

How to Install a Receiving Set in Your Ford

Radio Digest

EVERY WEEK

PROGRAMS
Illustrated

TEN CENTS

REG. U. S. PAT. OFF. & DOM. OF CANADA

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SATURDAY, MAY 17, 1924

No. 6

NEW RADIO TYPEWRITER

WIRED RADIO BEST MINER LIFE SAVER

CARRIER CURRENTS MOST RELIABLE, CLAIM

Surpass Pure Ether Waves in Ability to
Surmount Obstructions in Severe
Underground Accidents

WASHINGTON—Experiments with line Radio and carrier currents in mines indicate that this method is feasible for two-way conversations between miners below the surface and the mouths of mines, both for every-day use and in emergencies, according to the Bureau of Mines. It has greater advantages than the use of pure Radio, it is said, on account of its being simpler to install and more reliable.

The difficult problem of communicating with underground workers and surface stations of mines, especially after severe disturbances or accidents have taken place, will be solved, according to J. J. Jakosky, assistant engineer of the Interior Department, by the development of the "wired Radio" telephone, utilizing existing underground "carriers," such as trolley wires, mine tracks, water and compressed air pipes, and cables. In tests, which he supervised at the Pittsburgh experimental mine, no difficulty was experienced on the surface in receiving.

(Continued on page 2)



Vera Tompkins (above) is the star in "The Man Who Ate the Popomack," which was recently broadcast from WOB, Newark. Margaret Roberts (left), mezzo soprano, made a hit when she sang from Westinghouse Station KYW, Chicago. Julian Rogers (right), prima donna in John Robinson's circus, is the possessor of that wonderful voice you heard the night the circus was broadcast from WJAX, Union Trust, Cleveland.



Broadcast Six-Day Bicycle Race from French Capital

PARIS.—Radiola station was recently giving the results of the six-day bicycle race in the Winter Velodrome here. An interesting stunt that the famous announcer, "Radiola" worked was to go down into the resting pits with the microphone and have the resting members of the various teams talk to the Radio audience. The idea met with great success.

SENDS NEWS ACCURATELY WITH SPEED

Transmits 65 Words per Minute
on Standard Equipment
without Interference

Publishers Laud Machine

Demonstrate Before Large Representation of Newspapermen
at Recent Convention

NEW YORK.—A marvel of news transmission in the shape of a Radio operated typewriter was demonstrated to hundreds of newspaper publishers assembled at the American Newspaper Publishers' association convention here recently. With a sixty-foot antenna dropped from a window the machine ground out regular news matter at 65 words a minute on a standard equipment Kleinschmidt printer typewriter and sent veteran newspaper men away declaring loudly that it was a miracle of speed and accuracy.

A location in which the most adverse possible conditions would be encountered was chosen by its demonstrators, M. Koenigsberg and J. E. Connolly. In addition to the electrical interference from New York's subways, elevateds, cars and telephones, there was the constant chatter of



(Continued on page 7)

SEE VALUE OF RADIO FOR FIGHT ON T. B.

HOSPITAL "BROADCASTS" ITS OWN PROGRAMS

Patients Enjoy Entertainments That, Without Airplanes, They Would Miss Entirely

HAMILTON, ONT. — Physicians in charge of the Mountain Sanatorium here have accepted broadcasting as a valuable ally in their fight against tuberculosis.

Probably in no hospital has a more complete Radio receiving equipment been installed than that which is in daily use at the institution here where the buildings housing the patients are scattered over a large area. It is possible to get broadcast entertainment from all parts of the United States and Canada. Even when static is bad or when local interference prevents good reception, there is a program for the hospital "broadcasts" its own to the patients.

By means of a microphone or pick-up device and a special amplifying unit, addresses by physicians, and piano and phonograph music may be sent over the lines to every one of the 300 bedside phone sets.

Hear Local Entertainments by Wire

The patients are also permitted to participate in the musical entertainments held in the city of Hamilton from which they would ordinarily be shut off because of their illness. Churches and theaters may be connected to the receiving apparatus of the hospital by telephone lines; the signals are then amplified in the Radio room and sent over the hospital circuit to the listening patients.

If an adult patient is too ill to listen or if he does not care for broadcast entertainment he need not be disturbed and in this is the advantage of individual head sets over the loud speaker. The children's ward is connected by loud speaker and there a group of fifty children listens to the afternoon and early evening programs.

Like WGY Players Best

Every evening, for a period of three hours, beginning at 7:30 o'clock, Radio entertainment is provided the patients. One night a week an extra half hour of Radio is offered the patients. The most popular broadcast feature, according to vote of the patients at the sanitarium, is the Radio drama produced by the WGY players at Schenectady.

As a rule the play runs very close to 10 o'clock and the patients objected to losing the last act, as was generally the case when the receiver was cut out at 9:30 o'clock. There is now a standing rule at the sanitarium providing for "lights out" at 10 o'clock instead of 9:30 on the evenings of the WGY plays. The extra half hour of Radio is believed to be as beneficial as a half hour of sleep.

Eerie Broadcast Ghost Puzzles Fans of Britain

Mysterious "2LO" Broadcasts "Westminster Abbey" Services

LONDON.—The Radio ghost, calling itself 2LO, is eluding detection by broadcasters of two continents and listeners in the United States. His eerie broadcasting has delighted American ears at hours when the most rabid Radiophans in England were dreaming of getting Timbucto on a one-bulb set.

The international incident of the broadcasting ghost began with letters from the United States claiming to have heard concerts from London that were never transmitted. The mysterious announcer, it appeared from these letters, wound up his proceedings by requesting listeners to "please report on your reception to 2LO, London, England." This, the letter-writers proceeded to do, but the British Broadcasting company found that not only had the items never been broadcast but that in the hours named were ungodly times in the early morning when 2LO was closed down, asleep and locked up.

The most remarkable claim by the ghostly announcer was that 2LO was about to transmit a service and anthem from Westminster Cathedral. A listener in Texas was much struck by the clear reception he got and wrote to London to say how much he appreciated it. At the hour mentioned the cathedral was in profound silence and darkness. Another letter complimented 2LO upon a 3:30 a. m. entertainment on Christmas morning!

The "2LO" heard, it is believed, is some American amateur broadcaster with a practical joke turn of mind.

Gives Talk at Milwaukee

MILWAUKEE, WIS.—"Dielectric losses in reception and transmission" was the subject of a talk given by E. T. Flewelling, before the Milwaukee Radio Amateurs club May 1. A large representation was present to hear the talk.

ANNOUNCEMENT OF STANDARD RADIO FREQUENCY SIGNALS

THE Bureau of Standards is transmitting special signals of standard frequency about twice a month. These can be heard and utilized in general east of the Mississippi river. The special standard frequency signals are of use to testing laboratories, transmitting stations, operators, and others in standardizing wavemeters and adjusting transmitting and receiving apparatus. The transmissions on May 20 and June 5 will be of special interest to ship operators, those on July 7 to amateurs, and those on June 20 to broadcasting station operators. The accuracy of the signals is better than three-tenths of one per cent.

All transmissions are by unmodulated continuous-wave telegraphy. A complete frequency transmission includes a "general call," a "standard frequency signal," and "announcements." The "general call" is given at the beginning of the eight-minute period and continues for about two minutes. This includes a statement of the frequency. The "standard frequency signal" is a series of very long dashes with the call letters WWW intervening. This signal continues for about four minutes. The "announcements" are on the same frequency as the "standard frequency signal" just transmitted, and contain a statement of the measured frequency. An announcement of the next frequency to be transmitted is then given. There is then a four-minute interval while the transmitting set is adjusted for the next frequency.

The schedule of standard frequency signals from the Bureau of Standards is as follows:

Eastern Standard Time	May 20	June 5	June 20	July 7
11:00 to 11:03 p. m.	125 (2399)	300 (1000)	550 (545)	1363 (1270)
11:12 to 11:20 p. m.	133 (2324)	315 (952)	570 (461)	1430 (210)
11:24 to 11:32 p. m.	143 (2097)	345 (889)	750 (400)	1500 (200)
11:36 to 11:44 p. m.	157 (1934)	375 (800)	833 (360)	1600 (187)
11:48 to 11:56 p. m.	168.5 (1800)	425 (705)	940 (316)	1700 (176)
12:00 to 12:08 a. m.	205 (1623)	500 (600)	1050 (285)	1800 (167)
12:12 to 12:20 a. m.	260 (1153)	600 (507)	1150 (261)	1900 (158)
12:24 to 12:32 a. m.	315 (952)	667 (450)	1250 (240)	2000 (150)

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Looking Ahead

Construction of a Portable Set for the Automobile is another article by H. J. Marx giving further details of installing receiving sets in automobiles. In the next issue Mr. Marx will emphasize the best type of set to use in an automobile.

A Talking and Singing Suitcase is the title of another portable set that will be described in the next issue by S. R. Winters. This is some surprise. Wait until you see it.

Inductance and Capacity of Loop Type Aerials by R. H. Langley is an especially interesting feature of the next issue. This will give you all the information you need to figure out an aerial for your portable set.

Vacuum Tubes and How They Work is told by Paul E. Edelman next week. Mr. Edelman will describe how tubes are made and exactly what takes place inside one when you let current flow through the filament.

Wiring and Operating the Super-Heterodyne will be the concluding article on this subject by Allan C. Forbes, who will give many pointers covering the wiring and operation which can be applied to practically any type of receiving set.

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WIRED RADIO BEST MINER LIFE SAVER

CARRIER CURRENTS MOST RELIABLE, CLAIM

Surpass Pure Ether Waves in Ability to Surmount Obstructions in Severe Underground Accidents

(Continued from page 1) ing Radio messages from a transmitting set on a mine locomotive 400 feet below the surface, as long as the apparatus was near any metallic carriers.

Metal Carriers Help Range

It was demonstrated that the transmitting radius of a Radio set in the average mine is only a few hundred feet when no conductor is present, but becomes several thousand feet when operating in proximity to metallic carriers. Even when broken such conductors do not completely stop communication, as would be the case with the ordinary mine telephone line. Distasters, such as fires, floods, explosions and falls which might cause one or more breaks in the conductors, would not completely destroy them, and communication with the surface could probably be established, the investigator believes.

The installation of a line-Radio telephone system is simple. The Bureau of Mines points out and its general adoption by the industry as a means of communication in mine-rescue work hinges upon its availability for every-day operation. This would make it part of the operating system of the mine, with which all men would become familiar, and remove it from emergency equipment.

How System Is Installed

Mr. Jakosky says that it is only necessary in installing this method to lay a wire 25 to 50 feet long on the ground or stretch it along a wall or roof, in a direction approximately parallel with the "carrier," or to directly couple the set to such conductors with suitable capacities or inductances. It could be installed much quicker than the present system of mine telephones with its connecting wires. The apparatus itself, however, is more complicated than the telephone, and will have a higher upkeep expense, but it may eliminate the telephone and at least one wire. Practically any conductor, insulated sufficiently for the economic transmission of power or lighting current, will act efficiently as a high frequency carrier, without interfering with the power supply if properly filtered and coupled. The telephone circuit itself has been used for superposing the high frequency current.

Efforts to utilize Radio in mines in the interest of humanity have been many, and experiments have been undertaken in Illinois, Pennsylvania, Arizona, Utah, Idaho, Colorado, Michigan, Wyoming, Kentucky, New York, and Connecticut, as well as in England, Germany, Italy and France.

Entombed Miners Would Call for Help

Messages from surface Radio stations have been received successfully in mines, tunnels, and below water, which is of considerable value, but the method was not simple. Usually the procedure has been to take underground receiving sets of various degrees of sensitivity and listen to broadcasts from powerful stations on the surface. These are valuable and interesting experiments, but have been one-way tests and would be practical only in sending messages to entombed miners, as to progress of the rescuers or carrying directions to the unfortunate men.

Transmission from within the mine in event of accidents is of far greater importance. If a reliable means of voice transmission to the surface could be placed at the disposal of the imprisoned men, they could inform rescuers of their location, number, names, and local conditions. No reports of satisfactory pure Radio transmission from within a mine to the surface have come to the attention of the bureau, probably because of the impracticability of establishing transmitting sets and antennas in mines at available points, or carrying portable sets about.

While Owner Is in America

French "Ham" Steals Call

PARIS.—Stealing a Radio set is not unusual, but stealing another amateur's call letters does seem rather a curious thing to do. However, none other than the famous Leon Deloy received a letter the other day from one of his conferees, as follows:

"Someone has certainly been using your call letters, and using them very poorly, too. I was in Paris a while ago, and was working with the receiving set of a friend, the so-called 'SAE' proceeded to break up completely the transmission of 2LO on 363 meters."

M. Deloy was at the time in America!

Eiffel Tower is now transmitting a Radio concert on CW Sundays and Wednesdays, between 9:15 p. m. and 9:55 European time, on 1300 meters.

ROYALTY TAKES TO "MIKE" IN ENGLAND

BRITISH ETHER ACTIVITIES BOOM WITH INTEREST

Giant 25-Kilowatt Broadcaster for London—2LO Tries Educational Experiment in Teaching Music

By Frederick M. Delano

LONDON.—Royalty's interest in Radio and the active plans of the British Broadcasting company are keeping the ether filled just now in this country.

First the King of Greece issues a manifesto via the microphone; next King George, after procuring a specially designed receiving set, broadcasts at the opening of the Wembley Exposition; then his uncle, Prince Arthur of Connaught goes on the air.

A 25-kilowatt station for this city is being planned by the British Broadcasting company. The giant broadcaster is to operate on 1,600 meters and will be used for special programs when it is desired to be heard in localities now considered "dead spots."

