men just what you say—Electrical Experts. No man will ever make a mistake enrolling for your course."

Dickerson Gets $7500 a Year

"I earned $30 a week when I started with you—$50 a week when half through your course. Now I clean up at the rate of $7500 a year. Thank you a thousand times for what you did for me. Electricity pays big on the farm." Herbert M. Dickerson, Warrentown, Va.

$20.00 a Day for Schreck

"Use my name as a reference and depend on me as a booster. The biggest thing I ever did was answer your advertisement. I am averaging better than $500 a month from my own business now. I used to make $18.00 a week." A. Schreck, Phoenix, Ariz.

Pence Earns $9000 a Year

W. E. Pence, Chehalis, Wash., says: "Your course put me where I am today, Mr. Cooke—making $750 a month doing automobile electrical work—think of it—$9000 a year. Besides that I am my own boss. My wife joins me in thanking you for what you did for us."

$30 to $50 a Day for J. R. Morgan

"When I started on your course I was a carpenter's helper, earning around $5.00 a day. Now I make from $30 to $50 a day and am busy all the time. Use this letter if you want to—I stand behind it." J. R. Morgan, Delaware, Ohio.

Spare Time Work Pays Stewart $100 a Month

"Your course has already obtained a substantial increase in pay for me and made it possible for me to make at least $100 a month in spare time work. You can shout this at the weak fellows who haven't made up their minds to do something yet." Earl Stewart, Corona, Calif.

It's your own fault if you don't earn more. Blame yourself if you stick to your small pay job when I have made it so easy for you to earn $3500 to $10,000 a year as an electrical expert. **Electrical Experts** are badly needed. Thousands of men must be trained at once. One billion dollars a year is being spent for electrical expansion and everything is ready but the men. Will you answer the call of this big pay field? Will you get ready now for the big job I will help you get? The biggest money of your life is waiting for you.

I Will Train You at Home

I will train you just like I trained the six men whose pictures you see here. Just like I have trained thousands of other men—ordinary, everyday sort of fellows—pulling them out of the depths of starvation wages into jobs that pay $12.00 to $30.00 a day. Electricity offers you more opportunities—bigger opportunities—than any other line and with my easily learned, spare time course, I can fit you for one of the biggest jobs in a few short months' time.

Quick and Easy to Learn

Don't let any doubt about your being able to do what these other men have done rob you of your just success. Pence and Morgan and these other fellows didn't have a thing on you when they started. You can easily duplicate their success. Age, lack of experience or lack of education makes no difference. Start just as you are and I will guarantee the result with a **signed money back guarantee bond.** If you are not 100% satisfied with my course it won't cost you a cent.

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In addition to giving my students free employment service and free consultation service, I give them also a complete working outfit. This includes tools, measuring instruments, material and a **real** electric motor—the finest beginners' outfit ever gotten together. You do practical work right from the start. After the first few lessons it enables you to make extra money every week doing odd electrical jobs in your spare time. Some students make as high as $25 to $35 a week in spare time work while learning. This outfit is all FREE.

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The coupon below will bring you my big free electrical book—over 100 interesting pictures. The real dope about your opportunities in electricity—positive proof that you, too, can earn $3500 to $10,000 a year. Send for it now. Along with the book I will send you a sample lesson, a credit check allowing you a $45.50 reduction, my guarantee bond and particulars of the most wonderful pay-raising course in the world. Send the coupon now—this very second may be the turning point in your life. Send it while the desire for a better job and more money is upon you, to

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WorkRite Former

$2.00

This aircore Transformer has been perfected for use in the Neutrodyne method of receiving. It should be used with .0004 mfd. variable condenser for tuning to all broadcasting wavelengths. It can also be used as a transformer for tuned radio frequency reception, or fixed coupler with condenser across secondary. It is made with tubes of moulded Bakelite and wound with green silk wire. Extreme care has been taken to see that the tubes are properly spaced and just the right number of turns of wire are used, insuring maximum efficiency. Like all WorkRite products, it has been thoroughly tested by other laboratories as well as our own before being put on the market. It will measure up to the "WorkRite" standard of quality and efficiency.

Watch for the WorkRite Variable Condenser

WorkRite Super Vernier Rheostat

This improved WorkRite Vernier Rheostat is just the instrument you have been looking for, 50,000 possible adjustments. A turn of 1-32" will separate two stations or clear up one. Made in three different resistances so that there is a WorkRite Vernier Rheostat for every tube now on the market. 6 ohms, $1.00; 15 ohms, $1.15; 30 ohms.....$1.25

WorkRite E-Z-Tune Dial

Snappiest Dial on the market. Has a knurled flange on the rim for delicate leverage. Price 75c

WorkRite Resistance Cartridge

Raises the resistance of your 5 or 6 ohm Rheostat to the 15 or 30 ohms required for UV 199, and similar tubes. Price, either 15 or 25 ohms.....40c

WorkRite Neutralizing Condenser

WORKRITE

Neat, compact and very efficient. This instrument has a glass insulation on the outside which greatly expedites neutralizing the set. Price each, 25c.

