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Popular No. 225
Tuska Regenerative Receiving Set


Send for Catalog No. 14
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Write for "Musings of Dr. Mu."
Radio Topics
An Illustrated Monthly Devoted to Radio

Volume III APRIL, 1923 Number 3

Radio is playing a big part in the movies these days. This is a scene from the Preferred Pictures Corporation film, "Thorns and Orange Blossoms." The player operating the Kennedy set is Kenneth Harlan, star of the picture.

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The radio bill has been put over until December, or even the electric telegraph. The air has lent wings to the human voice that defy space. The broadcasting of stock reports has become a very important thing to the farmer with wheat and cattle to sell. And he’s taking every advantage of it.

Chicago is trying out the “silent night.” Now, if the amateurs and spark hounds will only desist on Monday nights maybe the “silent night” will mean something.

Do the girls wear those radio boots so they can sidestep the damp waves, ‘er what?

### Editorial of the Month

**Broadcasting Records**

(Chicago Journal)

The broadcasting record for a woman’s voice is claimed for a recent test covering 3,500 miles of space.

At Douglas, Alaska, on the night of January 6, Mrs. Robert E. Coughlin plainly heard “Mother Machree” being broadcasted from station PWX. The singer was Miss Harriet Williams, a member of the staff of the American consul-general in Havana, Cuba. The Cuban Telephone Company verified the record.

The distance, 3,500 miles, easily establishes the feasibility of broadcasting the human voice across the Atlantic ocean. Some allowance must be made for the wonderful atmospheric rarity of northern latitudes like northern Canada and Alaska in mid-winter. But, when atmospheric conditions are right, radio transmission from east to west, and vice versa, has already scored wonderful records.

One can appreciate only faintly what it means to those who are imprisoned in high northern latitudes in winter to be suddenly brought into intimate touch with the outside world. In lonely Hudson Bay Company’s posts, in northern Canada, radio sets are now a portion of normal equipment. In the faraway hamlets that stretch almost to the Arctic circle the long winter nights are lonely no longer, for the radio brings music and oratory and news bulletins from the great world to the south.

We live in an age of marvels, but each development in applied science is only, apparently, the vestige of a still more marvelous one. The regulation of “laws of the air” will bring order out of present crude experiments in broadcasting sounds. The scientific tuning of radio apparatus will preserve the most delicate shadings of the human voice through vast spaces.

Not so long ago it took days, weeks, or even months for intelligence from the outside world to penetrate hamlets on the outskirts of civilization.

Today the human voice, thanks to radio development, is becoming independent of railways, or post-offices, or even the electric telegraph. The air has lent wings to the human voice that defy space.
"Wired Wireless" to Solve Broadcasting Problem

COMPANY FORMED TO SELL BROADCASTED CONCERTS TO REGULAR SUBSCRIBERS—$60,000,000 CORPORATION

Is the question of "who is going to pay the artists who are nightly called upon to play at broadcasting stations," to be answered by the adoption of the plan sponsored by the North American Company? That some solution of this vexing problem must soon be arrived at every devoted radio fan in the country agrees.

Professional entertainers cannot afford to work for nothing, and the big companies have been sitting up nights trying to devise some system whereby they can get some return for this service besides the selling of receiving sets and accessories.

According to Variety, a New York theatrical weekly, this is the solution:

What will probably develop into the most gigantic radio undertaking yet is the plan now being developed by the North American Company, which is behind a "wired wireless" enterprise. It provides for centralized broadcasting stations, with the entertainment arranged by an official director. This service will be paid for by the radio subscribers, and, accordingly, will bring into demand talent from all spheres, which will be proportionately reimbursed for their services.

"It is the first official cognizance by the radio people that the talent must be paid for, and is to be considered as a very important factor in popularizing radio.

Plans Far-reaching

"The plans are so far-reaching and ambitious that were it not for the fact that a corporation which has since proved its success in supplying heat and power to various cities and townships is behind it, it would sound like the colloquial 'pipe dream.' The North American Company has for its basis the licensed patents of Major-General George Owen Squier, chief signal officer of the U. S. A., now consulting engineer of the corporation. The wired wireless is merely a patented device whereby the overhead aerial, ground wire and storage and dry battery cells are eliminated; the mere plugging in on the ordinary electric light wiring circuit serves as the means to effect radio communication. The plan is to sell the radio instruments on the monthly installment basis, as the electric light companies sell electric toasters, irons, vacuum cleaners, etc. In addition, the small charge for the entertainment service is added to the electric bill at the end of each month.

"A system of attuning to various wavelengths will permit the subscriber to tune into any division desired. These divisions are divided as follows: Dance music, opera and symphony orchestra concert, sermons and lectures, news reports of sporting events, topical news of the day, weather and agricultural events, etc., and light entertainment.

Crystal and Tube Used

"Experiments conducted for two months with the Cleveland Electric Illuminating Co. have proved the practicability of this new radio innovation to the satisfaction of the North American Company. The latter, by its license arrangement with General Squier, has the privilege of sublicenseing to anybody it sees fit. All that is necessary, technically, are a simple crystal set and vacuum tube receivers to facilitate loud speaking. The instrument itself is not much larger than the ordinary desk telephone, although a bit more bulky and clumsier in appearance. On it are the various dials to permit switching from one wavelength to the other.

"What effect on show business in general this new device will have is startling in its revolution-
AT last we have the "flivver" receiving set. It is so called not because of its low cost—the crystal set still holds the record for that and low up-keep—but because of its compactness and long distance record.

The one shown here is the handiwork of W. E. Foster, 2308 Bryant avenue, Minneapolis, Minn., and cost in the neighborhood of $8 to build. It is about as simple in design as any single circuit set could be, with but one control the 23-plate condenser, and occupies the space usually allotted to one unit of an ordinary set.

Mr. Foster claims he has heard programs broadcasted from Louisville, Ky., Atlanta, Ga., Los Angeles, and Fort Worth, Texas. He states it is extremely sensitive and there's no doubt it will be popular with the radio fans who are looking for a simplified hook-up with a long range.

There are no superfluous parts to this "flivver" and it will no doubt be the means of assisting many ardent fans to graduate from the crystal set class to the one tube contingent.

### Uncle Sam Issues New Radio Books

The United States Signal Corps is issuing a series of radio pamphlets describing the principles and operation of radio apparatus, with particular reference to the types of apparatus employed in the radio service of the Signal Corps.

Probably the publication of this series which is best known to the public is Signal Corps Radio Communication Pamphlet No. 10, "The Principles Underlying Radio Communication." It is a book of over 600 pages, which contains more than 300 illustrations, and is an elementary text covering the principles of radio communication and the more important radio methods and apparatus. A copy may be purchased for $1 from the Superintendent of Documents, Government Printing Office, Washington, D. C.

"Wave metres and Decimetre s," Signal Corps Radio Communication Pamphlet No. 28, has recently appeared. It contains fifty-five pages and a number of illustrations, including photographs. It discusses the principles of the measurement of the decrement of damped waves. Detailed descriptions are given of the construction of the various types of wave metres and dec imetres em ployed by the Signal Corps and instructions for their use. A copy of Radio Communication Pamphlet No. 28 can be purchased for 10 cents from the Superintendent of Documents.

### Court Decides Against "Bootleg" Tubes

JUDGE AUGUSTUS N. HAND, in the United States District Court, for the Southern District of New York, recently handed down decisions in three patent suits brought by the Radio Corporation for infringement of the DeForest audion patents by the manufacture and sale of vacuum tubes for radio purposes. In all three cases Judge Hand granted preliminary injunctions asked for.

The first of these suits was that of the Radio Corporation of America against La' France Import & Sales Company, Inc., and others, who are manufacturing and selling a vacuum tube known as the "La France" detector and amplifier.

The second suit was against Harry Rosenthal and others who are manufacturing and selling a vacuum tube detector and amplifier known as the "Perfection" tube.

The third suit was against the Radio Guild, Inc., a dealer in the "Perfection" tubes.

One of the principal defenses urged upon the Court for a denial of the preliminary injunction motions was that Radio Corporation of America had no rights to maintain the suit because the DeForest Radio Telephone and Telegraph Company was the owner of the DeForest audion patents. This defense, as well as other defenses, was overruled by Judge Hand in granting the preliminary injunctions.

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Famous "Flivver Radio," which can be built at a cost of about $8. It consists of a vernier rheostat, one 50-turn honeycomb coil, a grid condenser, 23-plate variable condenser and tube.

Hook-Up for "Flivver"
Photographs Sent by Radio

PORTRAIT OF PRESIDENT HARDING BROADCASTED FROM WASHINGTON TO PHILADELPHIA—PREDICTS MOVIES WITHIN YEAR

THE first successful transmission of photographs took place on March 3rd, a portrait of President Harding being placed in a camera-like outfit in the Naval Radio station at Washington, D.C., and was broadcast to another camera-like apparatus 130 miles away on the top of the Evening Bulletin building City Hall Square, Philadelphia.

A group of newspaper publishers, scientists and the inventor stood about the radio receiving set and watched a blinking star cause a little hair strung across the camera lens vibrate. The brilliancy of the shadow cast upon a photographic negative slowly evolved into the complete picture of the Chief Executive.

Test Was Successful
The test was under the auspices of the North American Newspaper Alliance. The apparatus by which the picture was sent is the invention of C. Francis Jenkins of Washington.

Mr. Jenkins, who watched the demonstration, believes within a year his apparatus will be sending motion pictures by the air. It is a simple step from the successful experiment of today, he is certain.

Experiments were attempted with three photographs, those of President Harding, Vice President Coolidge and Governor Pinchot of Pennsylvania. President Harding's portrait was the only distinct one received. The fact that the Bulletin Building is in a business district, with tall buildings on all sides, hindered perfect reception. Every structure nearby acted as a ground, so that many blemishes in the picture were due to the imperfections in radio reception, which will be eliminated with the progress of the science.

An apparatus had been installed on the tenth story of the Bulletin Building. It was a big camera, divided in two parts, with the lens in Washington and the photographic plates in Philadelphia.

The Mechanism Described
On one of the box-like mechanisms was a device made chiefly from an ordinary automobile headlight bulb. Something analogous to a periscope was attached to this, a vibrating mirror, whose purpose was to reflect the photographic rays of light.

The next step in the process was to procure a card to fit over the lens. A hole had been drilled about as wide as a pencil. An oblong slot several times longer than it was wide, was cut in the center of the card. An aperture remained, and it was placed so the center fitted over the hole. A black hair was pasted lengthwise down over the hidden coin, take the sheet from the table, and behold, a perfect copy of the money, Indian's head or bull.

Printed From Negative
The sending was done from an ordinary photograph. At the receiving end the process was reversed. The picture when received through the air was printed from a negative in the ordinary manner.

All of the features of radio are preserved. The antenna used in receiving consisted of a single wire, with the camera-like box substituting for the headlights. The radio receiving apparatus consisted of a detector and amplifying unit of the type used by many amateurs.

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Ray Trace Picture
A set of prismatic plates began to rotate. The shapeness of the light set the hair quivering. The quivering of the hair cast a shadow upon the opening. The prismatic plates kept the ray of light moving slowly. It passed down the negative and continued to do so again and again in parallel lines, a small fraction of an inch apart.

The portrait of President Harding was traced on the negative. The brightness with which the spark twinkled decided the intensity of the effect upon the negative which appeared when placed in the developing solution in the photographic dark room.

The theory was somewhat the same as that put in practice by every youngster—to place a coin under a sheet of paper, draw lines up and down over the hidden coin, take the sheet from the table, and behold, a perfect copy of the money, Indian's head or bull.

Sending set of prismatic lens discs, invented by C. Francis Jenkins, successfully used to send photographs by radio.
Chicago Tries Out the “Silent Night”

One “silent night” a week was agreed upon recently by all the broadcasting stations of Chicago, and Monday was chosen as the night when every radio fan can go fishing for long-distance stations. The thing has proved a success so far and was greeted with enthusiasm by the countless thousands of receiver owners on the first night.

Alderman John Toman was the originator of the idea and through a canvas of fans conducted by the Chicago Daily News radio department it was found the idea met with popular favor. This is in line with “silent night” observed by Davenport, Iowa, and Atlanta, Ga.; also other cities in the East.

At a meeting of the council committee on gas, oil and electric M
e
tent it is proposed the hours for broadcast between 6- and 7 on Sunday be 10 to 11 on Thursday, 11 to 12 on Friday, and Saturday from 12 to 1 a.m., thus enabling the local fans to hear “the world in a week,” as Dr. Miller expresses it.

Amateur Operators Suspended

The Department of Commerce, Bureau of Navigation, has recently suspended the licenses of a number of amateur operators for violation of the act of August 13, 1912, section 4, regulations 3, 4 and 15. Similar action may be taken against any other operator reported for violation of the radio law.

 Operators are also warned that any change in the characterization of the radio apparatus or service of their station must be authorized by the Secretary of Commerce as required by regulation 70. This authority is given in the form of a new license showing the new characteristics of the station.

Broadcasts One-Act Plays

Radio fans of the United States will be entertained on the evening of April 17 with another feature attraction from Westinghouse station KYW. Since the entire production of “Shore Leave” was broadcast from Powers’ Theatre, Chicago, several months ago Wilson J. Weatherbee and Walter C. Evans, director and chief engineer respectively of KYW, have endeavored to develop the broadcasting of spoken drama to meet the popular demand of the invisible audience for this form of entertainment. Their efforts have culminated in arranging through the cooperation of Jessie Boyce Landis, director of the North Shore Players’ Company, a schedule of one-act plays to be produced from time to time in the studio of KYW.

The first of these is entitled “Bargain Day,” and was arranged and directed under the personal supervision of Mrs. Landis. The part of the harassed husband will be played by Sidney M. Spiegel, Jr., who acted the role when the play was given in Chicago. The finale lead will be interpreted by Jessie Royce Landis.

Like Coconuts?