Educational Experiments Under Way

Station 2LO here recently gave a music lesson to the younger school children as a part of its plan to utilize the ether wave for educational purposes. In addition the University of Wales has named a commission to study the possibilities of Radio in their lecture courses.

The commission has decided to try the scheme out, with the help of the British Broadcasting company stations, beginning with a series of six lectures. These will include such subjects as Shakespeare, history, music and biology.

Parliamentary debates even may be broadcast here soon. The House of Commons will soon have a "Drink Bill" brought before it, the discussions of which very likely will go on the air.

Invents Radio Moving Shadows

It is reported that an English experimenter has perfected a system of sending by means of Radio a sort of moving shadow, somewhat like a motion picture. However the device does not give the exact photographic detail of the latter.

The Sheffield station of the British Broadcasting company has been re-broadcasting the concerts from the Eiffel Tower station. The Sheffield receiving or "pick-up" station is two miles away from the broadcasting station proper, and the two are connected by land-wire.

An unusual incident in the broadcasting of a play through 2LO here occurred when a bathroom scene was used. One of the actors was obliged to splash the water in the tub with his feet in order to give the correct sound effects. The play's title was, "The Man Who Sang in His Bath."

Need to Use Esperanto on Czecho-Slovak Air

New Broadcaster Finds Universal Better Than Native Tongue

PRAGUE.—Esperanto is being used for lectures in the studio of the new broadcasting station in Czecho-Slovakia, and is meeting with considerable approval. It is of course more difficult for the people of this country to broadcast internationally than for the French and English as the Czech tongue is a hard one to speak and is not used much outside of this country. Esperanto begins to appear as an important factor in European Radio.

Esperanto, however, is not always so successful as it sounds. A well-known professor in Poland recently broadcast a lecture in Esperanto, but the only people in all Europe who understood him were the Poles themselves. He was heard in several other countries quite clearly, but, as those who reported it said, "He spoke beautiful Esperanto, but it was his devil of an accent that kept us from understanding him."

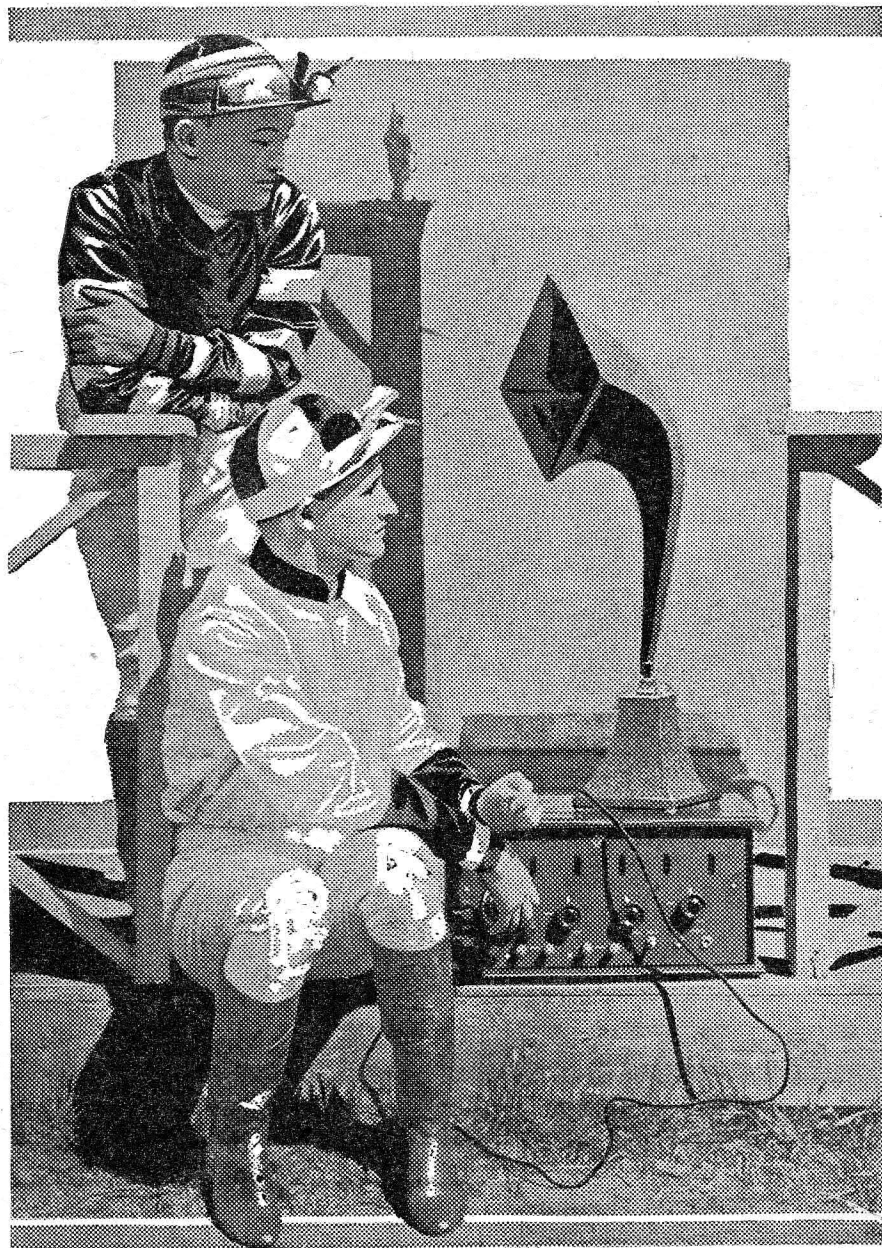
FRANCE TIES CAN TO ETHER FUNNY STUFF

PARIS.—Comedy singing is once and for all banned before the microphone of the Postes, Telegraphes & Telephones station here. Humor may be all very well in its place, but when it comes to using the government station to make fun of the government, humor ceases to be, and the whole affair assumes a very serious aspect. Government in France is not a joking matter!

U. S. MAY FORECAST ETHER CONDITIONS

WASHINGTON, D. C.—Investigations by the weather bureau, both in the United States and abroad, into the possibilities of forecasts on "Radio reception conditions" has brought the conclusion that the time is not far off when the government will be able to outline fairly accurately just what Radiophans may expect each evening. Such forecasts will be like weather predictions.

JOCKIES FOLLOW THE PONIES



Attendants at Churchill Downs this week end may expect to see the above sight repeated. The jockies, in this case at an eastern track, are not, however, following the ponies, but happen to be busily engaged in absorbing the baseball scores and a little music as a means of relaxation before the gruelling struggle. Photo Topics Photo

GIVES 50-WATT SET TO CHURCH STATION

Stronger Transmitter to Replace Outfit at WMAN

COLUMBUS, O.—Station WMAN, First Baptist Church, will have a brand new broadcasting outfit in operation by the

first of October, thanks to the generosity of W. E. Heskett, Columbus furniture dealer.

For the past two years Dr. Daniel F. Rittenhouse, pastor, has been broadcasting his sermons twice each Sunday through a 10-watt transmitter, which Mr. Heskett presented to the church. The popularity of this set, or rather of the broadcast sermons, prompted Mr. Heskett to donate a 50-watt transmitter, which will be installed late in the summer.

REMICK SUES G. E. ON BROADCAST OF SONG

CROSLY, VICTOR IN SUIT, SCORNS PUBLISHER

Music Firm Seeks \$250 Damages for WGY's Rendition of "Somebody's Wrong"

NEW YORK.—Somebody's wrong. But we won't know who until the courts decide a test case which was started recently when the General Electric Company was sued in connection with the broadcasting of copyrighted music and other compositions.

The complainant was Jerome H. Remick & Co., song publishers, who claim copyright of a song entitled "Somebody's Wrong."

Papers in the case state that the General Electric company broadcast the song from its station, WGY, at Schenectady on the night of March 1, last, and that the defendant threatened to continue such infringement. The Remick organization petitioned that the company be enjoined from broadcasting the song and also be required to pay damages of \$250.

Crosley Beats Remick; Won't Use Music

The General Electric suit is believed an echo to the recent Remick suit against the Crosley Radio corporation of Cincinnati, which Remick lost. Judge Hickenlooper of the federal district court said in his decision that broadcasting did not certainly constitute a "public" performance for profit.

Powel Crosley, Jr., president of the Crosley Radio corporation, however announced that no copyrighted music will be broadcast by WLW, despite the ruling of Judge Hickenlooper. "It is known that the American Society of Composers, Authors and Publishers brought the suit in the name of the Remick firm and we have no intention of playing any of the society's music, which would only advertise it," said Mr. Crosley. "We have plenty of music supplied by the National Association of Broadcasters."

An appeal from the decision of Judge Hickenlooper in the case of Remick against the Crosley corporation has been filed by the plaintiff and the case will go to the United States Circuit Court of Appeals.

Broadcast Warnings to Lake Ships Daily

New WJAX Service Becomes Additional Safeguard to Smaller Vessels Without Code Operators

CLEVELAND.—Broadcasting as an aid and additional safeguard to vessels on the Great Lakes is shortly to be inaugurated by WJAX, Union Trust station, here. The new service has been made possible by the co-operation of Lieut. B. F. Jenkins of the U. S. branch hydrographic office of Cleveland.

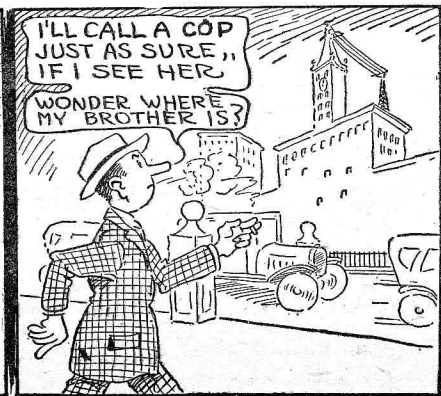
Lieutenant Jenkins will furnish WJAX daily with warnings which will be broadcast immediately following the weather reports. These warnings will cover such items as misplaced buoys, lights and buoys not functioning properly, changes in characteristics of lights, recommended drafts for rivers and harbors, new soundings obtained, reports of shoals and floating obstructions such as derelicts, rafts of logs, etc., submerged obstructions reported, such as anchors, lost in a confined fairway, and the like.

Although all of this information is broadcast regularly in code by government stations, there are many vessels on the lakes without Radiotelegraph receiving stations manned by code-reading operators, but on almost every boat, however, there is someone who has a receiving set. These sets may pick up important voice messages and warnings broadcast by WJAX.

THE ANTENNA BROTHERS

Spir L. and Lew P.

Part II—It Runs in the Family



WHITE BILL MOVING BUT MAY NOT PASS

HOOVER TO CALL CONFERENCE IF NO NEW LAW

Important Changes Made by Subcommittee in Regulation Bill but Won't Divulge—Try to Pass.

WASHINGTON, D. C.—The subcommittee on Radio of the House merchant marine committee has completed its work on the White Radio bill and will submit its recommendations to the full committee soon.

Pending the approval of the full committee, members of the subcommittee will not discuss what they have done with the bill, but it is generally understood here that a number of important changes have been suggested.

These changes effect, for one thing, the matter of an appeal from the decision of the secretary of commerce. It is said that the changes also have been made in the monopoly clauses of the bill. Other changes have also been suggested along the lines of suggestions made to the committee during the course of the recent hearings. Some of the changes suggested will make it much harder to get the bill through Congress, it is thought, and there are some who say it will be impossible to get a Radio law passed by Congress during the present session which will probably adjourn in June.

Secretary Hoover will call another Radio conference if Congress does not pass Radio regulatory legislation at the present session.

The secretary, in announcing this policy, expressed himself as very much gratified with the co-operation received.

Rochester Hears Voice of Marconi in Britain

Fan Uses Single Tube Set and Indoor Antenna

ROCHESTER, N. Y.—Hearing the voice of Marconi and a band playing "God Save the King," both of which were being broadcast from the British Isles at the opening of the Wembley exhibition recently, is the claim for long distance reception laurels made by Alexander Marquis, of this city.

Mr. Marquis, using a single tube set of his own design, with an indoor antenna system, attributes his success to the unusual type of aerial he uses.

The British government according to reports, admits that except for isolated cases when snatches of speech or music were heard, the test was a complete failure. Some 10,000,000 of the king's subjects in the British Isles heard the resonant nuances of his voice, while the cabled message circled the globe along the British cable routes and was returned to the king's temporary throne in the big exhibition stadium in eighty seconds.

File Petition to Have Monopoly Case Dropped

United Fruit Co. Claims "Trust" Publicity Injures Business

WASHINGTON, D. C.—A petition has been filed by the United Fruit company asking the Federal Trade commission to dismiss its complaint against the firm in connection with the alleged Radio monopoly. The petition, coming as it does, after the formal answer has been filed with the commission is out of the ordinary procedure generally adopted by attorneys practicing before the commission.

The petition states that the business of the firm is being injured by the publicity attending its connection with the case and the fruit company again asserts that it has nothing to do with any Radio monopoly.

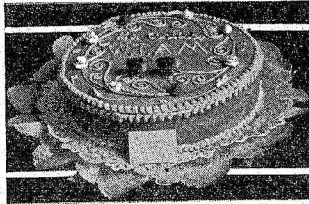
There is nothing in the petition just filed which is in any way new. It seems absolutely impossible that the Commission could excuse the United Fruit company from the monopoly case on the strength of the petition just filed.

Czecho-Slovakia Goes in for Broadcasts; 2 Plants

PRAGUE.—Czecho-Slovakia is going in for the broadcasting business with a will these days in spite of some rather arbitrary laws on Radio at the present time.