WorkRite Tuner Team

WorkRite Super Variometer

WorkRite 180° Super Variocoupler

Tunes out local stations and gets the one you want. This famous Tuner Team is made up of two WorkRite Super Variometers and one WorkRite 180° Super Variocoupler. Variometer is made from polished mahogany. Variocoupler made from moulded Bakelite and wound with green silk wire. Range 150 to 705 meters. Shaft 3-16".

WorkRite Super Variometer, each.....$3.50

WorkRite 180° Super Variocoupler, each.....$3.50

"WORKRITE RADIO PARTS WORKRITE"

WorkRite Nonmicrophonic Socket

Here is the right Socket for use with your UV 199 and C 299 Tubes. It is moulded with a sponge rubber base in one piece which is even better than the soft rubber recommended for use with these tubes. Very neat and attractive. Price 60c

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You need one for your storage "A" battery. Full instructions with each instrument. Price 75c

WorkRite Head Set

Very Sensitive. Light and sanitary. Try one and see. Price $6.00

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Just what you want. Use the block for drilling panel. Arms and points made to work together. Price 50c

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The SIGNAL FIRE of TODAY

PIONEERS of the old west were amazed to see how quickly the Indians learned of their presence.

The advance of a wagon train was known days ahead. Even a lone trader was known long before he arrived in the Indian camp.

Eventually the pioneers learned that the savages had a highly perfected signal code. From mountain top the signal fire blazed its message at night, or by day sent up its smoke in columns, wreaths, puffs—white smoke, black smoke—it carried a story far and wide.

Gone are the signal fires. Scattered are the tribes. Today the Westerner in remotest places receives his message by Radio—the Modern Signal Fire.

The Crosley Radio Corporation owns and operates Broadcasting Station WLW

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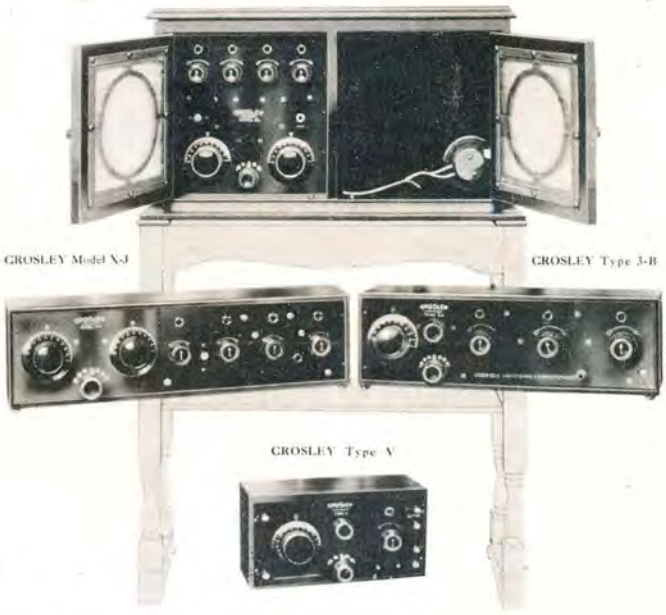
CROSLEY Model X-L Consolette



CROSLEY Model X-J

CROSLEY Type 3-B

CROSLEY Type V

A CROSLEY RECEIVER FOR EVERYONE

CROSLEY TYPE V PRICE $16.00

A one-tube regenerative set, licensed under the Armstrong U. S. Patent No. 1,113,149. Actual performances of this little receiver have proven a revelation to the radio world. The McMillan expedition has consistently been clearly brought in with this instrument as well as Honolulu and other far distant points.

CROSLEY TYPE 3-B PRICE $42.00

This 3-tube regenerative receiver licensed under the Armstrong U. S. Patent No. 1,113,149 combines the Crosley Type V and the Crosley two-stage amplifier. In the hands of amateurs and professionals alike it has consistently out-performed sets costing a great deal more. A person hearing a broadcasting station may turn off the set by throwing switch and come back later without re-tuning.

CROSLEY MODEL X-J PRICE $55.00

A four-tube radio frequency set combining one stage of Tuned Radio Frequency Amplification, a Detector and two stages of Audio Frequency Amplification. At bringing in distant stations we believe no instrument can equal it. Local interference is easily and quickly tuned out. We unhesitatingly claim that the Crosley Model X-J is the best receiver ever offered to the public.

CROSLEY MODEL X-L Consolette PRICE $120.00

A duplicate of the Model X-J except for the arrangement and mounting into a beautiful mahogany cabinet with the addition of a built-in loud speaker. Space is provided in the cabinet for housing the necessary batteries. A special mahogany stand as illustrated in outline for the Model X-L may be had for $25 extra.

This instrument provides an exquisite piece of furniture for any home, together with all the pleasures of a long distance radio receiver.

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Write for Complete Catalog which fully describes the Crosley line of regenerative and radio frequency receivers and parts.

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