We have heard of all sorts of prizes for those who listen in on the nightly concerts from Cleveland, Chicago, Newark and other points, but the offer of Station WQAM, Miami, “Daily Metropolis,” takes the cake.

To each of the first thousand listeners who reported hearing WQAM on a recent March evening, Florida-grown coconuts were mailed, post free. Did you get yours?

New Meyers Tube on Market

Elman B. Myers of the Radio Audion Company, who is establishing new factory headquarters at Montreal, Canada, announces the discovery of a new filament which will be used in a tube for radio purposes which will be guaranteed for five years.

The tubes in appearance and general physical dimensions are the same as the former ones that were put out by the Radio Audion Company, of which Mr. Myers was engineer. Mr. Myers can be reached for the present at the Windsor Hotel, Montreal, Canada. The new tube sells for $10 and carries a five-year guarantee.

War Hero at WGY

Harry Sadenwater, one of the heroes of the air service of the United States navy, has been placed in charge of the technical operation of the broadcasting stations of the General Electric Company, including WGY at Schenectady, N.Y., and the projected station at San Francisco, Cal.

Two years before he entered the ranks of the radio engineering department of the General Electric Company Mr. Sadenwater was a lieutenant in the United States navy and was one of the few out of hundreds of volunteers selected for the hazardous flight of the NC flying boats NC-1, NC-2 and NC-4, across the Atlantic from Newfoundland to Portugal.
Long Distance Records Plentiful

Europeans Hear Concert From WOR, Newark, and North Pacific Inhabitants Hear KSD, St. Louis

SEVERAL long distance records were reported from various parts of the country during the past month. Probably the most noteworthy of these was the WOR test, when Miss Edith Bennett, of Concord, N. H., sang from the Bamberger station, Newark, N. J., and was distinctly heard in Paris, Stockholm, Antwerp, Italy and England.

Cablegrams have been flooding the New Jersey station since the test was made, February 24. The Paris edition of the New York Herald, in connection with which the test was made, reported the concert was clearly heard in Paris on a home-made set by George Blen, and from Galliers, Brighton, England, a message read, “Received every word this morning. Translation perfect on a Burndett receiver.”

English Real Fans

The special musical program which was broadcast at midnight from WOR, of course reached England when their local stations were closed, but the test shows how thoroughly the British public has taken to radio, because in order to hear the program they had to sit up until 5 o’clock in the morning. Even the most ardent radio fan in this country would scarcely stay awake up to that hour for a record.

Another long distance record was established by station KSD of the St. Louis Post-Dispatch, St. Louis, Mo., when a program broadcast from that station was picked up in the Aleutian Islands in the North Pacific.

The lonely Pacific island where it was heard is 2,061 miles northwest by steamer from San Francisco and 1,700 miles in an airline from Seattle, Wash. It is estimated this concert from KSD traveled 4,008 miles in a direct line from St. Louis.

Detector and One Step

The information was received from Lost Harbor, Alaska, and the letter in part stated: “Your program of Jan. 1 was received without noticeable fading for three-quarters of an hour. The station is located at the Alaska Sulphur Company’s mines on Akun Island, the second of the Aleutian Islands, below the peninsula of Alaska. I use a detector and one step of amplification.

“There are sixty men and one woman here, so no source of entertainment can be overlooked.” The letter was signed “Walter Lee.”

Report of another long distance record comes from Havana, when it is stated the voice of Miss Mina Harriet Williams, a member of the staff of the American consul general, was distinctly heard in Douglas, Alaska, 5,600 miles away, by Robert E. Coughlin. The music was broadcast by station PWX of the Cuban Telephone Company, and Mr. Coughlin reported he plainly heard the song “Mother Machree” being sung by Miss Williams.

Here’s a map of the territory over which the music from KSD was heard—4,008 miles.

On the Stage

Radio is being recognized on the stage. In a new play, “Zeno,” which recently played in Chicago, radio was used by a clever crook to open safes, help a fake medium and baffle the police.
Invented Many Radio Appliances

BENJAMIN FRANKLIN MEISSNER, who, since 1920 has been director of the phonographic research laboratory of the Brunswick-Balke Collender Co., left that post on February 15, 1923, to accept the position of chief engineer of the Radio Division for the Multiple Electric Products Co., Inc., Newark, N. J.

Mr. Meissner's ability gained recognition several years ago by his co-operation with John Hays Hammond, Jr., in the perfection of the Wirelessly Controlled Torpedo. In 1920 a system insuring radio secrecy was perfected by Mr. Meissner, he being the first to complete such a system recognized by radio engineers.

Mr. Meissner is the author of several books, "Radiodynamics" being probably his most widely known book. He has written many articles for the Scientific American, Electrical World, the Aerial Age Weekly and other magazines, giving detailed description of various wirelessly controlled mechanisms. Readers of these magazines will probably recall Mr. Meissner as the engineer who perfected "Selene," the electric dog which was made to perform answering to the rays of a flashlight through the power of selenium tubes.

Several important radio inventions are credited to this noted engineer and radio expert. His most recent was the perfection of a light socket connection for radio sets to be used instead of an aerial. He also received considerable publicity two years ago when he recorded by wireless the opera "La Boheme" on a phonograph record in his laboratory five blocks from the Chicago Auditorium, where the opera was being sung.

During the recent world war he developed the Miessner Airfone for use in communication between pilot and student in the instruction of cadets.

Mr. Miessner's connection with the Multiple Electric Products Company, Inc., was effected through their Chicago representatives, the Mitchell Blair Company, 1429 Michigan avenue, Chicago.

HIRAM'S RADIO SET

Hiram Jones was not so slow, although he looked quite green; but he had ideas in his head about the things he'd seen. He took a trip to New York town and had a lot of fun, and while folks may have laughed at Hiram, he was not so dumb. He went to all the burlesque shows and several cabarets, and vaudeville and music he saw in various ways. He rode in high-priced taxis and he traveled o'er the "L"; he even went down in the "Sub," although he said 'twas h-l. He saw most everything there that really was worth while, and though he was a "Reuben" he lived in royal style.

"I know what I am going to get—a set of radio. I'll bring the city to the farm and have my own free show." Thus Hiram spoke, and straightaway bought a swell receiving set, and back at home he listens in and feels he's living yet.
The Farmer and the Radio

More Than in Any Other Industry, the Radio's Maximum of Usefulness Is Reached

"Down on the Farm"

In an interesting and instructive article prepared by F. M. Russell of the U. S. Department of Agriculture in the March Issue of Farm and Fireside, he has the following to say. The article is titled "Watch the Radio; It Is the Marvel of the Age," and contains the only complete statement made by Henry C. Wallace, Secretary of Agriculture.

Last September a southern Illinois farmer had two carloads of prime yearling steers finished for market. He could sell to the local buyer or ship to a rather unsteady market at the National Stockyards, Illinois. The local buyer's bid was about $10.50 a hundred, one of the best prices offered for a long time.

On the day he decided to take that price he received an early morning message from the operator of the local radio station that reports indicated a healthy advance in the price paid for prime cattle. Knowing that the radio information was reliable, and having only a short haul to market, the farmer got his cattle to the National Stockyards on the following morning. When sold, they brought $11.10.

Whereupon, this Illinois farmer became an ardent supporter of the radio as a means of getting timely information pertaining to agriculture, whether it be in the form of market quotations, weather reports, or short talks on farming subjects. He had long since become attached to the radio for the music and other entertaining features sent out daily. He saw in the radio an opportunity of receiving market information a few hours before other mediums could get it to him. And from his recent experience he knew that a few hours, or even a few minutes, might mean dollars and cents to him.

Wants Practical Information

From the standpoint of the farmer the enthusiasm which greeted the first radio has cooled. To him radio and its possibilities have settled down on a practical basis. It is true that he and his family have gotten a great deal of enjoyment out of the musical and entertainment features which are crowding the programs of the over five hundred broadcasting stations, but the agricultural field of the radio can only be successfully exploited when the stations and others concerned come to the realization that the farmer demands practical information pertaining to his chosen field.

"Since the community has learned that it is possible for us to get the latest market reports three times a day, there is hardly a day passes that some stockman does not telephone in from the country for the latest reports," wrote Glen R. Childress of Lancaster, Missouri. His letter is typical of hundreds received by the Department.

There are estimated to be between one and two million radio receiving sets owned in the entire country. There are more than five hundred broadcasting stations, many of which have permits to send out government weather, crop, and market information. This number is increasing daily as the stations are coming to realize the great demand from farmers for such information.

Many Stations Broadcasting

The Department of Agriculture early saw the possibilities of the radio. Today it is sending out weather, crop, and market reports from six radio telegraph and telephone stations of the Post Office Department, and from three high-powered radio telegraph stations of the Navy Department. Daily market reports on the livestock, grain, cotton, hay, feed, fruits, and vegetables are broadcast over virtually the entire United States, and farmers located almost anywhere can receive them either direct or with the assistance of amateur operators.

The use of the navy stations at Arlington, Virginia, and at Great Lakes is part of an extensive plan to utilize existing government facilities in establishing a dependable, nation-wide system for broadcasting agricultural news by radio. The plan has been approved by the radio committee composed of representatives of the different government departments, and contemplates the use of high-powered stations at Arlington, Great Lakes, Puget Sound, San Francisco, and New Orleans; certain army stations, such as those located at Fort Bliss and Fort Sam Houston, Texas; and the present post office stations, which have been sending out daily reports from Washington, D. C., Omaha and North Platte, Nebraska; Rock Springs, Wyoming, and Elko and Reno, Nevada.

Under favorable static conditions both the Arlington and Great Lakes stations can be heard over the entire country, but under average conditions the range is about two thirds of the eastern part of the country.

Secretary Wallace Says:

The amazing development in the transmission of the word by radio and the prompt adaptation of this discovery to the use and needs of the farmer mean much to the future of our agriculture. By the use of the powerful government sending stations and the over five hundred limited broadcasting stations, it will soon be possible for any farmer, no matter where he lives, to receive daily reports on the receipts, and prices of grains, livestock and farm produce of all kinds. All that will be necessary is to install a receiving instrument.

The U. S. Department of Agriculture has taken an active interest in the development and use of the radio because we recognize it as a medium through which the farmers of the land can be kept posted on what they need to know concerning farm markets.

These market reports will be sent out by the Department through the Bureau of Agricultural Economics. By the use of radio, as well as telegraph and mail, it will try to keep the farmers of the land posted on prices and on marketing conditions.

HENRY C. WALLACE,
Secretary of Agriculture.

www.americanradiohistory.com
Extension of the service is restricted only because the leased wire system of the Department of Agriculture over which the reports are dispatched for broadcasting does not reach some of these points.

Reports as Press Items
The reports as sent out from the various government stations are sent as press items, except where it is indicated that they are sent in code form. Forms are necessary for copying reports sent by code, and these are available to any interested party. Just write and ask for them.

With the exception of federal stations practically all market, crop, and weather reports are sent out on 485 meters, while entertainment, news, etc., is broadcast on 360 meters.

The following schedule is representative of those sent out by the Department of Agriculture, taken from Arlington schedule. Livestock receipts from five or more principal markets are sent out by code at 9:15 a.m. each day. At 10:00 a.m. the weather forecast is given. A market flash showing the early prices of hogs at Chicago and St. Louis is sent out at 11:15 a.m., and at 11:20 a.m. the latest reports on fruit and vegetable shipments are issued. Fruit and vegetable market quotations and news is broadcasted at 1:40 p.m. At 2:25 p.m. crop reports and special market news are sent out, while the closing livestock prices are given at 3:45 p.m. On Mondays, Wednesdays, and Fridays, at 4:00 p.m., reports from feed and hay markets are given. The second weather forecast is scheduled at 5:00 p.m., the daily marketgram at 5:30 p.m., and the final weather forecast at 9:45 p.m.

Stole Radio Station Equipment
THIEVES saved their way into a steel bar protected room at the Edgewater Beach Hotel, Chicago, recently and escaped with about $1,000 worth of paraphernalia assembled there for the new broadcasting station WJAZ. Passers-by who saw the thieves carrying away the loot to an automobile notified the police, but they escaped before the officers arrived. The equipment belonged to the Chicago Radio Laboratories.

Chicago to Have Unique New Station
A NOOTHER large broadcasting station is soon to be added to Chicago’s list of excellent radio entertainment points, according to R. H. T. Mathews of the Chicago Radio Laboratories. This new station will be located in the Edgewater Beach Hotel, one of Chicago’s finest hotels, located in the North Side residential district and right on the lake front.

The station has already been assigned the call letter of WJAZ and it will be known as the Zenith Edgewater Beach Hotel station.

Glass Studio
A novel feature of the new broadcasting station will be a “crystal room” or studio, to be built entirely of plate glass on the main floor of the popular hotel. By this means the guests of the hotel and visitors will get a clear view of the artists at work, but there will be no outside interference or confusion.

The “crystal room” will be draped in red velour and be equipped with an indirect lighting system.

E. F. McDonald, Jr., of the Chicago Radio Laboratories will be in charge of the new station, with L. M. Clausing acting as operator, R. H. T. Mathews, assistant engineer and M. B. West in charge.

Fan-Shaped Antenna
A fan-shaped antenna will be used atop the hotel and the output will be 10 K. W. The generators are now being built for WJAZ of 4,000 volts capacity.

Among the artists engaged for the new station are Paul Beise and his orchestra, now playing in the main dining room of the Edgewater Beach Hotel. During the summer months the orchestra will play on an open platform for the benefit of the hotel guests and the thousands of listeners of WJAZ.

WDAP Has Amateur Night
An epoch-making event in the history of WDAP station in Chicago was held March 1, 1923, when it inaugurated an amateur night.

This amateur night in some sense of the word could be called “initial night,” as the majority of the talent was appearing for the first time before the microphone of any broadcasting station. The current of congratulatory telegrams received has encouraged Messrs. Donnelly and Jenkins to continue this type of performances for their large radio family. Dates and evenings will be set for another amateur night soon.