There is a large broadcast station here; another one at Kbel, nearby (transmission just started reception, between 6:15 and 8:15, European time, on 1150-meter wavelength); and another two kilowatt station will start within six months in Strassnice, a suburb of this city.

ARTISTS' PARTY CAKE GIVEN STATION WTAM



This is the cake that Art Herske, WTAM announcer, suggested for the artists. It was eighteen inches across with a proportional depth. And good? One of the best! Mr. Herske was hardly able to talk after the cake was cut—had his mouth full the rest of the evening.

The French military post in Tunis, Africa, is now broadcasting on 1100 meters.

LONGER DAYLIGHT RANGE PREDICTED

European Experimenters Find Short Waves Hold Promise—Military on Nine Meters

PARIS.—Interest in the very short wave in Europe is growing, and two recent experiments lead people to believe that short waves will be the most practical for amateurs, or at least have peculiar properties which may prove useful.

Two English amateur stations worked one night on 200 meters, while a third worked on a much shorter wave. The intensity of reception of the three was identical during the night; but in the daytime the short wave station remained as strong as ever, while the two 200-meter ones became much weaker.

Another case is the French military station, OC45, transmitting on 45 meters. This station is heard with equal clarity either day or night.

Military Radio continues to lower the studied wave lengths. A nine-meter wave is the favorite one for the moment in

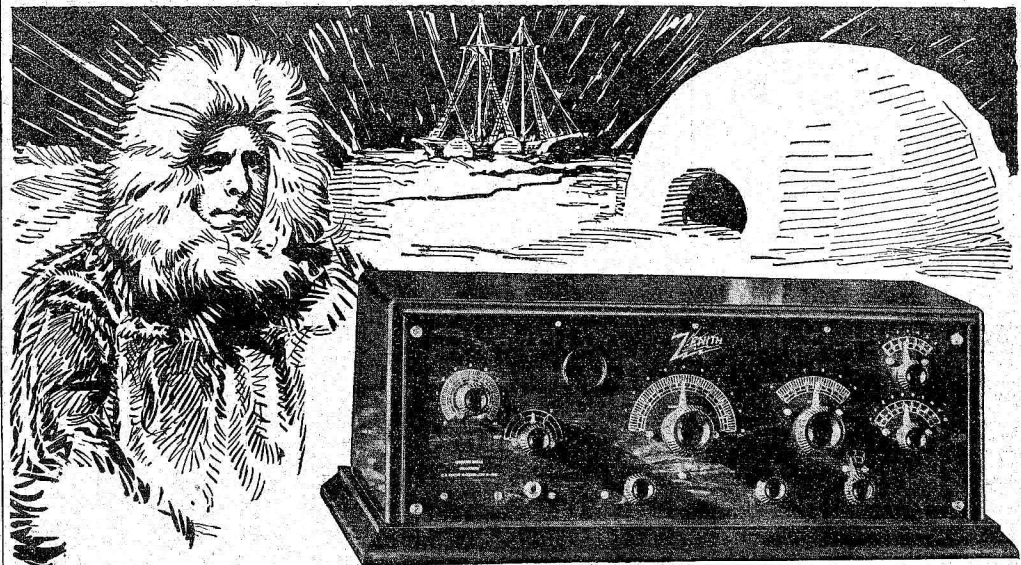
France, and has been found both effective and simple to receive. Experimenters are working on the theory of directional sending recently expounded by Commandant René Mesny of the French department of Marine.

Amateurs Experiment with High Altitude Reception

LONDON.—Amateurs in the mountainous districts of Europe are devoting themselves to the study of reception in the higher altitudes. Around Grenoble they have been particularly successful, spending several nights in their little snow-covered hut, and receiving some of the American stations, as KDKA, WHN, and WOR. A set with detector and one stage of audio frequency was used, with provision for two stages of audio when static was not bad.

Tunes in 71 Stations in Five Hours; Claims Record

JACKSON, MINN.—Single night receiving championship is claimed here by Gordon Nasby, who lists 71 stations he tuned in from 5 to 11 p. m. one evening, recently. Two tubes were used.



Licensed under Armstrong U. S. Patent No. 1,113,149.

MacMillan Listens to Honolulu and New Zealand "Tunes In" California

Using

From a little ice-bound schooner—eleven degrees from the North Pole—comes this message:

"Am very thankful that Arctic Exploring Ship Bowdoin is equipped with complete Zenith radio apparatus. Here at top of world, in darkness of great Arctic night, we have already listened to stations practically all over United States, from Europe, and even from far away Honolulu. Zenith has united the ends of the earth."

—"MacMillan"

Again, from far-off New Zealand comes a report of radio reception even more startling:

"It may interest you to know that the writer last evening landed KGO, Oakland, California, between 6:45 and 7:30 P. M. Heard his call four or five times distinctly, and jazz music. The music was not as clear as the voice, but one could pick up the tune all right. As San Francisco is 6,300 miles from New Plymouth, and only one tube was used, we think this is a very fair performance."

—(signed) H. Charles Collier.

The sets used by Captain MacMillan and Mr. Collier are earlier models—since improved by the addition of a **third stage of audio frequency**. These new models, described at the right, represent an achievement in radio construction not duplicated in any other set on the market. A demonstration will convince you.

Write today for full particulars and name of nearest dealer.

Zenith Radio Corporation
McCORMICK BUILDING, CHICAGO



Long-Distance Radio

Model 3R

The new Zenith 3R "Long-Distance" Receiver-Amplifier combines a specially designed distortionless three-stage amplifier with the new and different Zenith three-circuit regenerative tuner. Fine vernier adjustments—in connection with the unique Zenith apertic or non-resonant "selector" primary circuit—make possible extreme selectivity.

The new Zenith 3R has broken all records, even those set by its famous predecessors of the Zenith line. Under favorable conditions, satisfactory reception over distances of 2,000 to 3,000 miles, and over, is often accomplished in full volume, using any ordinary loud-speaker. The Model 3R is compact, graceful in

line, and built in a highly finished mahogany cabinet.... \$160

Model 4R

The new Zenith 4R "Long-Distance" Receiver-Amplifier comprises a complete three-circuit regenerative receiver of the feed-back type. It employs the new Zenith regenerative circuit in combination with an **audion detector** and **three-stage** audio-frequency amplifier, all in one cabinet.

Because of the unique Zenith "selector," unusual selectivity is accomplished without complication of adjustment.

The Zenith 4R may be connected directly to any loud-speaker without the use of other amplification for full phonograph volume, and reception may be accomplished over distances of **\$85** more than 2,000 miles.....

ZENITH RADIO CORPORATION,
Dept. 1-J 328 South Michigan Avenue, Chicago, Illinois

Gentlemen:
Please send me illustrated literature on Zenith Radio.

Name.....

Address.....

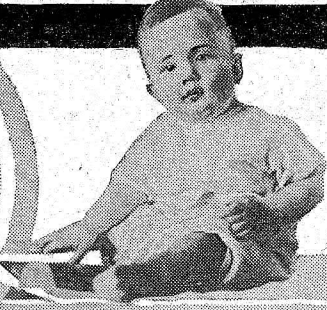
BEFORE THEY THOUGHT OF "MIKES"



Alberta Bachman, Station WBAH, Minneapolis, is the young lady whose baby picture was shown last week.



The young man looking over the rear side of this 1904, late model Franklin, is none other than the popular announcer at WD —



This chubby, plump-faced youngster is now the seriously, humorous director-announcer for Station W — and was married just a short time ago.



Otto Becker, announcer at WGR Buffalo.

WATERSON AIMS TO PROVE MUSIC TRUST

FORMER MEMBER OF AMERICAN SOCIETY SUES IT

Claims Society Has No Radio Rights, Is Illegal and Oversteps Authority in Refusing Resignation

NEW YORK.—Misunderstanding of the exact status of the suit brought against the American Society of Composers, Authors and Publishers by Waterson, Berlin & Snyder, prominent firm of music publishers, who lately resigned from the American society, demands a clearer explanation of the case.

Henry Waterson, president of the Waterson firm, takes the position that the contracts made between the American society and members whereby all public performing rights assigned and transferred to the society, were made before radio broadcasting was known, and therefore the contracts cannot include what has become known as "radio rights."

Mr. Waterson aims by his suit to show that the American society is illegally collecting fees from a few broadcast stations.

Claims A.S.C.A.P. Illegal Monopoly

Mr. Waterson is also introducing evidence in his suit to show that the American society has become an illegal monopoly, against the laws of the United States. He asserts that when he became convinced of the fact that the society was an illegal trust, he promptly resigned.

He sets forth that his resignation was not honored, the American society claiming that it was impossible for him to resign.

The suit of Mr. Waterson against the alleged music trust is being watched with interest on account of its significance in determining the present status of the American society. It is not believed that the courts will uphold the action of the society in restraining a member from resigning from its organization.

NEW COMPOSER LAUDS RADIO FOR SONG HELP

Says Broadcasters Give Needed Chance to Young Writers

NEW YORK.—Radio plugging of songs pays according to Harold Hummer, composer and publisher of "Dear Old Georgia Mammy," a foxtrot that has been made so popular that the composer has found it necessary to put his song in the hands of a larger publisher who is more able to supply the demand.

"Previous to radio," says Mr. Hummer, "a new song by a new writer lived about as long as a bull in the Chicago stockyards. But radio has made things for once in favor of the independent publisher with a good song."

"Like everything else in the world, radio benefits someone, and it is about time the new composer was given a chance."

"I See by the Papers," New Series Broadcast from WOR

NEWARK, N. J.—"I See by the Papers" is the title of a new radio series offered by "Hollywood" McCosker and scheduled to be broadcast weekly from Station WOR every Monday evening at 8:20 p. m. Eastern daylight saving time.

Alberta Bachman, WBAH

THE folks were praying for a boy. That's why the copper-tinted hair director of Station WBAH is called Alberta Bachman. There were fifteen children in the family, so even her mother has forgotten the exact date of her birth, but, she was the thirteenth, so Radiophans over sixteen and under thirty have a chance. Every man for himself.

Her birthday is February 10. That's all we know. She's not quite five feet tall, has blue eyes, but best of all, she's single. Of German descent, but should have been Irish. Three guesses why.

Her hobbies include swimming, skating, tennis, golfing and tobogganing, but first of all we must mention her deftness with "Mississippi Marbles." In fact, they were instrumental in winning her a contract. A particular difficult gentleman comes into the case. "I'll beat you at a game of craps," he said. "If I win, you sign the contract," said Alberta. (Notice we call her by her first name, a friend of the family's.) Suffice to say, the contract bore his John Hancock ten minutes later. She beat him three out of two.

In 1916 before she became acquainted with "Mike" she was booking and sales manager for the Red Path Chautauqua and manager for the Mother Goose Lady. Now she manages Station WBAH and directs all their programs. Aside from these duties, she has very little to do.

"Roxy's" Campaign Puts Sets in Vet Hospitals

\$23,000 Fund Raised Already in Drive Begun in Washington

WASHINGTON.—Through the efforts of "Roxy" (S. L.) Rothafel, aided by his company of broadcast artists of the Capitol Theater, New York City, the military hospitals in Washington are now being equipped with radio receiving apparatus so that wounded veterans may keep in touch with events in the outside world.

With the proceeds of benefit performances given by the Capitol artists as a nucleus, and in the short space of four weeks, \$23,000 has been raised for this purpose. The contributions have come largely from Radiophans who have taken this opportunity to reciprocate for the entertainment they have received over the air.

A Washington bank has been acting as depository and the work of distribution and installation has been carried on under the supervision of a committee appointed by the government.

S. L. Rothafel, accompanied by Edward Bowes, managing director of the Capitol, arrived in Washington recently to confer with the government committee with a view to similar installations in the military hospitals throughout the eastern part of the United States. The fund has become known as the "Roxy Radio Fund."

Gets \$100 Fine, 30 Days for Imitating Dubilier Part

NEW YORK.—As a result of charges brought and proved by the Dubilier Condenser and Radio Corporation, Harold Hymans, doing business under the firm name of the Micadine company, pleaded guilty to having criminally imitated a fixed condenser made by Dubilier. Hymans was prosecuted under the commercial fraud statutes of the state of New York. A sentence of thirty days in jail or \$100 fine was imposed by the Court.

This is the first criminal action brought in an effort to purge the Radio industry and trade of fraudulent manufacturers and dealers who have imitated well-known

Otto E. Becker, WGR

REMEMBER the youngster last week who was holding the bird in his hand? He had been told that a bird in the hand is worth several in the bush, so he immediately demanded it. That was Otto E. Becker, born in Dansville, N. Y. Ever heard of Dansville? No? Well, it is one of those towns where the trains slow down, whistle, then go through. That's Dansville. Otto, craving the urban life, gathered his goods and chattels and moved to Buffalo as soon as he was able to think at all for himself. That was at the tender age of six months.

See that grave, judicious expression? Look at that expression a second time and then listen in to WGR the next chance you get for those measured accents that go with that face. As an announcer he is noted for the full, round tones, carefully measured and enunciated, that come forth from this station.

That expression and those choice accents are a result of training and experience as a salesman of stocks and bonds.

He was successful in this line of endeavor, highly so, and then:

"He took up Radio!" Radio has grown on him until it is something more than a hobby. When he isn't announcing from WGR, he is studying the subject.

For the sake of those who might, perhaps, fall in love with his voice, it may be added that he is very happily married, and has a son eight years old who is now pestering him for a crystal set. Mr. Becker is a graduate of Cornell, was once a sprinter, and likes tennis and—Radio.