Public opinion on the merits of talent or individual performances was varied, to say the least. There were several judges chosen, among them being Mr. Simpson of NAJ, Mr. Evans of KYW, Mr. Rompel of the Peerless Motor Company, Mr. Evans of Butler Brothers, and E. G. Brown of the Western Electric Company. The judges deemed it advisable to resign their positions a half hour later, due to pressing conditions which arose in the studio. Each of them was presented with Jewell instruments (either a thermal-ammeter or milli-ammeter) suspended from their necks by means of insulated cables, which was the only insulated part of the make-up.

The first number on the program was rendered by Harold White, a 7-year-old boy, who gave an imitation of George Beban in his monologue, “My Little Rosa.”

RADIO TERMS

WORSE THING ABOUT
THIS PLACE IS YOUH
CAN’T GIT A DRINK
O’ NOTHIN’!

“A dry cell.”
HAVING seen the effect of the heavy-side layer on the radio wave, let us next consider some of the possible reasons for limited range and weak signals that can be traced to the vicinity of the receiver.

Reasons for Weak Signals

In large cities, where there are a large number of high steel frame buildings, these buildings act as antennas and absorb some of the energy remaining to affect the radio receiving antenna may be so small that signals from distant transmitters may not be received at all. The owner of a radio set living in the heart of a large city, therefore, such as New York City, may never be able to get as satisfactory results as his fellow citizen living in the less densely populated sections even with the most sensitive apparatus.

A similar condition may exist if the radio receiver is situated immediately at the base of a high hill. The hill may absorb much of the energy in the radio wave in the immediate neighborhood, leaving but a very small amount of energy to affect the antenna. Even if the hill does not actually absorb the energy, it may cast a radio "shadow" for some distance on the side opposite to that from which the radio wave is coming and thus prevent a strong signal being induced in the radio antenna.

Assuming that the radio wave has escaped all of the pitfalls that may have befallen it and that it arrives at the receiving antenna with considerable intensity, let us see what can be done to insure its giving loud response in the telephone head set or the loud speaker.

A number of good articles have recently been written on the construction of antennas in recent issues of the radio periodicals and so this important link in the radio chain will not be greatly elaborated on. It will be assumed that if a strong signal arrives at the antenna, that a strong high frequency current will be set up in the antenna circuit.

Design of Antenna

One important point in the design of an antenna for use with a single circuit receiver may be touched upon with profit, however. Considerable criticism has been leveled at the single receiver on account of its lack of selectivity. When two broadcasting stations are operating simultaneously in the neighborhood, a good single circuit receiver may be improperly judged in its ability to pick up one station at the exclusion of the other just because of an improperly constituted antenna.

For use with a single circuit receiver, an antenna must be short. It should not be more than 80 or 100 feet long. If a short antenna is used with a good single circuit tuner, it will easily be possible to separate two stations operating on waves differing only by 10 per cent. This is true even if the listener is very close to either station. Furthermore, when a vacuum tube regenerative receiver is used, this shorter antenna does not materially reduce the signal strength.

The thing of prime importance after the proper antenna is assured is the proper selection of the receiver. Under no conditions should a receiver with crystal detector be relied upon to operate over distances in excess of 25 miles from a broadcasting station of 500 to 1,000 watts power. From a 5-watt broadcasting station a crystal detector will probably not cover distances greater than five miles. It is true that old-time amateurs used to cover phenomenal distances using crystal detectors, but such a detector is peculiarly adapted to reception from spark transmitters and is not so well adapted to reception from telephone transmitters. Besides, many of these phenomena were made with very weak signals, the operator at times holding his breath so as to hear. A signal so weak is, of course, absolutely unsuited for broadcast reception.

Proper Receiver

If a receiver using a crystal detector is used and is properly applied, how shall the operator insure satisfactory operation?

In the first place, he must be sure that his tuning circuit is as good as can be made. Tuning coils with sliders are, generally speaking, the least efficient form of tuners. A tuning coil will not give good results if any of the turns touch each other or if the slider touches more than one turn at the same time. Variometers are by far the best form of tuners for short wave lengths such as are used for broadcasting. The better class of manufacturers of complete sets are now using variometers exclusively.

The detector of the set is one of the most important parts. The detector when properly adjusted acts as a kind of check valve, allowing current to flow through it in one direction only. Thus, the radio currents which oscillate so rapidly that they are inaudible to the ear flow through the detector in one direction only and are trapped when they attempt to reverse. A unidirectional current then flows through the telephone receiver varying in intensity in accordance with the transmitted speech wave and causing the telephone receiver to reproduce the sounds that were spoken by the broadcaster.

Various crystals are used by different manufacturers. Galena enjoys wide popularity on account of its extreme sensitiveness, but it has counterbalancing objectionable features that make it inferior in many ways to other crystals. It requires a very light pressure and is, therefore, easily knocked out of adjust-
mental. Furthermore, it is inclined to distort signals somewhat, due to its electrical characteristics.

The Pericon Detector

The pericon detector, using zincite for one crystal and chalcopyrite for the other, makes a very rugged and fairly sensitive detector. Zincite with metallic tellurium is used by one manufacturer with excellent results. The adjustment is not critical and there is practically no distortion. As zincite is a somewhat soft mineral, it will wear away if rubbed on the tellurium. Also, when tellurium is used as the other element, a black deposit will appear on the zincite, decreasing its sensitivity if the two crystals are rubbed together. This black deposit may be removed with a knife, but care should be used not to rub the crystals together any more than necessary.

The telephone head set used with a crystal detector should be of reliable make and of 2,000 ohms resistance or more. Although head sets are rated in so many ohms resistance, this factor is really an undesirable one and is used merely as a measure of the number of turns of wire on the head set. A large number of turns is essential for proper operation. During the early days of radio the regenerative receiver was worthless. Practically any time of the day or night waves sent out by improperly adjusted regenerative receivers can be heard and it will be only a matter of time when the regenerative receiver will be legislatively protected against if proper care is not exercised by the radio user. The added feature in the regenerative receiver is the tickler. It is usually controlled by rotating a knob. As this knob is rotated from minimum to maximum there are two distinct divisions in its effect. As the knob is rotated over the lower end of the scale, the overall effect is to reduce the resistance of the antenna. The average receiving antenna has a resistance of from 20 to 25 ohms and by careful adjustment of the tickler this can be reduced to a few ohms with corresponding increase of signal. Now if this point on the scale is passed, the receiver will send out weak radio waves which may be heard by all of the neighbors in the form of musical notes of various pitches.

A helpful analogy of the effect of the tickler is the following: Consider an automobile climbing a very long inclined platform that is pivoted at the center, the steepness of the incline would correspond to the resistance of the antenna circuit, the car corresponds to the unit of electricity, the torque on the rear wheels corresponds to the voltage created in the antenna circuit, and the speed on the car represents the current. Now assume that the platform is gradually tilted about the pivot until it becomes more nearly level. This corresponds to rotating the tickler knob toward its maximum point. When the platform is nearly horizontal the car will climb with considerable speed but with the application of little power. This condition is similar to the proper adjustment of the tickler for best results. If the platform is now tipped further the car will be running down hill, and will run itself with no application of power. This is similar to the condition reached in the regenerative circuit when the tickler is turned too far.

Adjusting Your Set

It is easy to tell when tickler has been turned to the point where the set is disturbing all listeners in the neighborhood. Generally there is a hissing noise in the head set which is much louder than that heard with the tickler on zero. Also, if the antenna binding post is touched with the moistened finger, a click will be heard in the telephone receiver both when contact is made and when the finger is removed.

If others in the immediate vicinity also have their receivers improperly adjusted, so that they are sending out radio waves, a musical note will be heard in the head set as the tuning knob is rotated, the pitch varying from above that which is audible to zero and back again to above audibility. Not only does the user of the local receiver hear these notes, but the particular receiver that is assisting to cause the musical note also hears the very same sounds.

This musical note is caused by the phenomenon known as "beats" and finds an analogy in sound in the pulsing of the sound from a pipe organ when two pipes supposedly of the same pitch are played simultaneously and when one of the pipes is slightly out of tune. In the case of radio, the high frequencies generated by the two radio receivers correspond to the sounds produced by the organ pipes, with the outstanding difference that in the radio case, the rates of vibration of the electrical currents are far above the range of audibility, whereas, of course, in the sound analogy the rates of vibration of the air in the organ pipes are audible. The musical note heard in the radio head set corresponds to the pulsation heard on the organ. Fig. 6 illustrates graphically what occurs in the radio set.

The pitch of the musical sound in the radio head set depends on the difference between the two radio pitches or frequencies. Thus if there are a number of stations in the immediate neighborhood listening to a broadcasted concert and

<table>
<thead>
<tr>
<th>April, 1923</th>
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<tbody>
<tr>
<td>The New Radio Law</td>
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<tr>
<td>HIGH spots of H. R. 13778, which passed the House of Representatives January 31:</td>
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<tr>
<td>Secretary of Commerce may refuse license to a radio &quot;trust&quot; or monopoly.</td>
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<td>License stations transmitting to foreign countries.</td>
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<td>Can revoke license of any company making unjust or unreasonable regulations.</td>
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<tr>
<td>Issue permits for new stations.</td>
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<tr>
<td>Prevents communication monopoly.</td>
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<tr>
<td>Classifies licensed stations and provides rules for prevention of interference.</td>
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<tr>
<td>The President assigns wave lengths to government stations.</td>
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Engineers Discuss Receivers

INTERESTING SESSION OF THE RADIO DIVISION OF CHICAGO ELECTRIC CLUB

ABOUT three hundred persons attended the March 6 meeting of the Chicago Electric Club in the Morrison Hotel. The evening was spent in discussions conducted by Mr. Forbes, who spoke on elementary principles, embodying the ways and means of radio transmitters.

Mr. Forbes pointed out the reason for some of the muddle that is constantly present by re-radiation of spark transmitters—namely, the three waves. This was the third lecture of Mr. Forbes, who is connected with the Forbes Radio Company, Chicago, and who also acts as instructor of elementary principles for the Chicago Electric Club.

Discuss Receivers

Mr. M. B. West, research engineer of the Chicago Radio Laboratory, spoke and illustrated the several reasons which are embodied in the manufacture of the present day radio receivers. Also delving into the scientific research that is necessary in order to bring forth a good receiver for the average person of today.

Several discussions were had and diagrams used showing the relative merits of the various circuits. When all is said and done the average person demands the old stand-by, the regenerative receiver.

Speaking along these lines Mr. West showed wherein the average person who purchases a radio receiver will wonder at times just what the reason is for his not getting certain stations located in the majority of cases on the utmost reception limits of any of the up-to-date receivers.

He pointed out where the antenna with a certain amount of resistance is coupled directly (conductively) to the inductance of the receiving set, wherein another resistance is predominant actuated by still another resistance of the grid condenser and grid leak. It was pointed out that the grid leak and grid condenser are of a very high resistance to the receiving circuit.

For the sake of illustration let us assume that the antenna, single wire and others, which the average person puts up, measures in the neighborhood of some twelve to thirty ohm resistance. This, then, coupled to the inductance, whose resistance varies from six to thirty ohms due to insulation between turns on the coil, insulation on the wire itself, and finally the tube upon which the wire is wound.

Cardboard Tube Helps

Mr. West pointed out where the plain everyday cardboard tube, coated with some transparent varnish or collodion, would materially help toward the reduction of this resistance.

Then the condenser across the inductance was discussed and it was shown that these condensers, in most cases when tested, proved to contain sufficient high frequency resistance to be discarded into the waste basket, having a resistance of thirty ohms at the lowest range, or what is supposed to be zero capacity, or best working part of the condenser, then six ohm high frequency resistance at 180 degrees or maximum capacity. Mr. West stated the purchaser of variable condensers would have to look for condensers whose insulation between the movable and stationary plates is placed at the extreme ends of the plates in order to overcome...
this high frequency resistance. In this we can readily see where the average person purchasing radio equipment without first studying it is at a loss sometimes to understand why Mr. Jones, his next door neighbor, is receiving better results with practically the same equipment that he is using. Let us say, for instance, Mr. Jackson is the man in trouble and Mr. Jones is the party of the second part.

**Different Equipment Used**

Mr. Jackson does not know that Mr. Jones has been experimenting around with different equipment and has brought his high frequency resistance down to a possible nothing and thereby is reaping the harvest, the reception of better signals, from greater ranges than Mr. Jackson, who is content to have and play with what he has.

It can be said for the novice that radio, since its inception, has been more or less of an experiment. There have been sets and circuits invented, but they do not work the same for this or that person as they would for us in the research laboratory.

We have tried at all times to maintain or confine our answers to questions to truth and unbiased opinions of research that is being worked every day.

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**NOVELTY of the recent Radio Shows held in Chicago at the Rothschild department store and the combined Leiter stores was the Coyne Trade and Engineering School exhibit.**

This school was the only one represented and the management of both stores was well pleased with the display and efficient manner in which it was conducted. Immense crowds visited the radio shows every day and it is estimated over 800,000 radio fans visited the two stores during the exhibit.

The Coyne school furnished two radio engineers and several assistants. One of them gave fifteen-minute talks on radio construction throughout the day, illustrating various hook-ups on a blackboard. The assistants also answered all questions of the visitors and furnished them with tips on how to build their own sets.

There were hundreds of sets started during the two weeks’ display and this not only created a demand for parts from our booths, but stimulated interest in the fascinating game of “building your own.”

The Coyne school was known as the clinic or hospital for sick sets, and many poorly wired outfits were brought there and made ready for service under the direction of the Coyne experts.

“The radio school and clinic was one of the great features of the show,” said S. E. Gross, who planned and put over the Rothschild exposition. “The place has been crowded by people of all ages and both sexes, seeking advice on radio hook-ups, or having their sets gone over to learn how to get the best results from them.”

Everything in radio from a binding post or cat’s whisker, up to beautifully mounted and cabinetted sets that cost as much as a big automobile was on display, and throngs swarmed about each exhibit continuously since the opening.

**Perils of Movies Explained**

Elmer Clifton, producer of a film called “Down to the Sea in Ships,” now showing in New York, entertained thousands of radio fans from Station WEAF recently, telling of the perils endured in taking the Hodkinson picture. The picture was made in the Caribbean Sea, and Mr. Clifton explained in capturing a 90-ton bull whale, one of the largest ocean monsters ever caught, it destroyed the ship’s small boats and hurled the actors into the water.
Correspondence With the Institute

The Director of Radio Topics Institute will answer any questions puzzling radio fans in this department. Make your letters as short as possible, write on one side of the paper only, and give name and address. This is your department. Use it.

Myers Tubes for Amplification

Milwaukee, Wis.—To the Editor: Kindly let me know if Myers tubes can be used as an amplification. If so, would you be kind enough to send me instructions on how to use it? I have a 43-plate condenser, Kellog vario-coupler and two Thomson transformers.—F. F. Krzyshak, 604 Grant St. Answer: Myers tube can be used for audio frequency amplification. Circuit mailed you today.

Simplified Circuit Wanted

New York City.—The set you describe in January Radio Topics on page 17 would be a great help to me if I could get it a little clearer, if possible, as I can't get used to the symbols used to tell each part. What I refer to is the hook-up. I have looked over the directions and have started a dozen times to build a set, but never got it hooked up right. I burned out one because I did not know the symbols. Kindly send me dope on positive and negative of hook-up and advice on which side of the rheostat you hook up the detector tube.

We are trying to use simple language in writing our publication especially in instructions from the rheostat which are taken forth from the cylinder to the panel. The wire is left solid on the cylinder. The manufacturer of this equipment will discard them, due to the inherent noises that predominate when striking the element or reducing the spacing. Would the primary and secondary coil be satisfactory for a crystal set without tickler coil, and what would be the best hookup? Would you like to build my complete circuit the way that I may complete later.—A. H. Martin, Loco, B. C.

Reinartz Circuit

Muncie, Indiana: I am very much interested in the three-tube receiver employing the Reinartz circuit which is described in the February issue of Radio Topics and would appreciate a little further information regarding same. Will this receiver give satisfactory results using WD-11 tubes for both detector and amplifier? Also, what would be the approximate range in miles of this set? I would like to make this set in two units. One, the detector unit and the other the amplifying unit. Will you please give me the wiring diagram for each of these units? Also, what "P" battery volatages should be used for each unit?

In the instructions given for making the inductance the diameter of the form is given as 6" and the depth of the slots as 3". In that case the slots would all come together at the exact center of the form. Are these figures correct? Can you name one or any manufacturers who have these inductances for sale?

Would a variable grid condenser improve the efficiency of this outfit?—Marshall L. Williams, 814 North Elm street, Muncie, Indiana.

Answer: The Reinartz tuner will give you distances up to 1,000 miles with two stages of audio-frequency amplification. Use 22.5 volts on the plates of the WD-11 amplifiers as this is the specified voltage with these tubes. Possibly after you use them for your amplifiers you will discard them, due to the inherent noises that predominate when striking the table or cabinet in which they are mounted.

Complete inductances for the Reinartz tuner can be purchased through this publication or from the Lynn Radio Co., 45 Consumers Building, Chicago, Ill. at $2.50.

Whether or not a grid leak would improve this set depends upon the operator. Personally, we feel that a grid leak is surplus equipment on any radio set.

The depth of the slots in the form should be 2½ inches instead of 3 inches, in answer to your third question.

That Two-Stage R. E. Set

Tallmadge, Ohio: In February, 1923, issue of Radio Topics, I notice an article covering "A Receiving Set With Two Stages of Radio Frequency Amplification." I am very much interested in the construction of a radio frequency receiving set and wish to make a few inquiries relative to the set described in the aforementioned article. Practically all of the names of the makers of the material used are given with the exception of the transformers. However, from the appearance of the radio frequency transformers in the illustrations, I assume that the transformers are used. Knowing that Cotoco R. F. transformers are used. Knowing that Cotoco people do not build complete sets, I am wondering just who designed the set you describe. It looks good. What audio-frequency transformers are used? The other parts described are of the best obtainable. Can the WD-11 tube be used?

Any further information you can give regarding this set which will help to construct it will be appreciated.—R. H. Whetzel, Tallmadge.

Answer: The full set as described on page 18, February issue, is of the Cotoco type. We do not doubt that this description was from a circular which the Cotoco sent into this publication for general writeup. It has awakened a field of people and letters to this publication have been numerous. There is no doubt in our mind that the average person could not go astray if he ever contemplated the construction of this set from the diagrams as were shown. The audio-frequency transformers are their own.

The WD-11 tubes can be used for the radio-frequency amplifier as shown but the question arises to their use in the audio-frequency amplifier. Numerous readers state that they are very noisy in the audio-frequency amplifier, due to inherent noises from the elements and when the desk or table the amplifier is standing is struck a ringing noise is heard. Any additional information can be had from the manufacturers of this equipment.

Making a Three Coil Set

Loco, B. C.—I would like to make up coil as per your January issue of Radio Topics and am writing for further particulars. The primary calls for 70 turns on first, 7, on the second. The second switch shows 9 points. Do I increase the winding to get the 9 points or reduce the spacing?

If the primary and secondary coil be satisfactory for a crystal set without tickler coil, and what would be the best hookup? Would you like to build my complete circuit the way that I may complete later.—A. H. Martin, Loco, B. C.

Answer: You can use this set with primary and secondary mounted alongside each other but there will be some loss of energy that otherwise would not be encountered if you were to use a straight-away vario-coupler. This can be used just the same tuning and only tuning will have to be done with the taps and condenser across the secondary of the inductance.

There is a mistake in the drawing of the number of points necessary with the inductance. Taps are taken from the first seven turns, then six taps are taken from each ten turns, that is, ten turns for each of the second; this gives 67 turns; the first, center and last turns are not touched. The manufacturer of this set does not take taps from the start and finish of the winding but scrapes the wire back and solders his leads right to the wire on the coil, thereby eliminating a lot of unnecessary capacity between windings. That is taking leads back and forth from the cylinder to the panel. The wire is left solid on the cylinder.
Telephone vs. Radiophone

By L. W. CHUBB,

ANY of you have asked questions regarding the future of radio broadcasting service. Although it is impossible at this time to make any accurate prediction or answer all inquiries, it may be of interest to discuss some of the more common questions in order that you may better understand some of the present broadcasting conditions and what may or should be expected in the near future.

We are asked, "Will radio telephone supplant the wire telephone?" and "What are the limitations and applications of radio telephony?"

Radio has been found to be most useful in carrying on telephone communication to and from moving stations, such as ships, aeroplanes and railroad trains; between isolated points, such as trans-oceanic stations, islands, camps, mines, forest patrols and in military operations.

For most of such services there is not any effective means for direct and reliable telephone communication because of the inability of using, conducting or guiding wires.

In addition to these uses of Radio Telephony, for which there is no choice of method, there are many applications in which conversations can be carried on by either radio or wire line telephone. The choice of method will be determined by the relative cost; kind, quality and reliability of service required and upon several other factors all of which need not be considered in this brief talk.

The third and final classification of telephone service is that of the familiar public service now carried on by the great wire systems with their individual subscriber circuits leading to central stations connected together with trunk lines and affording direct and private operations of many many simultaneous messages.

This great system of city telephones, we feel, will never be supplanted by radio telephony, chiefly because with radio the number of conversations which may be carried on simultaneously, is limited and there is lack of secrecy, lack of operative control, and lack of practical and economic methods of selection and calling.

The wire telephone service is an unusual economic commodity in that it does not follow the law of diminishing returns. Every telephone installed increased the value of the instruments in operation. This is not the case with radio telephony. Extensions of the radio system will reduce the value of service after but few operating stations have been installed in a given locality. This unfortunate limitation caused by interferences, lack of central control and inability of indefinitely increasing the channels of speech will probably never be overcome for telephone communications.

Comprises Two Systems

From what has already been said it may appear to some of you that our modern radio system does not compare well with the wire telephone. This is true for individual, two-way communications, but is not true for one-way telephony, or what is known as broadcasting, the great application of radio telephony.

Because of the different field of application of the two systems several important features must be considered or any comparison of them will be of little value. Experience has taught us the laws of growth and development of the wire telephone system. To predict the future value and development of the broadcasting application of radio telephony we must keep in mind the great physical, technical and economic differences involved.

To transmit at distant points voice or musical messages, energy transformation from sound waves in air to electric or wireless waves which travel at high velocity, is resorted to. At the receiving station these waves are again transformed to audible sounds. If several messages are to be transmitted at one time without interference some means of selecting or separating the various signals is necessary.

In wire telephony, the sound is changed to and propagated as pulsating electric currents representing the sound, and selectivity is obtained by guiding the waves in a physical wire. In radio telephony additional transformations are used at each station. The mechanical energy of sound waves is changed to electrical energy then to radiant energy in the form of wireless or Hertzian waves which spread out in all directions.

High Frequency Waves Necessary

In radio, selection of one of several signals is obtained by using wireless waves of different length, or rate of vibration, and by tuning the receiving apparatus to pick out only the desired waves. The use of high frequency wireless waves which radiate in all directions is both necessary and fortunate; necessary for selection in tuned circuit and because energy can be radiated only at high frequencies; fortunate because it allows the use of sensitive tuned electric circuits and because the radiation in all directions allows the reception of signals at any point within the range of the transmitting station.

These characteristic differences and further restrictions in the two systems make it obvious at once that the wire telephone is best suited to the extensive use of two-way telephone communication and the radio telephone will reign supreme for public broadcasting.

Radio broadcasting started by station KDKA over a year and a half ago, first spread as a fascinating fad and has grown beyond the present legislation and without consideration of the economic factors involved. It consists of two separate functions, transmitting and receiving, while wire communication combines these functions at each station. Owing to the limited number of programs which can be broadcast...

(Continued on Page 32)
Elementary Electrical Principles

This is the fourth of a series of articles written for RADIO TOPICS—It deals with power calculations in electric lines.

By Harvey Mitchell Anthony

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EDITOR'S NOTE: In this article, which is a synopsys of one of Mr. Anthony's lectures, he presents step by step the various factors entering into the study of power lines. The principles involved apply as well to radio circuits, although they do not relate to alternating currents.

The first of this series of instructive lessons appeared in January, 1923. Issues 2, 3, and 4, have been devoted to power calculations in electric lines. You can plainly see that if we actually have five horse-power of useful energy at the pulley we must put into the motor a little more than five horse-power in order that some of this input may be used in overcoming these losses, yet having delivered at the pulley the motor rating.

If we got out of any machine just what we put into it we would have 100 per cent efficiency. This would develop perpetual motion and thus far there is no such animal and very likely it will never be known, at least not on this earth during our time.

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Large motors are, as a rule, more efficient that small motors. It is obvious that a ten horse-power motor need not necessarily be of ten times the mass of copper and iron that is used in a one horse-power machine. The bearings need not be of ten times the surface, etc., so the real frictional losses decrease as the horse-power increases. Think this over. It is not at all difficult to understand this. The average efficiencies of motors are as follows:

1 H. P., 70 per cent; 3 H. P., 75 per cent; 5 H. P., 80 per cent; 10 H. P., 85 per cent; 50 H. P., 90 per cent.

Now to go back to our motor example where we had the five horse-power to install. If we multiply 746 watts by 5 we have 3,730 watts. This motor output would not be expressed in watts, however; just simply horse-power, but its equivalent is the 3,730 watts. We call this output. Now it is possible for us to find the input if the motor were 50 per cent efficient, the average as noted above for a motor of this

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to say much in these few lines. Only the general idea can be given here.
EFFICIENCY = OUTPUT / INPUT

If you wish to make this into a little "nutshell" formula, write it like this:

EFFICIENCY × INPUT = OUTPUT

Let us find the input into this 5 H. P. motor. We know it will be necessary to provide a little more than 5 H. P., because it is only 80 per cent efficient.

Since input equals output divided by efficiency, we have in this case 3,730 watts (5 H. P.) divided by 80 per cent or 0.80. This gives 4,662.5 watts. Hence, we send into the motor 4,662.5 total watts, lose 20 per cent or 933.5 watts in overcoming friction and electrical resistance, and deliver the rest, or 80 per cent, to the pulley, 3,730 watts or 5 H. P.

Now, since we know the total wattage we can use the No. 7 wire and not the No. 5. You can find the size of wire necessary to carry this current. We have found the size of No. 5. You can get in on the No. 5 wire and less power will be lost in the overload gauge, which will be cut off. This gives 4,662.5 watts. Hence, you can plainly see that we lose 4.4 volts in the line wires it will be necessary to have this much added to the 110 volts which the motor is to receive. That is, the switchboard voltage must be 4.4 volts higher or 114.4 volts, this being the remaining 110 going on to the motor brushes. Now let's pass on to another step and study about the power in watts and see how this works out in this installation. A simple matter, indeed.

Watts equal volts times amperes. So in this case the watts lost in the line will equal the amperes flowing in the line multiplied by the volts lost in the line, or 42.4 amperes times 4.4 volts, which equals 186.56 watts. Since you must lose this voltage of 4.4 volts in the line wires it will be necessary to have this much added to the 110 volts which the motor is to receive. This involves another formula which you should also put down carefully in your notebook:

\[
\text{Resistance} = \frac{\text{Efficiency} \times \text{voltage drop}}{\text{current}}
\]

Circular MILS

This 10.8 is a constant for copper wire, and is the resistance in ohms for one mil-foot of copper wire at ordinary temperatures. A mil is one-thousandth of an inch or about the diameter of a hair in your head. The mil-foot is this wire of one-thousandth inch in diameter and one foot long. Think about this for a moment, a copper wire about the diameter of a hair and one foot long. This little section of wire has the resistance of 10.8 ohms.

The length in feet of the power line does not mean the distance just one way, but the total length of the circuit. In this case for the wiring of the 5 H. P. motor, the motor is 100 feet from the switchboard where we are going to attach our line wires. Then the total length of this circuit will be 200 feet, since we must run the line to the machine and back again.