Coney's Luna Park Wants to Set Up Own Station

NEW YORK.—The management of Luna Park, Coney Island, is trying to obtain a license to broadcast and is looking for station equipment. The plan is to make Radio broadcasting one of the features at the Coney Island resort this summer.

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You receive 52 issues with your subscription and 13 issues in each bound volume

Bound volumes 3, 4, 5 and 8 are now ready for immediate shipment. The supply of bound volumes 1, 2, 6 and 7 is exhausted. This offer good only in United States and Canada. To receive a bound volume free with a year's subscription it is necessary for your subscription to come to us direct with full remittance price.

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Make your remittance by check, money order or draft. Your prompt action gives you one bound volume with each annual subscription, new or renewal.

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Valuable Question and Answer Department. Department on How to Install and Operate sets.

In addition to these features the current issues give you all the live news in Radio; advance broadcast-ing station programs and a correct and authoritative list of all broadcasting stations licensed. The first and last word in Radio.

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Additional Bound Volumes at \$2.00 each.

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Today is Your Radio Day

SENATE MEETS AND DEFEATS RADIO TAX

SENATORS HEED FANS' IRE AND CUT OUT CLAUSE

Effort of McClean of Connecticut to Burden Industry Meets with Failure on Senate Floor

WASHINGTON, D. C.—Overwhelming opposition of Radiophans to proposed ten per cent. Radio tax caused its defeat 40 to 18 in the Senate when that body voted on the House revenue bill. The removal of the tax, inserted in the bill by the Senate finance committee, lead by Senator McClean of Connecticut, was sponsored by Senators Dill and Howell.

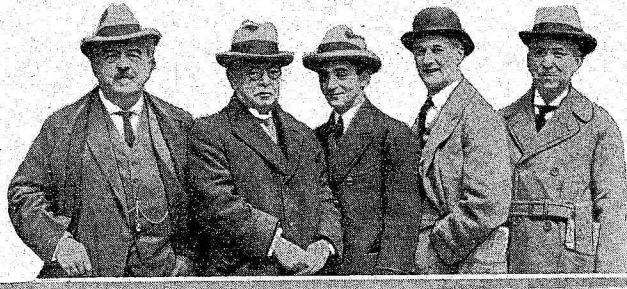
It is believed that the Senate defeat of the Radio tax clause will mean that the matter has been definitely settled. Receiving sets and accessories will remain tax free.

The Senate vote casting out the tax came as a reconsideration of the revenue measure. The day previous to the defeat of the tax the revenue bill had been taken up and passed without comment on the Radio clause.

Following the passing of the section, however, Senator Simmons of North Carolina, who handled the measure for the Democrats on the floor, asked that the vote be reconsidered. Senator Simmons' request was agreed to and the second day saw the removal of the Radio tax provision.

The Eiffel Tower is working on the transmission of very short waves, having a series of transmissions at 115 meters, others at 50 meters, and still others at 25 meters, for which the French amateurs are listening carefully and giving all possible information as to quality of reception, etc.

COMPOSERS COMPLAIN OF H.C.L.



Famous composers who appeared in Washington, D. C. to fight the Dill copyright bill and seek protection for the composers. These men claim that unless the broadcasting stations pay for the music played over the Radio, they, the composers, will be in a sad financial condition. They admitted, however, that their dividends from the American society had increased enormously in the last year. Left to right, Victor Herbert, John F. Sousa, Irving Berlin, Harry Von Tilzer and William Jerome.

P. & A. Photo

Capitol Theater Studio Moves to New Quarters

Enlarged Studio to Be Used Also by A. T. & T. for Experiments

NEW YORK—Broadcasting activities of the Capitol theater have grown to such proportions that it has been found necessary to discard the old studio for newer and more spacious quarters.

Through the courtesy of Messmore Kendall, a portion of the directorate suite of rooms on the second floor of the Capitol theater building has been devoted to this purpose and equipped with all the

improved facilities. The American Telephone & Telegraph company will also use the studio for the installation and experimentation of devices for the improvement of broadcasting.

Receiver of Pope Pius XI Fails to Pick Up London

LONDON—Owing to difficulty in adjusting the new Radio set installed for Pope Pius XI at the Vatican the British Broadcasting company abandoned the plan to have Cardinal Bourne broadcast a message to the pope from 2LO here.

WILDFLOWER ON AIR FROM STATION KYW

BROADCAST PERFORMANCE DIRECT FROM STAGE

Edith Day Plays Stellar Role While Radiophans Listen in Through Entire Show

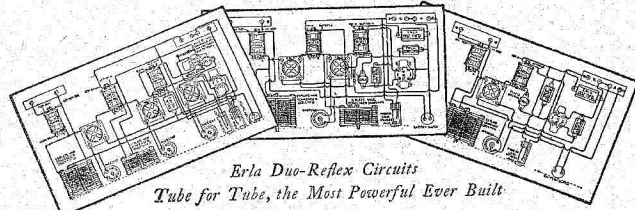
CHICAGO.—Broadcasting the entire performance of a musical comedy was accomplished here recently from the stage of the Apollo theater, when "Wildflower," Arthur Hammerstein's greatest success, went on the air through Station KYW.

Edith Day, Mr. Hammerstein's radiant young star, portrays the part of Nina, a warm hearted temperamental maid in Northern Italy, caught in the throes of an amusing love plot. She it was who created "Irene" in New York, and who won fame dancing in "Going Up."

She has not been trained abroad, as many of our prima donnas, nor has she come from a stage family. She is just a natural American girl, the daughter of a newspaperman, who owes her chance to the fact that Al. Jolson happened to be playing in her home town, Minneapolis, and needed a girl in his company. Her training and inspiration she owes to Anna Field in "Follow Me," and Mitzie in "Pom Pom," and her first popularity to the instantaneous success of her song and dance hit, "Tickle Toe."

Bernard Gorcey, veteran fun maker of many of Mr. Hammerstein's successes, appears as Gaston La Roche, and Esther Howard, the gifted comedienne, appears as his vampish wife, in several hits, including "The World's Worst Woman." Guy Robertson, endowed both as a singer and actor, is the lover.

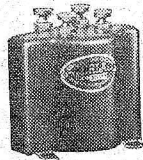
Circuits Unequaled In Range, Purity, Volume!



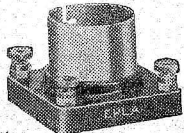
Erla Duo-Reflex Circuits
Tube for Tube, the Most Powerful Ever Built



Maximum range, selectivity and volume are positively assured through Erla radio frequency transformers. Reflex and cascade types, \$5



Superior quality of Erla audio transformers stands clearly revealed in their ability to amplify three stages without flaw. \$5



Exclusive features of Erla sockets are now available in 192 as well as standard size. Quality and workmanship unequalled. 65c and 75c

TIME serves only to emphasize the superiority of Erla Duo-Reflex Circuits—tube for tube, the most powerful circuits ever built.

An Erla circuit introduced efficient one-tube loud speaker reception, and still stands unsurpassed. So too, Erla two and three-tube circuits remain unchallenged in range, selectivity and volume, outstripping four and five tubes otherwise employed.

Even in minor phases of operation, Erla superiority is pronounced. Control is positively fool proof, eliminating body effects, reradiation and distortion, while stability is so complete that every station is heard invariably with the same dial setting.

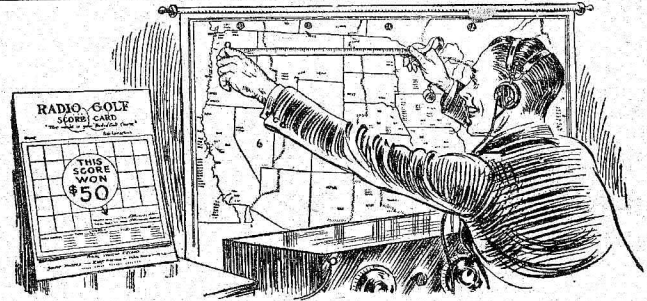
Underlying the efficiency of these circuits, and the mainspring of their success, are Erla radio and audio transformers. Through synchronizing perfectly received radio, reflexed radio and reflexed audio frequency currents, they enable vacuum tubes to do triple duty, multiplying amplification without flaw.

Equally indispensable to maximum sensitiveness—stability and ease of operation are Erla Selectoformer, Erla fixed crystal rectifier and Erla tested capacity condensers, meeting completely the exacting requirements of reflex work, supreme test of radio apparatus design.

For complete information, ask your dealer for Erla Bulletin No. 20; or write, giving your dealer's name.

Electrical Research Laboratories
Dept. A. 2500 Cottage Grove Ave., Chicago

ERLA



RADIO GOLF ~ New Thrill for Fans

Spend Thrilling, Fascinating Hours with Sensational New Game. Play with Any Receiving Set. No Extra Parts Required. As Exciting as a Battle

SIT down at your receiving set with a Radio Golf map before you—start twisting the dial—feel your way through the ether to neighboring or distant stations—and with your special radio golf-meter record your progress as you go. Somewhere in town, or out over the country, enthusiastic fellow-radio-fans are doing the same. Your ear is alert for the first faint signal of "distance"—and in a matter of seconds you're off on the most thrilling game of the century—Radio Golf.

Radio Golf, the newest, most fascinating development in the field of Radio, makes the whole world your radio golf course. Recently introduced for the first time at the Radio Show in Washington, D. C., this startling new game created a sensation. Now everyone is playing it, and getting more thrills to the minute than they ever had before.

With this remarkable outfit, especially and exclusively designed by us for playing golf by radio, you can log the mileage on your set day by day, with your score card always before you to record every big "play" you make. The game may be played for a day, a week or a month. The longer it lasts, the more exciting it grows—and your receiving improves daily as you continue the game. Five prizes of \$50 each are awarded each month to those making the best single daily score.

Radio Golf can be played with any receiving set. There are no extra parts to buy—no changes of any kind to make in your set. All you need is full equipment for playing, including the Radio Golf Map prepared exclusively by us for this purpose, a specially designed "Radio Golf Meter," International Broadcasting Directory, a year's supply of patented score cards (for recording daily, weekly, monthly and yearly scores), a table of handicaps and complete instructions for playing. All this is furnished for only \$1.00. Think of the fun you can have playing this game, either alone or in competition with friends, and at a cost that is a mere trifle—only \$1.00 for everything.

Get Into This Great Game Now

If you want to enjoy endless hours of the most fascinating game in existence—if you want to make a record with your set and show your friends what it can do—if you want to check up your receiving and improve your tuning—don't delay a minute. Order your equipment for Radio Golf today—right now. Send \$1 (cash, check or money order). As soon as the outfit arrives start in at once. Play Radio Golf for five days. Then, if you don't feel it is worth many times what you paid for it, simply return the outfit and your money will be promptly refunded.

To Dealers: To Dealers we are making a Special Offer. Write or Wire now for Discounts.

\$250 in Prizes

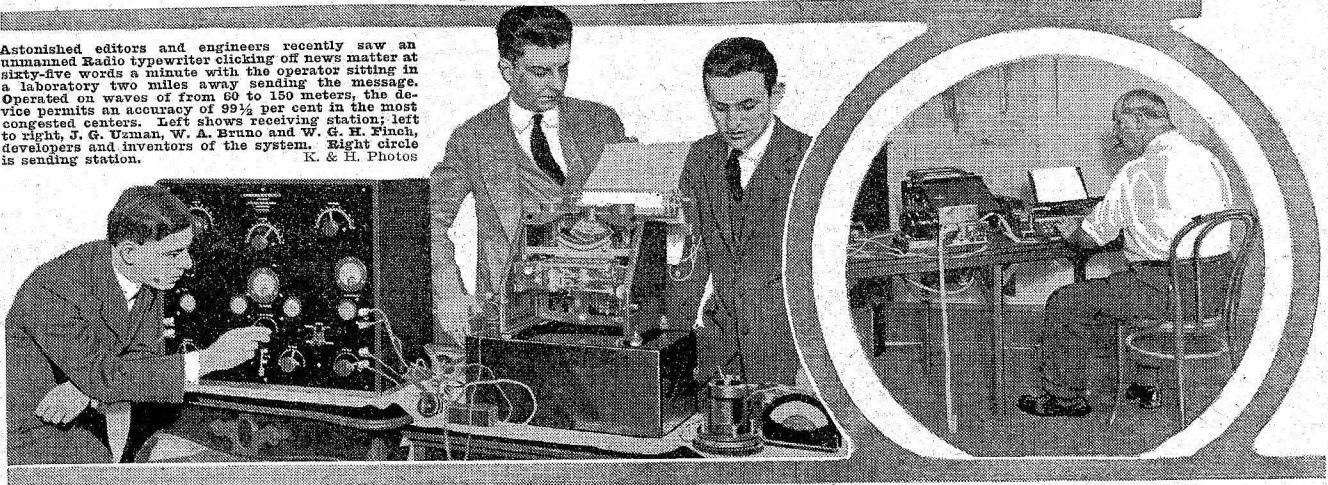
Each month the Radio Golf Assn. of America offers five separate prizes of \$50.00, for each type of receiving set (from a conventional to a tube set) making the highest single daily score. This competition is open to all. Sets of the same general type and of the same number of tubes are entered at par. Competing sets need not be of the same potential power, however, as such differences are covered by a table of handicaps.

Here is your chance not only to play a game that is fairly exciting with excitement and thrills, but to win a big money-prize as well. Complete information regarding the monthly contests and details of making entries are sent with each outfit. Make up your mind to go after one of these \$50 prizes right now.