The circular mils in the formula means the cross-sectional area of the wire under consideration, which is in this instance the No. 7, the cross-sectional area being 20.26 square mils. You can find these circular mil areas by referring to any wire table for Brown & Sharp gauge, this being used in electrical practice when copper wire is employed for lines. By working out this formula we find the line resistance will be 0.1036 ohm.

Let us say our 5 H. P. motor is located 100 feet from the switchboard. The motor, we assume, is out in the factory where machinery is operated. Since the motor is 100 feet from the switchboard supplying the electric power, we must make a careful survey of this situation and be sure that the motor will receive its proper pressure of 110 volts at this distance.

Now we have accomplished a very important step, and this resistance value will enable us to find the voltage drop over the 200 feet of wire, also the power lost in watts. From this watt loss we will be able to determine the money loss, as will be shown. As for the voltage loss, this is a simple process. Just use Ohm's Law. Voltage equals current times resistance.

The writer has explained about the resistance of wires carrying current, you will remember that length and cross-sectional area of wires are two very important factors. The longer the wire the greater will be its resistance; the smaller in cross-section the greater will be its resistance.

Now we will figure how much voltage we will lose by using wire size No. 7. B. fore we can find the voltage loss it will be necessary to find the resistance of the No. 7 wire. This involves another formula which you should also put down carefully in your notebook:

\[
\text{Resistance} = \frac{\text{Resistance of wire}}{\text{Cross-sectional area in mils}}
\]

The National Electric Code specifies that the wiring to motors should be rubber covered, and the table gives the safe-carrying capacities of wires of all sizes. The wire to be used in this case will be No. 7, Brown & Sharpe gauge, which will carry the above current without overheating. The total lost watts, because it is only 80 per cent efficient, are 933.5 watts, or 5 H. P. Hence, you can plainly see that we lose 4.4 volts in the line wires it will be necessary to have this much added to the 110 volts which the motor is to receive. That is, the switchboard voltage must be 4.4 volts higher or 114.4 volts, this being the remaining 110 going on to the motor brushes.

The experienced electrician will always consider this idea of lost energy, for it means a great deal in operating expenses of a power line. The writer will now lead you a step farther. We will now discuss lost power in this circuit. We have found the size of wire necessary to pass a current of 42.4 amperes.

We see the result of using this wire. For the sake of bringing out the point we will use the No. 7 wire and not the No. 5. You can get in on the No. 5 wire carrying you yourself a little later. Useful power and lost power are two different things. Of course, in our motor itself we had both useful and lost power. We have a useful power which was diverted to the pulley; the lost power being spent in overcoming motor losses. Now we have exactly the same thing in the line carrying the current to the motor. We put a certain amount of power in the line, and this power must be divided between useful and lost power. If you wish to make this into a little "nutshell" formula, write it like this:

\[
\text{EFFICIENCY} = \frac{\text{OUTPUT}}{\text{INPUT}}
\]
Fewer and Better Programs

NATIONAL CHAMBER OF COMMERCE FINDS PUBLIC WANTS FEDERAL LAWS TO END CONFUSION

FEWER broadcasting stations constitute the chief radio reform demanded by the American people, according to the results of a nation-wide inquiry conducted by the National Radio Chamber of Commerce in an effort to wipe out the evils existing in the radio industry. The investigation also revealed an insistent public desire for better programs, federal regulatory legislation to end confusion and to thwart selfish interests, and separation of public broadcasting stations from the experimental stations operated by amateurs.

The Chamber sent a questionnaire to persons representing all phases of the art from manufacturer to listener. The replies are analyzed in a statement made public by Ralph C. Watrous, former lieutenant-governor of Rhode Island and a member of the Chamber’s special committee appointed to make a study of the broadcasting situation.

The Chamber warns that a serious economic question exists and asserts its purpose “to keep broadcasting within the hands of the public, to whom this means of communication belongs.” Passage of the White Bill giving greater power to the Department of Commerce is urged.

“The one outstanding problem is that of broadcasting,” says the statement. “The response to the questionnaire was gratifying and pointed the way in several directions very clearly. Most prominent of all was the idea of ‘fewer broadcasting stations with better programs.’ No exact number of stations was generally recommended and this could not well be as the range of stations is so rapidly changing, both as to their efficiency and also to the steadily increasing receiving range of more efficient receiving sets. But that progress would be more rapid when we realize the necessity for fewer stations seems a perfectly safe deduction from the answers to the questionnaire.”

Serious Economic Question

“The matter of ‘better programs’ seems to be very naturally related in the minds of those answering to the expense of furnishing really good programs, but it does not seem to matter who pays for it; or how. The more people who can be served by a single station the less, of course, the expense per listener! This economic question is a very serious one and in the interests of the general radio public must be dealt with very carefully. However, of course, the people as a whole interested in radio must finally in some way pay the bill.

“Another matter clearly brought out by the questionnaire was that proper legislation should be enacted in Congress that would not only safeguard our Federal departments but give to Secretary Hoover’s department the power to so regulate radio, and broadcasting in particular, that the greatest service shall be realized by the greatest number.

“It would seem that the questionnaire also clearly indicates a need for line separation between public broadcasting stations from the stations operated largely in experimental work by our amateurs who served such a useful purpose during the war and who have done much constructive work. They must have a place, but their power and range must not be allowed to interfere with the public’s use of this new means of communication to an unreasonable extent.”

Wave Lengths Dealt With

“The question of wave lengths was dealt with in the questionnaire but this is a matter that will have to have much thorough study and any solution of this problem can only be covered temporarily as changing conditions will make necessary frequent changes in any provision inserted in the new law.

“The White Bill now pending in Congress provides for a Radio Council and the selection of this Council made in a way to really represent the whole radio public is about as important a matter as confronts us. We frequently hear the idea expressed that the more broadcasting stations the better,

Photo of Christian Strohm, who in 1859 traveled from Oldes Leben to Weimar, Germany, to hear the premiere of the opera which took Richard Wagner seven years to complete. Now, just sixty-four years later, Mr. Strohm here in America, listens to the same opera, using a crystal set, broadcasted from station WIP, Philadelphia.
for a great number will sooner awaken the public to the impossibility of satisfactory service under a system of numerous stations.

"This is absolutely wrong and the National Radio Chamber of Commerce believes that all that is needed is to call attention to the necessity of reduction and the American public will respond and make its wants known in no uncertain way.

"It was made clear in the questionnaire that answers were not desired if they were to be given with the spirit and intent of favoring any group, class or corporation; but rather that the matter shall be so considered and the answers so given that it would be apparent the interests of the government and the entire radio public were paramount."

**Much Data Gathered**

The number of radiophone sets licensed by the Department of Commerce for transmitting purposes in the United States totals approximately 570, it was said. Data covering 340 of the broadcasting stations has been gathered by the Chamber in a study of transmitting range.

It was found that forty stations have a range of fifty miles, sixty-nine stations a range of 100 miles, seventy-three of 200 miles, forty-three of 300 miles, eight of 400 miles, sixty-one of 500 miles, eight of 700 miles, seventeen of 1,000 miles, nineteen of 1,500 miles, and two of 2,000 miles.

**The Pallophotophone**

Voice of prominent figures recorded forever on pallophotophone. Left to right: General H. H. Harter, President of the Radio Corp.; C. A. Hoxie, inventor of the pallophotophone; David Sarnoff, vice president and general manager of Radio Corp.

If you have tuned in to 370 meters recently and have picked up WGY you have probably been surprised at the purer and truer tone quality of music and speech from the General Electric Company broadcasting station. The answer is the Pallophotophone.

A new use has been found for the remarkable device which photographs sound on motion picture film and then reproduces the sound from the film. C. A. Hoxie, the inventor, has now devised a pick-up or microphone using the principle of the Pallophotophone reproducer.

The microphone is the link between the artist or instrument in the studio and the electrical circuit; it converts or transforms the variations of tone into corresponding variations of current. Microphones now in general use are constructed on the principle of the telephone transmitter in which the compression or expansion of granular carbon affect the electric current.

In the Pallophotophone pick-up a very sensitive diaphragm is set vibrating by sound. The movement of the diaphragm is communicated to a mirror three sixty-fourths of an inch square. A strong light strikes the dancing mirror which reflects the light beam at a sensitive light cell. The variation in the beam of light, caused by the vibration of the mirror varies the effect on the light cell and thus produces a corresponding variation in the electric circuit. Amplification is then obtained in the ordinary way by means of pliotrons.

The new pick-up eliminates the hiss which accompanies the use of the ordinary microphone; it is more sensitive and responds more readily and accurately to sound waves, capturing harmonics which would ordinarily be lost. A feature of the new pick-up is the weight of the moving or vibrating part. The diaphragm and mirror combined weigh one-tenth of a grain or half as much as the head of a common pin.

The Pallophotophone pick-up is now a permanent part of the studio equipment of WGY. Many letters complimenting WGY on the improvement of its tone quality were received after the program of January 30, when the play "Bought and Paid For," which was put out through the new pick-up, was presented.

Broadcasting a play from WGY, the General Electric Company broadcasting station, Schenectady, N. Y. Note the position of the actor with reference to the Pallophotophone pick-up, which is used by WGY instead of the ordinary microphone. The telephone head set used by the director is connected to an outside receiving set, and is so carefully padded that he hears no sound from the studio itself, but hears the play as though he were one of the great audience outside. The sign he displays in the picture is not usually used during the presentation of a play unless the cast includes actors not accustomed to play broadcasting.
What's Wrong With the Crystal Set?

A Humorous Letter From a Serious but Vexed RADIO

Reader—E. W. Cornelius Would Like to Hear From the 999,999 Other
Crystal Set Owners—He Wants to Know If It's a Disease—What's Your Answer?

ERIE's one to play on your tambourine—it takes place at the gates of St. Peter:
St. P.: "What kind of a radio set does St. Peter have?"
1st Man. "I have an eight tube regenerative set."
St. P.: "You go over with the Presbyterians."
St. P. to 2nd subject. "What kind of a radio set have you?"
2nd. "I have a single tube amplifier set."
St. P.: "Fine, you go over with the Methodists!"
St. P. to Me. "And young fellow, what kind of a radio set have you?"
Me. "I have a crystal set."
St. P. "You go over with the Christian Scientists, you only think you have a radio set."

This is not meant to be sacriligious in any way. It is only to show the attitude of the radio magazines over the entire country. The thousands of "crystal gazers" as you might call them are often purposely ignored. It seems there are many that are willing to have us buy our crystal sets but after we get them they laugh at us. Show me the radio magazine that has remembered that there are so many of us poor beggars in existence that can't afford to buy a magazine that has remembered that there are so many of us poor beggars in existence that can't afford to buy a radio set instead of "ether waves."

But let me start at the beginning. Once a lady bought her husband a canary bird for his birthday because she wanted one so badly, only I'm a man and it was a radio set instead of a canary bird. My wife wanted a man and it was a radio set instead of a canary.
telephone and saying it wouldn't work because there was no hole for the sounds to go through, in the wires, are now kicking because there's nothing around the hole."

When I got home and sat down in between programs I looked over the radio section to find that in Chicago we are to sing a new popular song, "Silent Night, Quiet Night. All is Calm But Not So Bright." Oh, well, it's a good thing because now we can go to bed with a clear conscience, except that we are worrying about whether our neighbor with a "radio set" is listening to Honolulu or Corned Beef Hash.

** **

Now that I'm through let's hear from the other 999,999 crystal set owners and what they have to say for themselves. And if any of the world wonder TECHNICAL RADIO ENGINEERS can engineer enough courage to defend themselves I would like to hear from them. I will stand correction on any mistake I have made and I'm sure that the Radio Topics who have been kind enough to print this would be glad to forward all letters to me whether they have explosives or not, E. W. Cornelius.

P. S.—Remember now that I have showed you "Techs" the respect of putting your title in capital letters.

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The Noble Battery

The battery with a constitution. The Noble battery is constructed along the up-to-date battery engineering lines.

This battery is supplied to the public in either a wooden case or moulded rubber case with base, to protect your home furnishings against acid damages.

The positive and negative grids are "Triple Oxidized," and insulated with the best of Port Oxford Cedar, thereby permitting the battery to maintain a low internal resistance, leading to a high momentary discharge, if such is a necessity, when employing two, three or four vacuum tubes and loud talking device. Even with this high momentary discharge, no buckling of the plates is experienced.

The Noble battery of the wooden case outside, has three rubber jars for the individual cells, while the moulded rubber variety, each cell is moulded in shape at the factory, necessitating only the separators between the positive and negative elements.

Each Noble battery is made to last for eighteen months, sealed with "Leak Proof Terminals" and each battery jar is subjected to a dielectric test of 6,000 volts to insure against soft spots or defects which would impair its insulating qualities and cause premature failure of the cell.

Each jar contains the "Micrometer Tested" separators and made of the finest resawed cedar, the perfect separator material. In all Noble batteries, slightly thinner negative plate permits the use of separators a full 1-64 of an inch thicker than those ordinarily employed. This added thickness provides extra resistance to wear, and eliminates one of the most common causes of internal short-circuits.

The Noble battery plates have three reasons for being better:

A. Interlocking grid. A triumph of mechanical perfection. Interlocking ribs hold the oxides in a vise-like grip, and prevent shedding and plate disintegration.

B. Strength-Endurance. The extremely hard center of the "Triple Oxide" plate gives it unequalled rigidity and endurance, and reduces the possibility of buckling.

C. Super-Activity. By a secret and exclusive manufacturing process, the surface of Noble plates are maintained in a highly porous, semi-soft condition. This insures maximum speed and capacity.

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The Howard Multi-Terminal Telephone Plug

The Howard multi-terminal telephone plug will accommodate from one to six pairs of telephone receivers, either individual receivers or pairs of receivers with an instantaneous connection.

The multi-terminal telephone plug with a purpose.

The following combinations can be had when using the Howard multi-terminal plug: 1, single pair of telephone receivers; 2, two pair in series; 3, two pair in parallel; 4, two pair in series and one pair in parallel; 5, two pair in parallel and one pair in series; 6, three pair in parallel; 7, two parallel pairs, of two in series; 8, two parallel pairs of two in series with one pair in parallel with the combination; 9, three parallel pairs of two in series.

With this combination and with one of the Howard multi-terminal plugs on hand the embarrassment of telling your friends to wait a few minutes for hooking up of the old style of plug is eliminated. Proving a very big friend to you, your friends and the pleasure derived from making immediate connections thereby.

The Howard multi-terminal plug is handled by all up-to-date dealers and jobbers.

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WGY Vesper Services

Every Sunday afternoon a little group of people assemble in the radio studio of WGY in the midst of the towering factory buildings of the General Electric Company at Schenecad, N. Y., and vesper service, including organ selections, hymns, scripture reading and sermon, are conducted. The group in the studio is small, but many thousands in city and country participate in the devotions.

These services not only enter many homes but they are multiplied by means of receiving sets and loud speakers and made to furnish the religious inspiration of other gatherings in distant places. For example, the Railroad Y. M. C. A. at Oneonta, N. Y., no longer arranges for a special afternoon service, but instead receives WGY, and according to a letter from the general secretary, A. C. Lange, "These services come through very clear and are enjoyed by all who attend."
Proper Antenna for Tuning

By F. CONRAD

Assistant Chief Engineer, Westinghouse Electric & Manufacturing Company.

I WONDER how many tonight will hear my voice from Station KYW alone and how many will hear it with a babel of other sounds. If you hear it alone, it may be due to the fortunate circumstances of my having the floor alone, so to speak, or it may be that you have more or less solved one of the problems that confront the radio broadcast listener. This problem is to hear a desired station at will and without intrusion from undesired ones. The ability to hear a desired station alone, or "selectively," as it is called, depends in part on the receiving apparatus and in part on the antenna system to which it is connected.

Many of you believe that the better the antenna the better the signals. This is true, but it does not necessarily mean that the best antenna is the largest. The function of the antenna is to transfer to the receiving apparatus the electric forces which are set up by the waves being transmitted through space. This receiving apparatus must discriminate between the electric forces due to the radio wave it is desired to receive and the forces due to the undesired waves, among which are the waves from "Dame Nature" herself, or "static," as they are called.

Importance of Selective Receiver

The selective receiver is one that offers a high resistance to the flow of current which would be set up by the electric forces from undesired waves, and offers a low resistance path for the flow of current due to the electric forces from the waves it is desired to receive. In other words, it permits you to hear the stations you wish to hear, and to tune out those you do not wish to hear.

The receptive ability of an antenna is, in general, determined by the height of its horizontal portion above the ground, or, stated differently, the strength of the electric forces induced in an antenna by the radio waves is proportional to the height of this antenna. Therefore, to tune out or discriminate between different waves, the selectivity or resisting power of the receiver to interfering waves would have to be increased as the antenna height is increased, while to receive an equal signal from a desired wave the resistance in the receiving set to this desired wave would have to be decreased as the antenna height is decreased.

Experiments have shown that when the antenna height is increased and a receiver, such as a crystal-detector set or a tube set not using regeneration, is used, the signal at first increases but but soon reaches a maximum strength, which cannot be exceeded by further increase of antenna height. This height is such that the electric forces set up by the incoming wave is sufficient to drive through the receiving apparatus the full current strength which is equivalent to the received signals. To express it in another way, this maximum current is that which would itself set up the same strength of radio wave around the receiving antenna as is induced by the transmitting antenna sending out the signals it is desired to hear.

Tube Reduces Resistance

A vacuum-tube receiving set, in which the principle of regeneration is employed, tends to reduce the resistance to the flow of current from a wave corresponding to that for which it is tuned. Therefore, if a regenerative receiver is used, with an antenna in an ideal location, it will be found possible to maintain the maximum strength of signal, even with a reduced antenna height. However, as the same resistance will be maintained by this receiver against undesired waves the reduction of height will therefore give a greater selectivity. Of course, in general practice it usually will not be possible to obtain the same strength of signal with the low as with the high antenna, as there is a certain amount of absorption or loss near the ground which tends to reduce the possible signal strength.

Should the location be such that the antenna is perfectly clear and free from surrounding objects, the low one will be found to be practically equal to the high one, when a regenerative receiver is used. But should the antenna be located where it is considerably shielded, as where it is surrounded by high buildings, it is possible that the signal strength will be greatly influenced by height. In this latter condition, it will probably be necessary to make up for the poor selectivity of the high antenna by using a somewhat elaborate receiving apparatus. Under the conditions surrounding the average residence district, it usually is possible, with care in the location of

Paris Has Radio Maids

A CCORDING to recent dispatches, the radio is supplanting housemaids in Paris. George Ernchette, president of the French society for the Study of Wireless, is replacing the servants in his home by radio, from Eiffel Tower.

Every day at 6 a.m., a wireless wave from the tower starts an alarm clock on his dresser, opens the windows of his bedroom and pulls back the shutters. An electric stove is started by the same wave, the chocolate is heated and is electrically controlled and never boils over.

The news of the day is disseminated from a loud-speaker as he eats his dinner, official time is given him by radio, and all clocks in the house are operated by wireless.

M. Ernchette declares next winter he is going to heat his house by wireless waves from Eiffel Tower.
the antenna, to maintain good signals, even though the height is considerably less than with the scheme generally employed of attaching the horizontal wire to some point near or on the roof of a two-story house.

**Inside vs. Outside Antenna**

The actual selectivity required divides itself into two classes or conditions of service; one in which it is desired to discriminate between two relatively nearby stations of approximately equal signal strength but separated by some interval of wavelengths, the other where it is desired to discriminate against a nearby station and receive from a distant one, the signal from which would, of course, be very much weaker than that from the nearby station. For the first condition, it will be found that with the average regenerative receiver, ample strength will be obtained from an antenna which is not over ten or fifteen feet high, or it may even be entirely within an ordinary living room. The second condition, however, is much more severe and requires either a location where an antenna of not over fifteen or twenty feet high will not be unduly shielded, or where the lesser selectivity of a high antenna will be counter-balanced by a more elaborate and selective receiving set.

**Here's a New Filament Control**

**COMES this month the Auto­stat, a new rheostat, manufactured by the Automatic Electrical Device Company, Cincinnati, Ohio. It represents the most radical advancement in radio filament control presented in some time. The manufacturers claim for it many advantages over the old style of rheostat. The Autostat will give a precise control of the filament current, it is said, with the turning of the knob a hair's breadth. There were forty complete turns of the knob between the maximum and the minimum resistance. Its construction is radically different, too, from the common rheostat. Two parallel mounted, wire-wound, fireproof resistance tubes are connected in a series by a micrometer operated slider—the length of wire in circuit depending upon the location of this slider. It is claimed that one full turn of the Autostat knob produces finer

**NEW and improved Radio­tron type UV-201-A, superior in many respects to the UV-201 tube, and designed to supersede the latter, has been announced by the Radio Corporation of America.**

While in outward appearance UV-201-A resembles UV-201, with the exception of a slight discoloring of the bulb, the new tube incorporates several new and distinctive features.

**One of the outstanding features of the new tube is its special filament, which requires about 1.0 amperc with a 6 volt battery source for the production of normal filament emission.**

The latest tube, however, contains a new and improved filament, requiring only one-quarter of an amperc (.25) at five volts across the terminals of the filament, and with this current the filament emission averages about the same as that in the case of an ordinary filament tube. Furthermore, the filament temperature is less and it brings in distant stations loud and clear and tunes in those elusive stations that heretofore have remained unheard.

**It gives uniform change in resistance with each turn of the knob, possessing practically “zero” resistance at full-on position.**

haustion of the new tube are carried out with extreme care so as to insure satisfactory performance.

During this process of exhaustion a mirror-like film collects on the inside wall of the glass bulb, which remains after the exhaustion is completed. The translucent film should not lead the owner to believe that the tube is defective. This slight discoloring does not interfere with the operation of the tube in any way.

**The Autostat—a super-radio rheostat which gives most precise control of filament current obtainable—is one of the latest advancements in radiology.**

**Fig. 1 is the hook-up detector, and Fig. (right) shows hook-up for amplifier for the new UV-201-A tube.**

**April, 1923**

**RADIO TOPICS**

**New U V 201-A-Tube**

**High Exhaustion**

Aside from its superior filament properties, the new tube is exhausted to an exceedingly low pressure. A high vacuum is recognized as representing one of the most important factors in the design of vacuum tube amplifiers, and every effort has been made in the case of UV-201-A to completely expel the gases from the bulb. The successive stages in the ex-
NOVEL CONTROL DEVICE

(Patent No. 1,445,524, issued to Arthur At-water Kent, of Ardmore, Pa., Feb. 13, 1923.)

My invention relates to the control, for signaling and other purposes, of a large current obtained from the output circuit of a thermonic amplifier.

The object is to reduce the power consumption to a minimum or small value and to obtain a maximum output from a given amount of apparatus.

The results are obtained by so arranging the circuit that the space current flows in the amplifier tubes only during the time that signal impulses are being sent.

The figure of the drawing shows one arrangement of circuits by which the desired result is obtained.

Referred to in the figure, 1 represents a generator of high frequency oscillations of low power, which is connected to the primary of transformer 2, the secondary of which is connected to the input circuit of a thermonic amplifier 3; the electrodes of said amplifier being the heated element and the electrode 4 being the usual grid. The space current flows from the plate electrode 6 through the inductance 8, the battery 7 and the filament 9. The foil-signalizing purpose, the inductance 8 is inductively connected to the inductance 9, which in turn is connected to the signaling system.

Connected to the input terminals of the amplifier and in parallel to the secondary of the transformer 2 is a circuit consisting of battery 12, which is the usual battery for determining the potential applied between the electrodes 4 and 5. In this invention, battery 12 has a sufficiently high voltage to reduce the space current flowing between the electrodes 6 and 5, from the battery 7, to a zero potential value.

This invention permits the transmitting of signals, currents, it is necessary to reduce the voltage impressed on the input circuit sufficiently to permit the flow of the normal space current. In order to accomplish this, the following arrangement has been found useful: A switch or key 13 is placed in the circuit of the battery and a large resistance 14 of several thousand ohms or more is placed in shunt to this key. A conductor 15 leads from some intermediate point 16 of the battery 12, the免费 electrode of said conductor being placed in juxtaposition to the spring terminal 17, which also forms one terminal of the switch 13. It has been found desirable, but not necessary, to place a key or switch 18 in the circuit of the high frequency generator. The commutator key or switch may be operated by hand directly or indirectly by means of the magnet or relay 19. The armature 20 is rigidly secured to the operating portions of the Detector 21, which may be operated by means of the key 21, which closes a circuit connecting the orignal relay and the winding of the relay. In the circuit of the secondary of the transformer 2 is placed condenser 22. A similar condenser 23 is placed in shunt to the battery 7. A choke coil 25 is placed in the circuit of the battery 12.

ARTHUR KENT'S Rheostat

(Patent No. 1,445,524, issued to Arthur A. Kent, of Ardmore, Pa., Feb. 13, 1923.)

My invention relates to rheostats, of general application, and particularly those suited for varying the strength of current flowing through, and therefore varying the incandescence of the cathodes, as filaments, of thermonic devices, such as audionics, as the like, employed in the radio act and in other relations.

Referred to Figs. 1, 2 and 3, P is a panel or support of any suitable material upon which the rheostat structure is mounted. A sheet metal base member B has at its opposite ends the integral upstanding ears or lugs L, L, and also, preferably, the integral extension E, of any suitable form, as semi-circular, as indicated.

Wound about a strip S, of insulating material, as indicated fiber or the like, is the resistance wire or conductor R, covering a bow or semicircular portion of the strip S between its ends, by which it is supported upon and secured to the lugs L. Extending through registering holes in one lug L and one end of the strip S is a screw l, upon which is threaded a nut member a, thereby holding and clamping the strip S to the lug L. The nut n and the co-operating nut o form a binding post or one terminal of the rheostat, the binding post structure serving to clamp and connect the circuit conductor p, which according to the structure described, is in electrical communication with the base B, the end f of the conductor R being free or unconnected.

Through registering holes in the other lug L and the other end of the strip S extends a screw l, upon which is threaded the nut member a, thereby holding and clamping the strip S to the other end of the resistance wire R, whereby one end of the resistance conductor R is in electrical communication with the binding post formed by the nut n and the co-operating nut o, which serves to connect and clamp the other circuit conductor p, which is accessible in electrical communication with one end of the resistance R. By bushing b and washer s, of both of insulating material, the screw l is extended from the lug L and base B.

Extending through the registering holes in the panel or support P and the base B, or its extension E, is the externally threaded metal bushing A having the flange f, seating against the member P and having on its other end the metal nut a by which the flange f is drawn snugly against the panel P and by which the base B and the parts attached thereon are secured to the panel.

Rotating and bearing within the sleeve or bushing A in the section in which is secured by the screw e the metal bushing g having the end b of reduced diameter extending through a hole in the metallic contact lever l, which is fixedly secured to the bushing g by splitting over or riveting the end of the aforesaid portion h. The contact lever l has a struck-up contact portion j, which engages the resistance wire R.

The contact lever i is more or less resilient, and its tension, as determined by the position of the bushing g upon the shaft d, determines the amount of contact pressure exerted. The portion f the contact lever i, upon the resistance R, the bushing b being adjustable to different positions upon the shaft d.

A COMPACT DETECTOR


This invention relates to devices for modifying the effects of alternating electromotive waves to produce audible signal responses.

The primary object of this invention is to provide a sensitive easily adjustable and dependable contact-type detector for radio signaling.

The invention contemplates the use of an evacuated tube containing the dissimilar electrodes which together constitute a sensitive, for the purpose of converting radio frequency currents such as are received in radio telegraphy or radio telephony. One of these electrodes is stationary with respect to the other, and the other is of a granular or divided material which has non-cohering characteristics, and which is so placed within the tube as to afford a variable or adjustable contact with the other or stationary contacts.