RADIO GOLF ASSOCIATION OF AMERICA
334 Star Bldg., Washington, D. C.

URNS MEANINGLESS CODE INTO TYPE

Astonished editors and engineers recently saw an unmanned Radio typewriter clicking off news matter at sixty-five words a minute with the operator sitting in a laboratory two miles away sending the message. Operated on waves of from 60 to 150 meters, the device permits an accuracy of 99 1/2 per cent in the most congested centers. Left shows receiving station; left to right, J. G. Uzman, W. A. Bruno and W. G. H. Finch, developers and inventors of the system. Right circle is sending station. K. & H. Photos



NEW RADIO TYPEWRITER

(Continued from page 1)

hundreds of ship and shore stations and the day programs of five powerful broadcasting stations, WEAF, WOR, WJZ, WJY and WHNY. Through all this and the great steel buildings, the story of the arrest of the bobbed-haired bandit was received and typed, ready for setting in type.

How Invention Operates

Reception from the antenna is accomplished through three units: a conventional Radio receiver of unusual sensitivity and selectivity; an "interference ejector box," which almost completely eliminates all undesired Radio impulses in the ether; and finally the usual press typewriter.

At the sending station, which may be of either the arc or tube type, transmission is accomplished by putting the message on a perforated tape punched out on a stand-

ard keyboard typewriter. This ribbon with its perforations is fed into an automatic Radio transmitter which sends the message through the ether in combinations of five dots and spaces.

Any Radio receiver can pick up the signals, but they are absolutely unintelligible since they correspond to no telegraphic code and are sent at such terrific speed. The sound, in a pair of headphones, closely resembles that of a buzz saw with a very high musical note.

Thorough Test Proves Worth

The Radio experimenter will readily see that the secret of this device is at the point where electrical impulses are changed to mechanical motion. The Finch Radio relay, a delicate but extremely sensitive device in a small brass, glass-topped case, accomplishes this change and the apparatus may be speeded up even to 100 words a minute.

The new Radio typewriter transmission system has been in daily operation for a year between Tarrytown, N. Y., and Columbus Circle, New York city, as an endurance test, and between San Francisco and Los Angeles, 350 miles airline, in grilling tests for accuracy over long distance.

Over the latter route it transmitted 75,000 words, with one-half of one per cent of errors. The average transmission speed was sixty-five words a minute.

New Broadcasting Station Opens at Valparaiso, Ind.

VALPARAISO, IND.—The broadcast station owned and operated by the Immanuel Lutheran Church here, was opened for services May 4 with an organ recital. The station has 500 watts output and broadcasts on 273 meters.

RADIO BOOTLEGGERS WORRY GERMAN COPS

Many Fans Busy Trying to Evade Tax on Sets

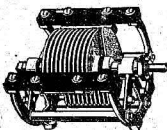
BERLIN.—Germany is having her trials with another kind of bootlegging from that of the United States—Radio being the attempted "prohibition" here. Radio is not actually prohibited, but the government is trying to collect a tax on all receiving sets and to forbid those who do not pay from listening in.

Unfortunately for the government, there are as many clever amateur constructors as there are in other countries, so the police have their hands full.

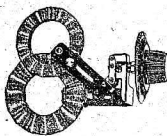
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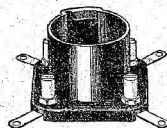
RADIO APPARATUS



The low loss Condenser designed by Flewelling is the utmost in skillful construction and scientific design. Built to last, to stand more than ordinary abuse, it is extra rugged; it is as near electrical and mechanical perfection as human ingenuity can make it. Supplied in .0005 mfd. capacity. Price \$7.00



This Flewelling low loss Tuner is more than an ordinary piece of tuning apparatus; it is designed and constructed with the same painstaking care as all other Buell Parts. It is built to produce satisfactory results and render the acme of service. Price \$8.00



Short direct terminals; contacts of the improved "side-wiping" design are the secret of the Flewelling Socket. This socket is surprising in its performance. The positive contacts assure permanent connections and elimination of so called "tube noises" that many times are the result of a faulty socket. Price \$1.00

BUELL MANUFACTURING COMPANY

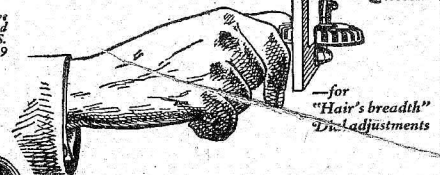
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The GREBE TANGENT WHEEL VERNIER

Grebe Regenerative Receivers are licensed under Armstrong U.S. Pat. No. 1,113,149



—for "Hair's breadth" Dist. adjustments



"The accomplishment of great things consists in doing small things well."
—Confucius

Perfection of detail is a big factor in the success of the Grebe Receivers.

Doctor Miller

A Device found only on GREBE Receivers

THE man who has once operated a Grebe Receiver reaches instinctively for the Tangent Wheel Verniers on every other receiver he thereafter tunes.

This and other details of Grebe craftsmanship are fully covered by patents granted and pending. Inspect these details at your dealer's today.

A. H. GREBE & Co., Inc.

Richmond Hill, N.Y.

POET ANNE OF WWJ BROADCAST PIONEER

FIRST RADIO VERSIFIER IS CLAIM OF DETROITER

Detroit News Writer, Anne Campbell, Wins Fame in Less Than Two Years

DETROIT.—The original Radio poet is Anne Campbell, of this city, who in less than two years has achieved a national reputation as a newspaper poet as well as for her splendid broadcast readings.

Miss Campbell, like many poets who have written so touchingly of the homely things of life, was born in the country, her birthplace being a little farmhouse in Lynn, Mich., about seventy miles from Detroit. She attended a country school and later went to the high school at Yale, the county seat of St. Clair county.

From her earliest schooldays, Miss Campbell exhibited a genius for fashioning verses and as she grew, she kept constantly at it, her remarkable talent developing with the passing years. After her parents moved to Detroit, she took every advantage the large city offered to study verse forms and poetry, living constantly with her task.

Breaks First into Farm Papers

Her efforts to have her earlier poems published met with the indifferent success that invariably follows the unknown author, but finally some of the farm papers in the middle west, appreciating the authority with which her farm ballads were written, began to publish them, and soon she had a steady market for them.

Two years ago her work was called to the attention of George E. Miller, editor of the Detroit News, who at once sent for the poet and engaged her to write a poem a day for his paper. The wide circulation of the News brought her work to the attention of other big city dailies and now Miss Campbell's charming verses are syndicated and printed in many cities in the United States and not a few in Canada.

Puts Her Works on WWJ

Early in her career on the Detroit News, Miss Campbell sensed the immense possibilities of Radio, and the News, the first newspaper in this country to establish a broadcasting station, gladly accepted her offer to broadcast her poems. For almost

CLAIMS TO BE FIRST AIRPHONE RHYMSTER



Anne Campbell, Detroit News poet, has been broadcasting her verses for over two years from WWJ.

two years, Miss Campbell's readings of her own poems have been one of the distinctive features of Station WWJ, the News broadcasting station.

She reads every Friday evening, always from her own poems. Through this medium, she has built up a tremendous audience all over the country. She possesses to a marked degree the power to read her tender lyrics of home and children and farm life, and in her home city she is constantly in demand at public gatherings, in churches and at schools.

In private life Miss Campbell is Mrs. George W. Stark, wife of the dramatic editor of the Detroit News, and she is the proud mother of three children.

Great care should be exercised to see that the A and B battery leads make firm contact. A resistance in these leads will often cause an audio squeal.

KGO PUTS AIRWAVE COLLEGE ON ETHER

RADIO CLASSES IN MUSIC, SPANISH, FARMING

Oakland, Cal., Station Puts Specialists in Charge to Spread Education

OAKLAND, CALIF. — Mountains and deserts of the great West need no longer be barriers to anyone seeking an education, for the Radio college is now a reality. On Monday nights at 8 o'clock Pacific time, thousands tune in on KGO, the General Electric Company station here, and receive instruction in agriculture, language, music, economics and literature.

A course in Spanish by Prof. Oscar Galeno, is so organized that listeners may send KGO stamped envelopes and receive in return leaflets which will aid them in taking instruction.

Prof. F. L. Griffin, head of the department of agriculture, University of California, conducts the course in agriculture. Among the speakers to be heard are R. L. Adams, "The Cost of Producing Milk," and C. L. Roadhouse, "Relation of Dairying to Agriculture and Human Welfare."

Teach Music, Economics, Literature

Music is taught by Alice Bumbaugh, instructor of musical history and harmony at Mills College, Oakland, assisted by Carl Anderson. Demonstrations during the lectures will be given by Katherine Urner of the Mills College faculty.

The course in economics will include speakers from the faculty of the University of California, and visiting experts on various economic subjects, under the direction of Edna Kelly Barker.

Wilda Wilson Church has prepared the course in literature, assisted by Dr. Aurelia Rhinehardt, President of Mills College. Joseph H. Jackson, literary editor of the Sunset magazine, and Frederick O'Brien, author of South Sea tales, will contribute talks.

Secretary Hoover vs. Inter City Case, Continued Later

WASHINGTON, D. C.—The United States Supreme Court has continued until the October term the argument in docket 244 which is the case of Secretary of Com-

Zukor Listens in from His Private Rail Car

Movie Party Evades Monotony of Train by Radio

NEW YORK.—Aboard the private car "Boston," speeding on its way to the annual Motion Picture Convention in Frisco, was a party that did not experience the monotony of long rail travel. Adolph Zukor, of the Famous Players-Lasky Film Corporation, is dean of the delegates from New York. Their private car was equipped with a super-heterodyne receiver which, according to telegraphic reports filed at the various cities on the route, furnished music and entertainment continuously after the party left New York City.

The latest advice received from the party state that while the train was in the vicinity of Syracuse, eleven stations were received in one night. Philadelphia, New York and Chicago were points heard, and an entire church service was participated in from Station WCX, Detroit.

Two Firms Clash in Court Battle Over Neutrodyne

NEW YORK.—Simultaneous court action has been started by the Freed-Eisemann Radio corporation and the Hazeltine Research corporation against each other. The former charges that attorneys Pennie Davis, Marvin and Edmonds, who represented both parties when a neutrodyne license was secured, had a financial interest in the Hazeltine corporation and fraudulently advised them against their best interests. The Hazeltine corporation seeks to abrogate the license agreement made with Freed-Eisemann, claiming the latter company had repudiated the agreement in various ways, among which was the omission in two or three advertisements of the word Neutrodyne.

merce Hoover against the Inter City Radio company. The case was appealed from the court of appeals of the District of Columbia. The case will come up at the October term of the court for argument but it is understood that the firm has since gone out of business.

If adjusting the filaments of an amplifier does not stop it from howling, try attaching a wire from the negative terminal of the A battery to the ground post

The De Luxe

NEUTRODYNE

LICENSED BY
INDEPENDENT RADIO MANUFACTURERS, INC.
UNDER HAZELTINE PATENT NO. 1,480,000
OTHER PATENTS PENDING
REG. U. S. PAT. OFF.



**READ THIS
STATEMENT**
of our
Chief Designing Engineer
M. Pascal Thelon
Of the Société Française Radio-Electrique
And of the Compagnie Radio-Maritime
Designer of The "De Luxe Neutrodyne"

"With thousands in splendid use in the city of New York, and more thousands throughout the Nation, already I have now established beyond question my original belief that this synchronized set is truly INCOMPARABLE."

M. Pascal Thelon

The retaining of the Parisian expert, Monsieur Thelon, as permanent member and Chief of our Designing Engineers, is typical of Radio Shack methods, and indicates the vast difference between ourselves and firms which are content to collect any odd lot of parts and call it a "set." Only a great organization can afford such an Engineer. The Radio Shack, as the LARGEST Radio Dealers in America, are proud to give publicity to the eminent M. Pascal Thelon.

5 TUBE NEUTRODYNE

Knock-Down Set COMPLETE \$34.49

SEND NO MONEY

We Ship C. O. D.

Complete Kit of STANDARD PARTS

- 1 Drilled Radion Mahoganite Panel, engraved in gold.
- 3 Four-inch Radion Mahoganite Dials, gold engraved.
- 2 Gold Plated Jacks.
- 3 Genuine Hazeltine Neutrodyne Transformers mounted on the famous Comsec Bakelite End Condensers. Positively the only Neutrodyne Kit including these famous Comsec Condensers.
- 2 Hazeltine Neutrodons.
- 2 Bakelite Sockets.
- 1 80-Ohm Rheostat with gold plated knob to match panel.
- 1 30-Ohm Rheostat with gold plated knob to match panel.
- 2 Genuine Killark Shielded Audio Transformers.
- 1 Baseboard.
- 20 feet Tinned Bus-bar.
- 1 .00025 Freshman Grid Condenser.
- 1 Tubular Glass Grid Leak.
- 1 Set Engraved Binding Posts.
- 1 .002 Micon Condenser.
- 1 .006 Micon Condenser.

Exact size special panel and base blueprint.

All packed in attractive box. Written Money-Back Guarantee. Complete Assembly Kit, Genuine 5-Tube Hazeltine Neutrodyne **\$34.49**

Written Money-Back Guarantee Sent With Each Purchase

ALL Parts LICENSED
ALL Parts MATCHED
ALL Parts SYNCHRONIZED

GENUINE HAZELTINE
NEUTRODYNE

LICENSED BY
INDEPENDENT RADIO MANUFACTURERS, INC.
UNDER HAZELTINE PATENT NO. 1,480,000
OTHER PATENTS PENDING
REG. U. S. PAT. OFF.

CABINET FREE

Here is EVERYTHING needed to operate this coast-to-coast set after building:

- 5 Tested Tubes (Type 201 A).....\$19.50
- 2 45-Volt Extra Large Variable "B" Batteries for Neutrodyne..... 6.50
- 1 60 Ampere Hour Storage Battery, guaranteed 2 Years..... 11.25
- 1 pr. 3000-ohm Head Phones and Cord..... 3.75
- 1 Antenna Equipment..... 1.50

Complete Outfit, \$43.40

(Parts Also Sold Separately)

If you order Building Kit and Complete Outfit both together, we will include Fine Mahogany Finish CABINET FREE.

The RADIO-SHACK

EXECUTIVE OFFICE:
55 Vesey Street, Dept. RD-510,
NEW YORK CITY

Send no money. We ship C. O. D. Pay your postman. Then build your set under our WRITTEN Money-Back Guarantee sent with shipment. We acknowledge all orders by return mail. Ship same on following day. We answer every letter we get on same day. The Radio Shack are the Largest Radio Dealers in America. No inferior goods. Only the best and most reliable. You buy in safety. Send your C. O. D. order today. This present low price may not continue. Use the coupon NOW.

The Radio Shack, Dept. RD-510,
55 Vesey St., New York, N. Y.

Mark X here only to order Radio Set

Mark X here only to order Accessories

FREE BARGAIN LIST Here X

If I have marked a cross (X) in UPPER square at left, ship me the De Luxe Neutrodyne, \$34.49. C. O. D. If I have marked a cross (X) in LOWER square at left, ship me Complete Outfit of Operating Accessories, \$43.40. C. O. D. Send CABINET FREE. I have checked with you. Everything ordered is subject to your WRITTEN Money-Back Guarantee.

NAME (Print Plain).....
ADDRESS

RADIO NEW TEACHER CLAIM OF EDUCATOR

RANKS WITH NEWSPAPERS AS INSTITUTION

Predicts That Airphone's Educational Possibilities Have Scarcely Begun to be Developed

CINCINNATI.—James C. Boykin, one of the recognized leading educators of the country, hails Radio as a new and powerful force in the cause of education, ranking it with the school, library and newspaper in the group of most potent educational agencies.

"As the fourth of this important combination of factors in education," Mr. Boykin says, "Radio promises to take its place, and it appears to be fast fulfilling that promise. Thus far we have seen only the beginning. The prediction that within a few years at most practically every American home will have some form of Radio receiver is reasonable and it is certain to transpire. The educational possibilities of Radio have not been more than suggested and have scarcely begun to be developed. It is apparent, however, that it not only occupies a place of its own but that it aids and supplements all other educational agencies."

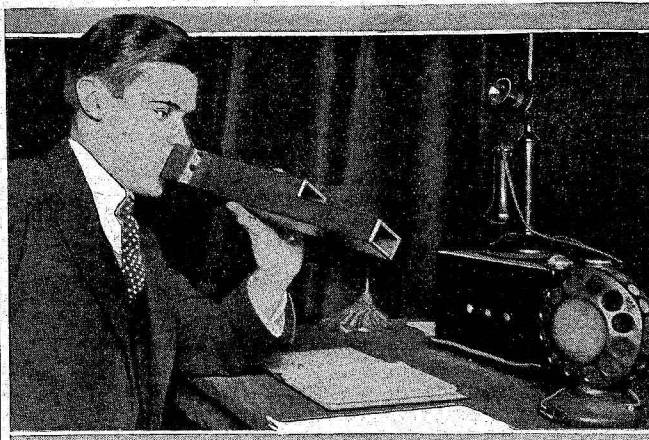
Educates as it Entertains

Citing the fact that six years is about the total education that the average American receives in the schools, the rest being attained from various sources in the activities of life, Dr. Boykin declares the effect of Radio is incalculable value to the masses. "In its ordinary use so far," he said, "its educational effect is comparable to that of the newspaper."

"Those who listen in do so, as a general rule, for the entertainment they get out of it and not because they wish or expect to be educated that way. Willingly or unwillingly, however, there is education in Radio for even the most frivolous. The mere fact that they are receiving mental stimulation from an outside source means much in itself. Music, news items, talks and even jokes to a greater or less degree stimulate the mind to activity and broaden the vision of the listener beyond his narrow sphere."

Over thirteen hundred daily and weekly newspapers carry Radio programs.

HAY, NOW OF WLS, TOOTS HELLO



George Hay, famous announcer formerly of WMC, Memphis Commercial Appeal, dropped in recently for a visit at WLS, the Sears Roebuck Agricultural foundation station in Chicago, but decided to make his visit permanent. Here he is with his "hushpuckiny" at WLS as new directing announcer. He has sent the WMC hushpuckiny back to Memphis and has replaced it with a locomotive whistle.

WLS ADOPTS TRAIN WHISTLE FOR CALL

GEORGE HAY IS ENGINEER OF "UNLIMITED"

Sears Roebuck Station Hires Visiting Announcer from WMC as New Boss

CHICAGO.—WLS Unlimited took its first continental trip over its wireless track recently, when George D. Hay, engineer, blew one long toot of the locomotive whistle and called out "WLS, the air-first stop, Bangor, Maine." There was no grinding of the brakes or puffing of the engine as the WLS Unlimited pulled out only the echo of a whistle dying in the distance.

George Hay, the new directing announcer of the Sears Roebuck Agricultural Broadcasting Station, who came here with his steamboat whistle for a week as visiting announcer from Station WMC, Memphis Commercial Appeal, but decided to make his visit a permanent one, sent his co-partner, the "Hushpuckiny," back to Dixie. "The river boat whistle belongs to Memphis and the South, even if I am its originator," Hay said.

Hay Wants More Speed

"Anyhow, I want something with a little more speed than a river boat. WLS has so many calls for special information and songs and musical numbers from every part of America that a river boat couldn't make all the stops."

The locomotive whistle Hay ordered made is over two feet long and a foot wide and is protected by a wooden case of red cherry. It's an exact duplicate of the steamboat whistle in appearance. But they have different vocal accomplishments. WLS Unlimited will make its continental trip twice each day, noon and evening. The whistle is the starting and closing signal, with a long toot for every station. There may be a little rough-riding for a day or two until Hay gets used to being an engineer instead of a river boat pilot.

Two hundred and fifty thousand persons are connected with the Radio industry in the United States.

It is estimated that three thousand American concerns manufacture Radio supplies of various sorts.

One Farm in Every 17 in Ohio Has Airphones

7,500 Rural Homes in State of Ohio Equipped with Radio

COLUMBUS, O.—One out of every seventeen farms in Ohio is equipped with Radio, according to an estimate by C. J. West, state-federal crop statistician, with headquarters in Columbus.

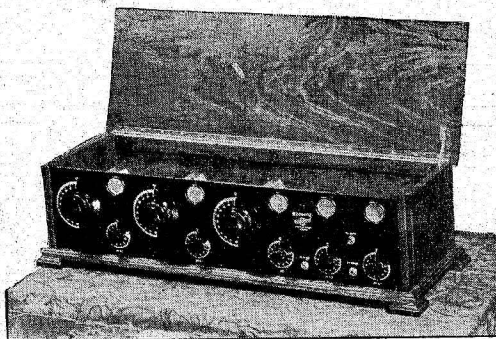
This means that about six per cent, or 7,500 farms, have receiving sets of some description. The noonday program from WBAV is especially popular with the farmers, judging by the numerous letters and cards received on these daily programs. At noon each day, WBAV broadcasts piano music, news bulletins, mar-

ket reports and the weather forecast. The farmers are most "touchy" about the weather forecast and upon occasions when the announcer neglects this item, the protests that flood the mail indicate that he has committed a grave crime.

Paris Adds Fifth Plant, Built on American Plan

PARIS.—Another broadcast station has opened here, which, from the construction standpoint is strictly American. A well-known American company erected the station for the newspaper "Petit Parisien." This station will soon be on the air in competition with the four stations already in operation.

This makes the second broadcast station which is totally American built, the first being that of the Postes et Telegraphes.



The Howard 5-Tube Neutrodyne Coast to Coast Range

Beautiful black Walnut cabinet with special designed Howard Neuroformers, Neurodones, special sockets and rheostats.

The Howard Neutrodyne brings the wonders of radio into your home and allows you to distinctly receive the famous broadcasting stations of the world.

Write Today for Descriptive Folder of This Remarkable Set

Howard Mfg. Co. is one of the few manufacturers licensed under Hazeltine patents to sell Neutrodyne receivers.

HOWARD MANUFACTURING COMPANY
4246 NORTH WESTERN AVENUE
CHICAGO



BRISTOL SINGLE CONTROL RADIO RECEIVER

Using Grimes Inverse Duplex System
Patents Pending



Most Simple to Operate

The set for those who want results with little effort. Anyone in the family can quickly learn to operate it because technicalities and guesswork are eliminated—One Control Dial does it all.

Does Not Interfere With Your Neighbor

Other close by reception is not disturbed when you tune in with this non-radiating Receiving Set. It gives you a comfortable sensation of freedom to be able to change from one station to another knowing that you will not interfere with your neighbor's receiving.

Choice of Aerial or Loop

Where conditions make it difficult to install an outside aerial, as in congested sections of cities, good results can usually be had by using inside Loop. In fact, the directional feature of the Loop often brings in stations not possible with a stationary aerial.

Mounted in solid mahogany case with walnut finish, the Bristol Single Control Radio Receiver is handsome in appearance. The price is \$190.00. Bulletin AY-2013 describing this set will be mailed on request.

BRISTOL

TRADE MARK
AUDIOPHONE
REG. U. S. PAT. OFFICE



Loud Speaker

This is known everywhere as the Loud Speaker with the quality tone. Not only is the tone natural and without mechanical distortion, but is sufficiently big in volume to be easily heard in a large room or all through the house. Comes to you ready to use—no auxiliary batteries are required.

Made in three models:

- Audiophone Senior Price, \$30.00
- Audiophone Junior Price, 22.50
- Baby Audiophone Price, 12.50

THE BRISTOL COMPANY, Waterbury, Conn.

COPYRIGHT REVISION BILLS ENTER HOUSE

CLOSELY PARALLEL DILL'S NOW BEFORE SENATE

Future Hearings Planned for Later Date with Representatives from Both Sides Present

WASHINGTON, D. C.—Hearings of copyright law revision bills have been occupying the attention of the House committee on patents during the past week. Most of the points brought out have followed closely those introduced at the hearings of the Dill copyright law amendment bill some weeks ago.

The two bills introduced in the House of Representatives closely parallel the Dill bill of the Senate, and are sponsored by Representatives Johnson of Washington and Newton of Minnesota.

Taking "public performance for profit" out of the scope of the copyright law was the purpose of all bills heard before the committee. The House bills, however, are not limited in applying to radio alone, but cover music played at motion picture theaters, legitimate theaters, dance halls and hotels.

House Committee Not Entirely Neutral. Further hearings were planned for a later date. At the later hearings it was planned to have the American Society of Composers, Authors and Publishers and the National Association of Broadcasters present their arguments and rebuttals.

It is to be noted that sitting on the House committee on patents is Congressman Bloom of New York city, a former music publisher. It is reported that he is an open advocate of the American society and did his best to ask heckling questions and prevent the hearing from proceeding in an orderly manner.

The Dill bill, in the Senate, at the time of writing had not been reported out of committee, but Senator Dill expressed himself as confident that it could be reported out soon, and in all probability passed by the Senate.

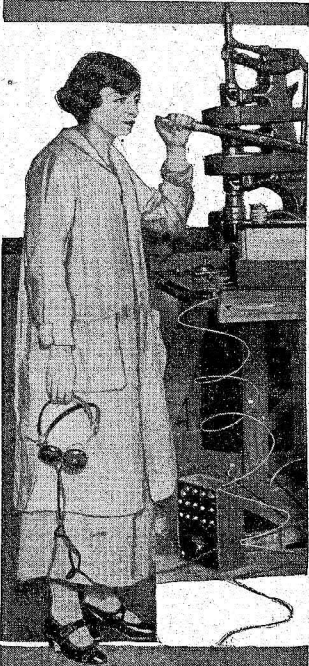
Arts Society in Italy Now

Forms Radio Fans' Club

MILAN.—The Italian society "Amici del Arte" has constituted a new branch of its activities, the "Radio Club Lombardo" with headquarters here and with sections in other cities and towns of Lombardy.

The society's activity is seriously limited by the fact that while a person or an organization may purchase a receiver, up to the present it is impossible to obtain the government's sanction to use it. The scope of the new club will be more educational than otherwise until the Italian government announces its Radio policy.

WOMAN IS SCIENTIST AND RADIO GRADUATE



The distinction of being the only woman Radio engineer in the world belongs, it is said, to Mrs. Edw. M. Munger, the lady presented above as seen in her laboratory. She is also an electro-chemist and is at present engaged in research work for a Radio corporation. Int. Photo

WTAS Raises \$10,000 for Widows of Firemen

ELGIN, ILL.—WTAS's recent campaign to raise funds for the widows and orphans of the firemen killed at Curran hall, Chicago, is expected to net a fund of \$10,000, according to figures given out by Charles E. Erbstein, owner of the station located here. Thousands of dollars' worth of Radio apparatus was donated by manufacturers, jobbers and dealers of Chicago.