The sensitive couple in the form shown in Figs. 1 and 2 consists of metallic particles and a so-called crystal or non-metallic substance S. The particles S are preferably of substantial size and may be termed "granules." They are also preferably of irregular shape, and may be any one of the well known materials used in the known contact detectors, such as commercial silicon, galena, iron pyrites, natural oxide of zinc, etc. These elements are mounted in the tube in the manner of plugs 7 and 8. The fixed or stationary act of the couple, is held a distance apart from the terminal 7 by means of a sleeve of glass or other insulating material 9.
NEW ELECTRICAL CONDENSER

This invention relates to electrical condensers and has for its object a condenser which is substantially cylindrical in form, which can be tightly compressed to a diameter of one inch or less, or any other desired form with which diametrically opposed extensions are provided, and which can be used in wireless apparatus and an object of the invention is to provide a carborundum detector which is simple to construct, which is compact, which can be tightly compressed to a diameter of one inch or less, or any other desired form with which diametrically opposed extensions are provided, and which can be used in wireless apparatus.

Referring more particularly to the drawing, the improved non-pyroelectric wave detector comprises a base 1 of wood or any suitable non-conducting material. The supporting base 1 is provided with a centrally disposed circular cutout portion 5 with which the diametrically opposed extensions 6 and 7 communicate. The mineral crystal carrying cup 8 of the wave detector is positioned in the cutout portion 5 and it comprises a substantially cylindrical cup open at its upper end and having supporting stems 9 and 10 projecting therefrom at diametrically opposed points. The stem 9 is rockably supported in the upper end of an angular metal strip 11 of conductive material, which is attached, by means of a suitable screw, to the bolt 12, to the supporting base 1. The stem 10 is rockably supported in the angular metal strip 11, bar 13 of conductive material, and one of the spines 15 and 16, which engage opposite conductive strip 14, is held in firm engagement with this conductive strip 14 by the bolt 15 which serves to connect both the angular bar 13 and the strip 14 to the supporting base 1. The strip 14 is connected to the binding post 16 which is to have connection with the wireless apparatus.

RADIO RECEIVING SYSTEM

(Figures Nos. 3 to 6, 720)

The present invention relates to radio receiving systems, particularly to systems for receiving continuous wave signals.

The present invention involves a crystal detector 1 with the usual indirect induction 2 and a transformer 3 by means of which the received signals are impressed upon the grid circuit of a detector 4 of the electron discharge type. The plate and grid circuits of the detector are coupled together at 5 in order that the detector may generate a current of the proper phase and intensity to drive the receivers of signals produced from near-by stations of high power and of wave length substantially the same as the desired wave length of signals which are to be received from a distant station.

YOU SAVE $7.30

By Our Big Special

HOMCHARGER DEAL

We offer one brand new, guaranteed, non-pyroelectric and a 180 day GUARANTEED RADIO "A" BATTERY, both for $8.75. Think of it! Just what others charge for battery alone! Here's real value for your money.

STUDY THESE FIGURES:

HOMCHARGER (as sold everywhere).

Value:...........

Price:...........

TOTAL VALUE:...........

YOUR SAVING:...........

The Battery You've Been Waiting For...

BROCKWAY VARIABLE CONDENSER

Our prices range from 150 degrees; others have only 150. Includes new 12-15 plate condenser, selective tuning detuned. These big BROC

KAYITE(/er 6 volt. 120 plate battery in special style, case with cover and handle. Frame in

12 volt. 18 plate battery, with cover and handle. Complete set owners of old receiver, only $1.50 with switch in cover.

BROCKWAY and this battery both for only $5.90.

NOBLE BATTERIES

1456 MONADNOCK BLVD. - CHICAGO

www.americanradiohistory.com
Both Selling Fast
Because the Price is Right!

Variometer $4.00

Set of Three
2 Variometers $6.00
1 Variocoupler $1.00

Special $10.00
Send Your Order to-day

Our Name Protects You
Chicago Radio Apparatus Co.
415 S. Dearborn
Chicago.

ESTRU
Lattice Variometers
List Price $5
Dalton, Whittier, True
2905 West Madison Street
Chicago

Frost Ones
Best for Your Radio Set

Patents procured and trade-marks registered.
Advices and terms upon request. Robb, Robb & Hill, 1421 Hanna Bldg., Cleveland, Ohio;
969 McLachlan Bldg., Washington, D. C.

FOR SALE—COMPLETE RADIO RECEIVING set, detector and three-stage amplifier, regenerative receiver, vario-coupler and 2 varioneters, phone, B battery and storage battery, new, loud speaker horn, Tuner rectifier, complete, installed. $150. CLINTON R. WHITE, 222 W. Kinzie St., Chicago.

Radio Topics" New Feature

The National Broadcasting schedule which is being prepared by RADIO TOPICS will be included as a supplement of the MAY issue, as the printers were unable to complete it for this issue.

This special feature will be an invaluable aid to radio fans throughout the country. Look for it.

The Receiver
which has met with
Universal Favor
Telmaco
Type B-R Receiver

A careful analysis of the past two revolutionary years in Radio shows unquestionably that the receiver of the future must have the following qualifications:

EFFICIENCY OF OPERATION: Securing distance, volume, selectivity.

EASE OF OPERATION: Enabling the novice to secure satisfactory results.

HIGHEST QUALITY OF WORKSMANSHIP AND MATERIALS.

The time when inferior radio products can be successfully merchandised is past. PRICE within the reach of everybody. All these qualifications are combined in the TELMACO Type B-R Receiver.

Specifications:

Panel—Formica, grained and machine engraved, Vario-Coupler—TELMACO special silk wound with loading inductor in series with primary. Condensers—Special 13-plate with h湖北e.
Lite ends. Rhincot—Special knob control. Sockets—Highly nickelized shell, Bakelite base. Dials—are polished, presenting pleasing contrast with dull panel. Workmanship manufactured according to TELMACO's rigid specifications. This guarantees your satisfaction, either 6 volt or 1½ volt tube may be used.

Price $25
The ultimate in value.

Telmaco Type B-A Two Stage A. F. Amplifier

Matches the above in size and construction. The greatest Amplifier value on the market. Price $20.00.

RADIO DIVISION
TELEPHONE MAINTENANCE CO.
20 S. Wells Street
Dept. C Chicago, Illinois

Cheaper than making your own

Detector and two-step audio-frequency amplifier unit, completely wired as illustrated, $24.75. Supply is limited.

Telegram or mail order today.

DX RADIO CO
SUMMIT, ILLINOIS

Say you saw it in "Radio Topics" when writing to advertisers.

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The BENWOOD CW Transmitter

Simple, compact, up-to-the-minute construction—incorporating all the improvements made possible by our years of experimenting, AND IT GETS RESULTS!

FOR SALE

- A REAL TREASURY

- 10 to 300 Jewell milliamperemeter, $4.00; 1-0 to 500 Jewell milliamperemeter, $4.00; 1-0 to 5 Jewell Radiation Ammeter, $7.00; 1 Radio Corporation Inductance, $7.50; 2 .0015 DeForest Variable Transmitting Condensers, $8.00 each; 6 W. E. Sockets, 75c each; 2-5 watt transmitting tubes U V 202, $4.00 each; 1 filament transformer 8-10-12 volt taps (home-made), $2.50; 2 choke coils (home-made), $5.00 for two; 1 Joy-Kelsey Microphone, $3.00; 1 W. E. Modulation Transformer, $3.00; 1 Boston Key $4.00.

Above can be had all mounted on panel for $55.00. The only thing necessary for immediate operation of set is motor-generator or C. W. transformer A. C. Or will sell individual parts.

Address Box X B, Radio Topics, Oak Park, Ill.

TELEPHONE vs. RADIOPHONE

(Continued from page 20)

without interference, it will be necessary to regulate the service in such a way as to assure the public satisfactory results. Limitations in the number of transmitting stations will naturally come, for talented performers are scarce and the best will have little incentive to perform in a babel of interference and to a divided radio audience.

May Be Extended

Radio receiving stations may be extended indefinitely in number without effecting the quality of service and such expansion in the great radio audience will make it worth while to broadcast the best of programs.

I have made an attempt, by contrasting the two methods of telephony and the two types of service, to show you the necessity or organizing and controlling radio transmission. It is unfortunate that the existing laws are so far out of date and there is now no means of regulating the uneconomic, unnecessary, and senseless interference caused by so many broadcasting stations, to which no one wishes to listen, and individual communications by both radio telephone and telegraph.

The American public will be satisfied only with good programs and good reception. Good programs will come only when broadcasting is done by a few favorably located, high class, high power stations. Good reception is possible if our law makers will allow the separation of broadcasting wave bands and will hush the individual who today ruins the entertainments of thousands by the operation of an antiquated or improperly adjusted telegraph apparatus.

Your co-operation is needed to improve broadcasting conditions. The tastes, troubles and desires of the public must be made known to those who broadcast, to your local radio inspector, and to your Congressional representative.

All of these are anxious to solve the radio problems in such a way that you will be given the best of local and long distance service.
As Noiseless and Smooth as a Bird Thru the Air

Gone are the scratching and noises as you vary the current to your tubes.

Can you imagine anything more perfect and smooth in operation than a resistance wire passing through a well of mercury?

Then there is another wire which gives a vernier adjustment.

No need to turn back the rheostat to shut off the tube; just a touch of the fingers and a bearing switch throws it in or out.

There is also a Gollos Potentiometer on the same principle.

They come ready for panel mounting and template furnished. A Gollos Mercury Rheostat sent postpaid for only $2.00

Dealers Desired

GOLLOS DEVICES, Not Inc.

"Perfect Noiseless Rheostats"

118 N. La Salle Street :: CHICAGO

Suite 704

The Gollos Mercury Rheostat

Say you saw it in "Radio Topics" when writing to advertisers.
HARSHA "SUPER B" Rechargeable Battery

Harsha "Super B" batteries are made in 24 and 65 volt types. Batteries contain no separators; this gives free electrolyte action and a more even flow of current. Special scaling eliminates acid and voltage leakage. Harsha "Super A" batteries are of highest grade construction. Harsha serrated plates give as high as 53% greater capacity per square inch. Cases in mahogany finish and Rub-Tex.

Hickok Transformers

Radio and Audio Frequency Transformers. Highest quality that can be produced, sealed and sold on a guaranteed performance basis.

Radio Freq., Air Core,shielded Audio Freq., perfectly shielded
will not boil. List......$2.09

Victory Variotomer

Bakelite, with molded rotor, spring loaded brush contacts; will not produce noise; material and workmanship of the highest grade. List......$6.50

Victory 180° Varioocoupler

Single and three circuit types. Most rigid coupling of this type on the market. Mechanical parts represent the last word in design and workmanship. List......$5.25

Felt-Kimmel Condenser

The most accurately built variable condenser on the market. Plate area and spacing adjustable. Most rigid coupling of this type on the market. Very rigid in construction, to prevent shifting of air gap during starting, testing and tuning within usual limits. Made in sizes: six, nine, twenty-three and forty-three plates.

Felt-Kimmel plate. List......$0.40-6.40

Felt-Kimmel "V" extra.

France Battery Charger

A new charger containing no metal contacts. Gives "A" and "B" Battery type charger, starts at 15, finishes at 90 volts. No. 1 unit. List......$15.00

Uses regular 110 volt battery from 100 volt Sharp. List......$8.50

Will charge 120 volt battery from 110 volt Sharp. List......$20.00

"A" & "B" Battery Tester

Only instrument of its kind. Will test any type storage battery. Plant will not stick and is extremely accurate. List......$6.00

Our parts and units contain the highest grade material possible. Each part is especially designed and constructed by experts, and has a guarantee of performance. Each part and unit beautifully finished.

DEALERS AND DISTRIBUTORS WANTED

Some territory now open. Write for catalog and discounts.

C. W. HOWE & CO.
21 East Van Buren Street, Chicago

RADIO TOPICS

ELEMENTARY ELECTRICAL PRINCIPLES

(Continued from Page 22)

kilowatt-hour you can figure the actual dollars and cents you spend on your line loss alone. A kilowatt is 1,000 watts. We have here a loss of 186.56 watts or 0.1865 kilowatt-hours. For one hour of operation of this motor we can calculate the expense not only of the motor's useful power, but also of the line loss power.

First, let us take the cost of useful motor power. The 5 H. P. machine drew from the line 4,662.5 watts or 4.6625 kilowatts. If the rate is 5 cents per kilowatt-hour and the motor runs at full load, every hour of running will mean an expense of 23 cents.

We find this by multiplying the kilowatts by the number of hours by the rate per kilowatt-hour. If you operate for ten hours per day for 300 days per year, this one motor will cost you $700. But this is not all. Here we only considered the motor itself. Remember that the line running to the motor is not 100 per cent efficient. We lost some power in it. Let us see how this works out.

We lost 44 volts in the line in overcoming the 0.1037 ohm. We had a current of 42.4 amperes flowing in the line when the motor was running on full load. Then the watts lost in the line equals to volts times amperes is 1,896.56 watts. This represents a loss of some money. At the same rate of 5 cents per kilowatt-hour, we have 186.56 watts or 0.1865 kilowatt multiplied by one hour multiplied by the rate 5 cents. This equals 0.095328 or nearly one cent money per hour every hour the motor is running at full load and drawing its 42.4 amperes.

If this continues for 10 hours per day for 300 days per year, we see the yearly expense of lost power in the line equals $7.98. This is really costly for a business. Suppose you had five or six of these motors all operating like this and each one costing this amount for line loss alone, you would soon begin to wonder what was the matter.

This condition actually does exist, however, in many factories and shops where the electrician is not technically trained and does not understand the method of handling such problems. Money is a big thing in plant operation and close tab must be kept at all times on such things as these. Right before our eyes big financial losses occur because of unnecessary resistance of conductors. It all evolves from this idea of efficiency. A simple illustration is this:

You pour into a bucket exactly one gallon of water; you empty the bucket and do you get out exactly the same gallon you poured in? Exactly not! Some of the galon sticks to the inside of the bucket. There is no machine or no power line which can pour out the exact amount of energy it takes in. Some is lost. What determines this loss? Simply this—efficiency.