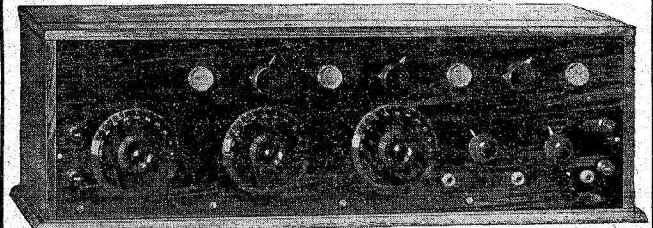
5 Tube Licensed Neutrodyne

PAY NO MONEY Just Pay The Postman

\$12.50 CABINET FREE

Special Ten Day Offer with Each Set

On account of this special offer you must pay the express



8x26x8, Mahogany, Walnut, Oak, with Piano Hinges

ALL LICENSED PARTS

WHEN you get this magnificent looking set wired and hooked up, you will be able to hear all stations without interference. All parts are same as illustrated in Radio Digest, Feb. 2nd. Panel is mahogany with beautiful mahogany dials—a set fitted for the most exclusive home.

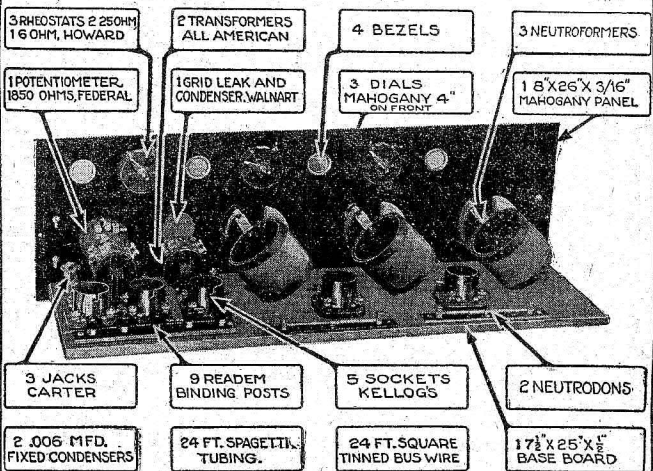
- 2 Rheostats, 25 ohms, Howard..... \$ 2.00
- 1 Rheostat, 6 ohms, Howard..... .50
- 3 Neutroformers, 2 Neutrodons..... 25.00
- 1 Potentiometer, 1850 ohms, Federal..... 1.85
- 3 Jacks, Carter..... 2.70
- 2 .006 Condensers..... .40
- 1 Grid Leak with Condenser, Walnut..... .65
- 5 Sockets, Kellogg's..... 5.00
- 2 Transformers, All-American..... 8.50
- 9 Readem Binding Posts..... .85
- 1 8x26 Mahogany Panel..... 3.64
- 4 Bezels..... .80
- 3 Dials, Mahogany, 4 in..... 4.50
- 1 Baseboard..... .50
- 24 ft. Square Bus Wire..... .60
- 24 ft. Spagetti..... .80

BLUE PRINT FREE EASY TO WIRE

\$48.50

SEE BELOW

Mounted on Panel and Baseboard



Panel not mounted or drilled, only \$45.50 with \$12.50 Cabinet and blueprints FREE.

COMPLETE WITH ALL EQUIPMENT

IN ADDITION TO ABOVE PARTS	
5 Tubes.....	\$25.00
1 110 Ampere Storage Battery.....	18.00
1 DeLuxe Homecharger.....	18.00
1 Headset.....	12.00
1 Complete Aerial Equipment.....	1.50
1 45 Volt B Battery.....	5.50
2 2 2/2 Volt B Batteries.....	\$ 6.00
Loud Speaker.....	\$96.00
TOTAL.....	\$38.50

The above parts and equipment complete would cost you \$159.50! Our Price \$125.00

Written Money Back Guarantee with Each Set

Special Sale on Webster Condensers, Fine for Super-Heterodyne Variable Condenser, .0005 (same as 23 plate), \$2.98 Variable Condenser, .001 (same as 45 plate), \$2.98 List, \$5.50. While they last—Bargain at..... \$2.98 List, \$6.00. Big buy at.....

We are responsible folks, money cheerfully refunded within ten days if you are not satisfied. All Orders Mailed Promptly. No Stamps Accepted. Send Check or Money Order.

Quality Merchandise at Low Prices Economical Radio House 4600 LINCOLN AVENUE, CHICAGO

Thrills from Radio

No. 19 of a Series Featuring Experiences of "ALL-AMERICAN" Users

"All-Americans Are Best Regardless of Price"

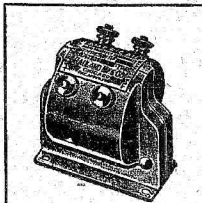
By "E. P." of United Electric & Wireless Co., Hagerstown, Md.

"We built a set using All-American audio frequency transformers and were surprised at the volume and clearness. 'demonstrate' All-Americans — and it sure sells them!"

"At first we thought it might be the set, so we removed the All-Americans and put in another make of transformer that is supposed to be so wonderful and sells for \$7."

"But we can say they gave far from equal the results obtained with the All-Americans."

"We keep this set in our store to



All-American Audio Frequency Transformers, 3-L, \$4.50; 5-L, 10-L, \$4.75. The best—no necessity to pay more.

"We have tried all the transformers that are worth trying and find that, to say the least, All-Americans are as good as the best."

Why pay more for less? Why experiment? Hundreds of thousands of fans have had similar experiences! Buy All-Americans, know you're getting the best—and save money!

Special Offer

All-American Power Amplification diagram—Circular and Book of 22 Tested Hookups sent for 2c in stamps to cover mailing.

All the better dealers sell the "ALL-AMERICAN" RAULAND MFG. CO., 2640 Coyne St., CHICAGO PIONEERS IN THE INDUSTRY

Audio and Radio Frequency: Power Amplifying (input and output)



More than 700,000 in use Standard on the better sets

ALL-AMERICAN AMPLIFYING TRANSFORMERS

Largest Selling Transformers in the World

OPERATING AND TROUBLE SHOOTING

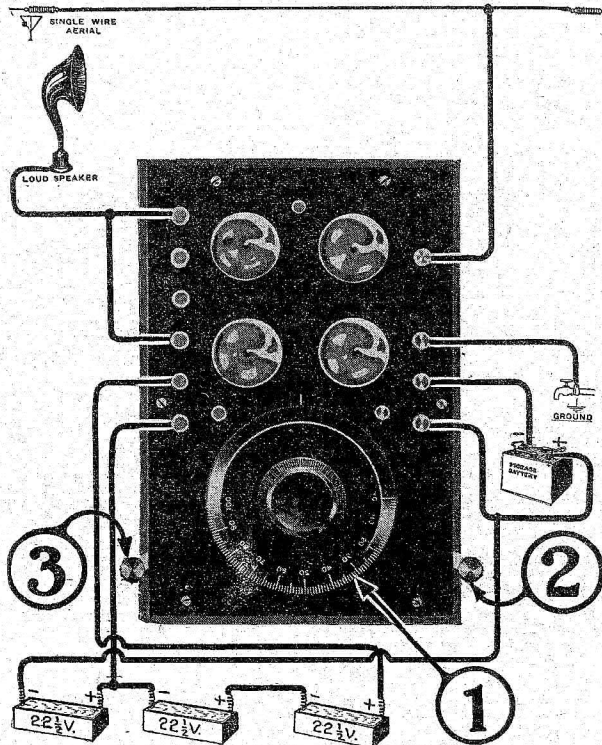
For the Owner of a Nightingale Four-Tube Receiver

“OPERATING and Trouble Shooting” is a Radio Digest feature whose purpose is to study the late models of various standard receiving sets and to show the newly initiated broadcast listener, who has purchased such a set, how he can operate it to get the best there is in it and how he can overcome minor difficulties which may be causing some trouble. On pages 11 and 12 this week the Nightingale Four-Tube Receiver is described. Radiophans with other sets will also find these articles worth reading, particularly the notes on trouble finding.

THIS set is adapted for use with any good 5 to 6-volt tube; a soft tube may be used as a detector, and a hard tube as an amplifier.

AERIAL.—An aerial of a single 20 to 22 gauge enameled copper wire, with a straight length of from 75 to 85 feet and having an elevation of at least 30 feet from the ground, is recommended. (If located over trees or on roofs of buildings, aerial should clear at least 15 feet.) The lead-in should be simply an extension of the aerial wire (to avoid joints) and, wherever possible, clear all obstructions and drop directly to the point of entrance to building in which set is located, passing through a minimum number of insulators to the set.

GROUND.—Number 6 wire should be used, running to near the set where a



flexible cord can be well soldered, in order to facilitate handling, and should be as short or direct as possible to the ground, which should be located in permanent moisture, if obtainable. Many installa-

tions work well where the ground wire is soldered to gas or water pipes (water pipes preferred) and the soldered joint made as near the entry of the pipe into the basement foundation wall as possible.

A BATTERY.—Any good six-volt storage battery may be used, but should never be permitted to discharge below 50 per cent of its capacity. Dry batteries may be used where all tubes used consume not over 1 ampere. However, their use in any 4-tube set has not proven to be very economical.

B BATTERY.—Either storage or dry cells may be used, using only the voltage recommended by the tube makers.

Phone Connections

When connecting phone or loud speaker, and you wish to use Aerial, connect aerial wire to post AER. 4 Tubes: Connect terminals to binding posts marked PH and 2 AF. 3 Tubes: Connect terminals to binding posts marked PH and 1 AF. 2 Tubes: Connect terminals to binding posts marked plus B DET. and DET. Connect the negative side of the B Battery to the positive pole of the A Battery and connect this to the post marked plus A minus B. Connect the negative side of the A Battery to the post marked A on set. Connect the plus side of the B battery to the post marked plus B on the set. Connect a flexible cord having a battery spring clamp or snap on one end to the post on set marked plus B Det. Connect the ground wire to the post marked GR.

Place tubes in sockets pressing down firmly and turning clockwise until locked into place. Turn on rheostat and all tubes must burn. Connect the battery clamp hat is wired to the instrument post marked plus B DET, to 18-volt stud or terminal of the B Battery.

Operation

Place the set with the tubes away from and the knobs nearest you as shown in the illustration. When the set is so placed: The farther right tube is the Radio frequency amplifier, the nearer right tube is the detector, the nearer left tube is the first stage of audio frequency amplification, the farther left tube is the second stage of audio frequency amplification. The dial Number 2 controls the wave length received.

Move the right rheostat Number 2 lever up until the tubes become noisy, and then lower slightly. (The left lever Number 3 controls the Radio frequency tube, and the right lever controls the detector and audio amplification tubes.) Throw the

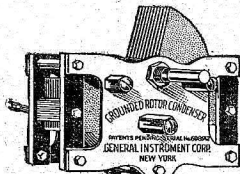
(Continued on page 12)

WAVE LENGTH LIMITATIONS

Are now conquered and it matters not whether you receive at 50 meters or 50,000 meters. All you need is the proper inductance and that means using

THE LOW LOSS

GENERAL INSTRUMENT CORPORATION GROUNDED ROTOR CONDENSER



LOW LOSS GENERAL INSTRUMENT GROUNDED ROTOR CONDENSERS

Have Practically No Dielectric Losses and Hence You Get **37% MORE DISTANCE AND VOLUME THAN WITH THE AVERAGE VARIABLE CONDENSER**

CHARLES SREBROFF, operator and owner of station 2 BHY writes, "You can use my name in your advertisements so that other amateurs may profit by my experience with your LOW LOSS GROUNDED ROTOR CONDENSER. There is no other condenser to equal yours and I can honestly say that my station is entirely free from any condenser losses since using your GROUNDED ROTOR CONDENSER."

"Amateurs can call me any night between 11 p. m. and 1 a. m. on 180 meters—three operators always on watch."

Type	Minimum	Maximum	Price
Type 46X 11 Plate	5 MMFD.	.0025 MFD.	\$4.50
Type 46A 13 Plate	6 MMFD.	.0033 MFD.	4.50
Type 46D 21 Plate	9 MMFD.	.0065 MFD.	5.00
Type 46F 43 Plate	15 MMFD.	.001 MFD.	5.50

AT YOUR DEALER

Otherwise send purchase price direct to us and you will be supplied

GENERAL INSTRUMENT CORP.

423 Broome Street
NEW YORK CITY



Federal

ANNOUNCES

Its Latest Achievement in the Field of Radio—

The "No. 102 Special" Federal Receiving Set will be demonstrated to radio enthusiasts beginning May first.

If you do not know the name of the Federal Dealer in your locality, write immediately to

FEDERAL TELEPHONE AND TELEGRAPH CO.
BUFFALO, N. Y.



Federal

Standard RADIO Products

Look for this sign



Boston New York Philadelphia Chicago Pittsburg
San Francisco Bridgeburg, Canada London, England

OPERATION, TROUBLES

(Continued from page 11)

left rheostat lever Number 3 up to the top, slowly rotate the tuner dial Number 1 until the wave causes the Radio frequency tube to oscillate, emitting a whistling sound. Lower this lever until the whistle ceases and the music comes in, usually slight adjustments are necessary—both with the tuner dial and the hand levers, to perfect the reception.

The operator should record the dial positions for the various stations, thereby, being enabled to turn at will to the station desired, provided the batteries or aerial have not been changed.

Too much battery (rheostat too high) on the Radio amplifier will cause this tube to spill (become paralyzed), and this is easily corrected by lowering the rheostat lever and then raising it again, but not so high as to cause this tube to repeat the spill. In selecting new hard tubes, try each one of the three in the Radio frequency socket, as this tube should be the most sensitive in the set.