So in our study of electricity we will deal constantly with power lines, be they running to motors, lights, radio apparatus, or anything else. We will always meet efficiency face to face. Resistance is the big thing we must watch in our electrical work. Small wires use up voltage. If we increase the size of our conductors a trifle we would get greater results from our circuits.

In the above problem, if we had wired this 5 H. P. motor with a slightly larger wire, the No. 5 Brown & Sharp wire, the cross-sectional area of this size wire being 4107 C. M. Since the mains are carrying a pressure of 110 volts exactly. When you press your sending key the ammeter in the primary circuit to your transformer reads 8 amperes. The line leading from No. 7, what would have been the following results for the 5 H. P. motor installation, yearly cost of lost energy on the line is not to be considered.

Do you understand why the better trained electrical or radio man tells you that your line losses rather large? To understand this article its fullest degree you must read it and reread it; study it carefully. You will then thank the writer for giving you this little bit of information and directing you in one of your first steps into real electrical engineering.

Problems

1. Referring to the article just discussed, if we would have used the No. 5 Brown & Sharp wire, the No. 7, what would have been the following results for the 5 H. P. motor installation, yearly cost of lost energy on the line in question, another important item, also, what would have been the necessary switchboard voltage in order that the motor could have received its 110 volts exactly? Show all your figures.

2. The transformer in your radio station is 150 feet from the electric light company mains. These mains carry a pressure of 110 volts exactly. When you press your sending key the ammeter in the primary circuit to your transformer reads 8 amperes. The line leading from No. 14 Brown & Sharp wire, the cross-sectional area of this size wire being 4107 C. M. Since the mains are carrying a pressure of 110 volts exactly. Use the method given in this article.

3. State exactly, in your own words, just what you understand by the word "efficiency." How can you increase the voltage input into your transformer? Use the method given in this article.

4. A motor is rated at 15 H. P. It operates on 220 volts and draws 60 amperes. Calculate its efficiency. How much would it cost to run this motor for one hour if the rate is 8 cents per kilowatt-hour?

If we have a motor which is said to be extremely inefficient, what probable causes would you give for this inefficiency? Name everything you can think of which will lower the efficiency of this motor.

Start to work out these problems and send your answers to Radio Topics, Oak Park, Ill., at once.
CROSLEY MODEL X
This Crosley Model—costing only $55—is probably the most complete and satisfactory receiving set on the market today. Owners of the Crosley Model X have tuned in with practically every broadcasting station in the United States, hearing the selections clear and distinctly.

The feature of the Model X success is the one stage of Crosley Tuned Radio Frequency Amplification before the detector. By means of this, the incoming sounds, even from remote stations, are amplified many times before they reach the detector. Other popular Crosley Models are No. VI, a two tube set at $28 and No. VIII, a three tube set at $38.

CROSLEY
BETTER COSTS LESS
RADIO
Write for complete catalog.
CROSLEY MANUFACTURING CO.
423 Alfred St.
Cincinnati, Ohio

Kellog V-T Socket
the durable socket
Kellog molded lamp sockets at all standard four prong based vacuum tube positions. Extra heavy solid base 7-16 inch thick. 75c ea. Four German silver springs with rounded ends firmly held in position in deep grooves. Cannot touch mounting surface. Double end nickel plated binding posts. Connections can be made under the socket as well as above. A practically indestructible construction. 75c each, postage paid.

COMPLETE RADIO EQUIPMENT
The item above is merely a sample of the excellent line of radio equipment that is handled by the Apex Radio Company, Inc. All orders for sockets or other standard equipment will be filled the day received. Send two cent stamps for our new price bulletin.

APEX RADIO CO. INC.
6914 S. Halsted St.
Chicago, Ill.

To the Man with an Idea
I offer a comprehensive, experienced, efficient service for his prompt, legal protection and the development of his proposition. Send sketch of model and description, for advice as to cost, search through prior United States patents, etc. Preliminary advice gladly furnished without charge.

My experience and familiarity with various arts frequently enable me to accomplish clients as to probable patentability before they go to any expense.

Richard B. Overy, Patent Lawyer
21 Queen Blvd., Washington, D.C.
2378 M Woollworth Bldg., N.Y.C.

RADIO TOPICS
HOW AND WHY OF BROADCASTING
(Continued from page 16)

The New BURGESS Radio Atlas of the World

T

THROUGH the air comes a signal! Who's calling? Where is he located? Can you mentally put your finger on the spot?

The new Burgess Radio Atlas lists every broadcasting station in the world and contains three big double page maps, 13 x 16 inches in size, showing—(1) The United States; (2) Canada; (3) The World.

10c Brings It
Send us ten cents and your dealer's name and we will send you this big 16-page map containing the three big maps showing by red dots the location of all towns with broadcasting stations. Contains two lists of all stations, alphabetically and by towns, together with wave lengths and names of owners. Maps show time divisions and radio districts. All new countries correctly shown and named. Single page map shows U. S. Army and Navy Stations. Many other descriptive facts and data too numerous to mention.

Every radio operator needs one of these Burgess complete Atlases. First edition is limited. Send your order today and don't fail to mention your dealer's name.

BURGESS BATTERY COMPANY
Dept. 55
Madison, Wis.

In Canada: BURGESS BATTERIES, Ltd.
Winnipeg, Toronto, Montreal

BURGESS RADI0 BATTERIES
"ASK ANY RADIO ENGINEER"

www.americanradiohistory.com
Radio Frequency Ammeters

HOT WIRE AMMETERS

All transmitting sets, and continuous wave sets in particular, require ammeters to obtain the best results. You cannot depend on the other fellow's ear. The circuits from input to output must be adjusted by ammeters.

The hot wire ammeter is the universal meter for this service. It is adapted for direct current, low frequency alternating current and for radio frequency. It can be checked at any time on direct current and will be equally accurate on radio frequency. As this section depends on the fundamental D-E law, it always measures actual effective amperes. We recommend for this service our Type 127 hot wire ammeter. This meter employs a platinum expansion element and is rugged and reliable. The diameter is three inches and this meter is made in front-of-panel and flush-mounting models. It is supplied in a variety of convenient ranges. The price is also right.

Price $7.75

SEND FOR FREE RADIO BULLETIN 914-T

GENERAL RADIO COMPANY
MASSACHUSETTS AVENUE AND WINDSOR STREET
CAMBRIDGE 39 MASSACHUSETTS

Do not confuse the products of the GENERAL RADIO CO. with those of other concerns using the words "General Radio." The General Radio Co. has been manufacturing radio and scientific instruments for many years. It has no affiliation with any other company.

The builder of radio-frequency amplifiers must expect to have to experiment somewhat to get the results they hoped for. At such high frequencies the current does not necessarily hold to the wire, but will pass from wire to wire by condenser action on the least provocation. Radio-frequency transformers therefore must be carefully shielded and much care must be exercised in seeing that the position of the wires is such as to prevent currents getting where they are not desired. A potentiometer is essential to the successful operation of a radio-frequency amplifier.

To sum up, properly constructed and installed radio receivers will operate satisfactorily if they are understood and if too much is not expected of them. Like any device made by man, they have their limitations, and they operate according to certain laws, and when these limitations and laws are properly understood, they will give satisfaction.

This radio game is just as much fun at our end as it is at yours. There's genuine satisfaction in knowing that our radio parts and radio sets will "deliver the goods" to some eager experimenter, or unforgetting convey a message of international importance to the ear of a waiting world.

At the SIGNAL plant we never forget that if we scrump on material or slight our work, then someone will surely be disappointed, and perhaps a despairing call for help may be made in vain.

So it is our joy to perform each operation, little or big, with the utmost of conscientious precision. Knowing, too, that no life can ever be charged against defective SIGNAL equipment.

Radio components bearing the name of SIGNAL may safely be depended upon for good, honest service.

SIGNA L Tuba Base for WD-11 Tubes

Adapted for building receiving sets using a single 6 volt cell for filament excitation. Does away with the troublesome 6 volt storage battery but retains the efficiency of the 6 volt tube. Legs provided for table mounting; screw provided for panel mounting.


Please send catalog and literature giving complete information about SIGNAL Radio equipment to name and address written in margin.

The crystal detector acts as a check valve, allowing current to flow through in one direction only. (Courtesy of W. W. Hodkinson Film Corp., from "The Mystery Box" Film.)
Radio Topics

New York Has Radio Show

The third annual convention of Executive Radio Council of the Second District which was held at the Hotel Pennsylvania, New York City, March 1-3, was another success of the radio amateurs.

The exhibitors had an interesting and instructive display and some of them eclipsed anything ever seen at any radio show. There were many new features never before seen at a radio show, among these being a particularly fine transmitting set. This set is something special in the line of transmitters and was used occasionally throughout the show for demonstration. There were more than thirty aerials strung up to the large sign on the roof of the hotel.

Interest ran high around the exhibition booths of the radio clubs, of which there were seventeen, coming from all sections of the metropolitan area.

The convention closed March 3, ending with the third annual banquet at the Hotel Pennsylvania.


Radio Helps Shorthand Students

Every day brings to light another use for radio broadcasting. It is now revealed that students of shorthand and typewriting are picking up addresses out of the ether to increase their speed at the typewriter or in writing shorthand symbols of the speaker's words. Those who have had to rely upon the patience of a member of the family or a friend to read to them while they dashed down the dots, dashes and curves, can appreciate the advantage of radio dictation.

Radio helps shorthand students because of the astonishing number of requests for Chi-Rad's latest Handbook-Catalog, we are forced from this date on to make a small wrapping and mailing charge.

In this Chi-Rad Handbook are 40 pages of valuable information for every radio fan. It includes the following:

1. Technical discussions of standard radio apparatus and equipment.
2. Complete instructions, including diagrams, circuits, and illustrations of "How to Build a Relinzr Receiver.
3. Radio definitions, codes, wire tables, etc.

Just wrap a dime up in this ad and mail it to us today. Requests for books will be filled in the order in which we receive them.

National Bay State Shoe Company

296 Broadway, New York, N. Y.

WANTED


Radio "HITS" Big Complete List

If Winter Comes, in Bluebirds, Land, Troy Along, Etc. Piano, Orch., Band, Sax, Mute., FREE CAT. Order from the Man You Know—WILL ROSSITER, 33 W. Lake St., Chicago.

The Cat's Whiskers

By RADIO JOE

Conditions instead of bettering themselves are presenting many a protest of the amateur, and he in turn is beginning to leave the radio field with a big bang, according to the latest reports from the Ninth District Inspector's office. Schools are anxious to get the dots, dashes, curves, can appreciate the advantage of radio dictation.

April, 1923
Montgomery Ward & Co.

The Oldest Mail Order House is Today the Most Progressive

Perry Radio Supply Co.
218 Washington Blvd.
River Forest, Ill.

Ford Runs 57 Miles on Gallon of Gasoline

A new automatic vaporizer and decarbonizer, which in actual test has increased the power and mileage of Fords from 25 to 50 per cent and at the same time removes every particle of carbon from the cylinders, is the proud achievement of John A. Stransky, 3482 South Main Street, Pukwana, South Dakota. A remarkable feature of this simple and inexpensive device is that its action is governed against the end of the tube terminals, and the same degree. This same objection is also found in all adapters, as it is necessary for the connection to cross over and run in close proximity to each other.

The Na-ald socket, designed and sold by the Alden Mfg. Company, Springfield, Mass., is designed especially for this tube, and the Na-ald No. 199 tube that works from two dry cells. However, the most interesting change for added efficiency is in the changing of the plate and grid terminals.

In the regular 6-volt tube Nos. 200, 201 and 201-A, the plate and grid terminals are side by side. In the Westminster W. D. 11 tube and General Electric Company's No. 199 tube, the plate and grid terminals, or prongs, are opposite each other. This elimination of capacity between these two terminals adds a great deal to the efficiency of these tubes. To get the full benefit of this efficiency it is advisable to use sockets designed especially for this tube. Some manufacturers have simply made over the mold for their regular sockets necessitating making the changing of connections underneath. To do this they must run close to each other, and this decreases the capacity effect to a serious degree. This objection has increased the power and mileage of Fords from 25 to 50 per cent and at the same time removes every particle of carbon from the cylinders, the Na-ald No. 199 tube that works from two dry cells.

New WD11 and No. 199 Tube Sockets

Probably a great many have wondered why it was that the Radio Corporation, with its exclusive control of the manufacture of vacuum tubes, have seen fit to change the types and sizes of their bases.

This question was put to one of their representatives recently, who made the following explanation:

There have been no changes made in tube design without a real reason for changing. The size of the W. D. 11 tube lends itself to a smaller base. The variation in the size of the prongs and peculiar location insure the tube being placed in the socket with the proper connections and prevents its being burned out by being placed in a socket of sets using a 6-volt battery.

The same reason for changing the size of the base also applies to the new G. E. 199 tube that works from two dry cells. However, the most interesting change for added efficiency is in the changing of the plate and grid terminals.

In the regular 6-volt tube Nos. 200, 201 and 201-A, the plate and grid terminals are side by side. In the Westminster W. D. 11 tube and General Electric Company's No. 199 tube, the plate and grid terminals, or prongs, are opposite each other. This elimination of capacity between these two terminals adds a great deal to the efficiency of these tubes. To get the full benefit of this efficiency it is advisable to use sockets designed especially for this tube. Some manufacturers have simply made over the mold for their regular sockets necessitating making the changing of connections underneath. To do this they must run close to each other, and this decreases the capacity effect to a serious degree. This objection has also found in all adapters, as it is necessary for the connection to cross over and run in close proximity to each other.

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January 30, 1923.

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These Loud Speakers are becoming more popular every day. And no wonder when you consider that they have no metal except in the phone units and therefore do away with that “tin-panny” tone entirely.

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