Various stations are tuned in by slowly turning the tuner dial. The plus B detector battery clamp may be shifted up or down on the B battery terminals until the best tones are received, 16 to 18 volts usually being best. It is also necessary to move the rheostat knob in order to secure the best volume and tone.

A little experimenting will soon indicate the best combination for local conditions. Do not burn tubes brighter than is necessary for good reception, they will last longer. This set is capable of producing results equal to or better than any set on the market today. Poor operation is usually caused by some defect outside of the set. Noises are usually due to defective or discharged batteries, a poor ground, or poor wire connections. Scrape all wires till bright where connections are made.

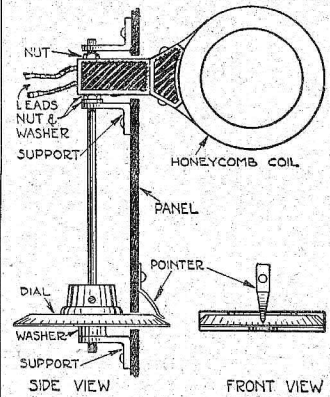
Caution

Be sure tubes are removed from set until all wires are connected. Place one tube in set and turn on rheostat to make sure you haven't misplaced B battery wires. This will save the rest of the tubes.

Coil Mounting

Herewith is a coil mounting that is free from capacity effects, easier to handle than the old style, and furthermore the positions of the coils may be read and the readings preserved for further use when the desired station is wanted again. The construction of this mounting is quite simple, as may be seen in the illustration.

Two openings are cut in the panel as shown, one for the coil mounting to extend through and the other for the edge of the dial. Three small brass or other non-magnetic metal supports are cut and mounted on the panel as shown. These are bent in the form of a right angle. A special coil mounting will probably have to be made as the ordinary ones are somewhat short. This may be made out of formica, hard rubber, wood or other insulating material. A hole is drilled in one end to admit the shaft, which is none other than a threaded brass rod. This shaft is fastened securely to the coil



mounting with two or more nuts. On the lower end of the shaft is mounted a dial as shown, so its edge will extend through the opening in the panel. This dial may be one of the small 2-inch kind. These may be bought cheaply, and they are quite easily drilled. As is seen the hole for the shaft is drilled completely through the dial. A small pointer is fixed on the front of the panel so a reading may be taken of the position of the coils with each station. Two of these mountings will be required for a three honeycomb coil set.—Evermont Fisel, Lebanon Junction, Ky.

Diaphragms Are Delicate

The caps on telephone receivers should not be unscrewed unless it is absolutely necessary. If this must be done to tighten the connections, etc., be careful not to bend or dent the diaphragm in any way.

Review of Books

Amateur Radio Call Book. We have a few copies of this valuable book of the fourth edition. It contains a list of amateurs, special amateurs, technical and training stations. Tells how to construct a Reinartz tuner, detector and amplifier. A two-color map comes with it. Original cost, \$1. While they last, 50 cents.

The Armstrong Super-Regenerative Circuit. By George J. Eitz, Jr., E. E. This is a De Luxe edition of this famous circuit. Profusely illustrated and fully explained. Fifty-two pages. Price, \$1.00.

Experimental Wireless Stations. By P. E. Edelman. Simple directions are given in this book for making Radio equipment for the transmission of messages over long distances. Price, \$3.

Vacuum-Tube Receivers. By O. F. Hessler. A book that tells how to make a simple set. How to make the cabinet. It includes a 27 by 36-inch layout blueprint. Price, 75 cents.

How to Retail Radio. A new book telling of tested plans and methods and policies for the dealer in Radio. Financing, location, store equipment and arrangement. Price, \$2.

Home Radio—How to Make It. By A. Hyatt Terrill. This book is particularly adapted for the amateur who desires to know how to make Radiophones. Twelve full page illustrations and diagrams. Price, 75 cents.

Radio for the Amateur. By A. H. Packer and R. R. Haugh. The underlying principles of Radio thoroughly explained in simple language and understandable illustrations. This book will teach you how to construct and operate a receiving set successfully. Price, \$1.50.

Elements of Radio Communication. By Ellery W. Stone. A splendid, well-connected, complete, accurate and up-to-date discussion of every phase of Radio telegraphy and Radiotelephony. Written in simple language. The subject is presented from the physical rather than from the mathematical standpoint, avoiding the use of higher mathematics. Price, \$2.50.

Ideas for the Radio Experimenter's Laboratory. By M. B. Sleeper. This book tells in a simple way the how and why of Radio apparatus. Comprehensive data are given on such necessary laboratory instruments as the oscillator, wavemeter, direction finder, Radio compass, vacuum tube, characteristic measuring set and detailed advice given on the winding of various kinds of standard inductance coils. Price, 75 cents.

The book department of the Radio Digest is prepared to send you any of the books on Radio published, whether listed in our Book Review or not. Let us know what book you want, send us your check and we will see that the book is mailed to you. Postage stamps in payment for books not accepted. Send money order or check. Radio Book Department, Radio Digest, 510 N. Dearborn St., Chicago, Ill.



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THE amazing expansion of Radio has opened up hundreds of wonderful new positions on land and sea. Big salaries, fascinating, easy work, short hours, and a wonderful future are offered to ambitious men who get into Radio now.

Take advantage of these wonderful opportunities to step into a big paying position in this great new field. Radio offers you an opportunity to travel and see the world, with all expenses paid, and a fine salary besides. Or you can stay at home and work up to a position paying up to \$10,000 a year. One of our recent graduates secured a position one week after graduating, paying a salary of \$300 per month. Hundreds of others report equal success.

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Hundreds of men are already earning handsome incomes in this wonder science. If you want to get into a profession where opportunities are unlimited make Radio your career—become a Certified Radio-trician.

Thousands of Certified Radio-tricians are wanted to design Radio sets; to make new Radio improvements; to manufacture Radio equipment and to install it; to maintain and operate great broadcasting stations and home Radio sets; to repair and sell Radio apparatus; to go into business for themselves; to operate aboard ship and at land stations.

You can easily and quickly qualify in your spare time at home through the help of the National Radio Institute, first school to teach radio successfully by mail, established 1914. No previous experience or training needed. Prominent Radio experts will help you. FREE, with course—circuits and parts for building latest receiving set also, three instruments are loaned to students, making the work thoroughly practical. The same plan that has already helped hundreds of our graduates to real success and real money in Radio is open to you.

Send for BIG BOOK

No other field today offers such great opportunities as Radio. Take your choice of the many wonderful openings everywhere. Prepare now to step into the most interesting and best paid profession today. Read about the opportunities open now—the different kinds of work and salaries paid. Write today for the 32-page book that tells how America's first and biggest Radio school can teach you to become a Certified Radio-trician in your spare time. Mail the coupon or write a letter NOW.

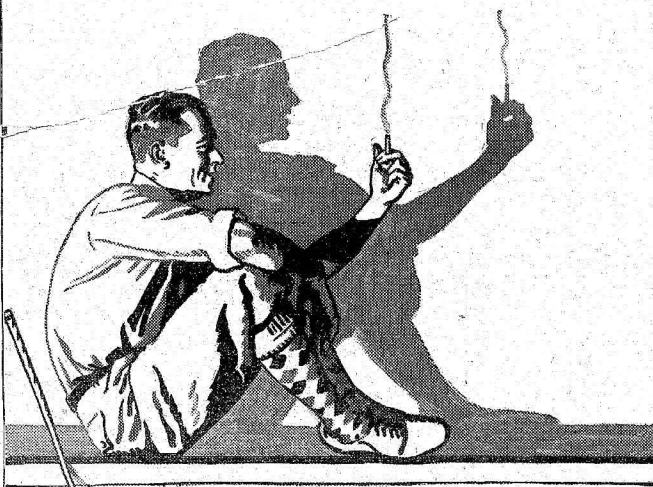
National Radio Institute
Dept. 55EA
Washington, D. C.

National Radio Institute, Dept. 55EA
Washington, D. C.

Without obligation send me your book, "Rich Rewards in Radio," which tells all about the opportunities in Radio, how spare time study at home will qualify me quickly as a Certified Radio-trician so I can get one of these splendid positions, and how your Employment Service helps me to secure a big pay job. (Please write plainly.)

Name..... Age.....
Street..... Occupation.....
City..... State.....

“What a whale of a difference just a few cents make!”



—all the difference between just an ordinary cigarette and—FATIMA, the most skillful blend in cigarette history.



“37 distant stations heard in one night”

IF ANYTHING is good, I sure believe in praising it—and I can't begin to praise your Shamrock Kit enough. I threw out a high-priced regenerative set because of poor selectivity. . . .

“I am enclosing original list taken Thursday, February 28, 1924. At all times at least two Chicago stations were on.

“The month of February I received 573 stations outside Chicago. Of course, these are not all different—but adding up the nights' totals. So far in March (17 days) have received 398 stations. . . .”

A few of the stations tuned in.

- WOR, Newark; WSB, Atlanta; WEAP, Ft. Worth; CKCK, Regina, Can.; KHJ, Los Angeles; KGW, Portland; WKAQ, San Juan, P. R.

The above is only one of hundreds of letters that we have received praising the wonderful efficiency of the Shamrock Kit. Inspect this kit at your dealer's today. If he hasn't it in stock, send us the coupon below.

Kit, list price \$20
SHAMROCK MANUFACTURING CO.
Dept. 27, Market St. Newark, N. J.



SHAMROCK MFG. CO., Dept. 27, Market St., Newark, N. J. Gentlemen: Please send me detailed information on the Shamrock Kit.

Name.....
Address.....
Dealer's Name.....

What's Wrong with Your Receiving Set?

Chapter XII—Miscellaneous Information on Neutrodyne Receivers

By Peter J. M. Clute

IT HAS previously been pointed out that with neutrodyne circuit receivers, as with those of any other type, the efficiency of operation is not only dependent upon the skill of the operator, but largely upon the quality of the apparatus and the care and accuracy exercised in construction. In the assembly and wiring of the receiver, the Radiophon is given an opportunity to display fine workmanship, neatness in appearance and carefulness in judgment. It is especially important that the Radio frequency equipment be separated from the audio frequency apparatus, and all connecting wires from circuits of different frequencies should be well apart to prevent reaction and interaction between them and to reduce inductive interference between leads to a minimum.

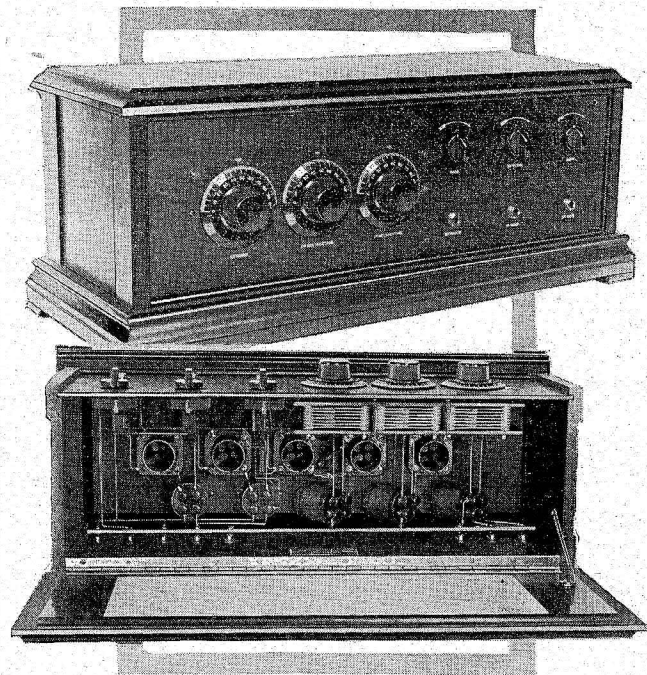
In tuning neutrodyne receivers, the programs from the various broadcasting stations will not be picked up by means of the familiar beat notes and whistles, such as characterize regenerative circuit operation. Instead, as the neutroformer dials are moved slowly from one division to another, the various stations will come through, faintly at first and then with greater intensity and clarity, as all adjustments are made for a particular station. It is especially advisable to make a record or log of the three neutroformer dial settings at which broadcasting stations are heard, so that later any particular station may be tuned in by merely setting the dials on the points previously obtained. This is, of course, contingent upon the condition that the station desired is "on the air" at the time. It is this method of "graphical selectivity" which has popularized the neutrodyne circuit.

Antenna System

When considering the question of a suitable antenna system, it should be stated at the outset that for best all-around results it is recommended that an outdoor single-wire antenna from 80 to 100 feet long and from 20 to 30 feet high be provided for neutrodyne receivers. With this type of antenna, it is possible to secure maximum signal strength without resorting to very sharp tuning. Sharpness of tuning is much greater when employing short indoor antenna than when using an outdoor antenna system.

While the neutrodyne circuit receiver will at times bring in local broadcasting stations with fairly good intensity and clarity, without either antenna or ground connections, such operation is not at all consistent and it is not recommended to use the receiver in this way. Where a regular outdoor aerial cannot be used, the next best substitute is an indoor antenna of about the same length, which should produce fairly good results.

Although the neutrodyne circuit is particularly adapted for operation with the usual antenna and ground system, some listeners in, either through necessity or for experimental purposes, desire to em-



ploy a so-called loop antenna. While the latter, on account of its size, can only intercept an exceedingly small amount of energy, many Radiophans report good results, although such good fortune cannot, obviously, be consistently guaranteed. When a loop is used, the most common method is to connect both ends of the loop to the antenna and ground binding posts on the receiver, shunting or paralleling the loop with a variable condenser. To complete the circuit arrangement, a lead should be run from the ground binding post on the receiver to a suitable ground. The best inside ground connection is obtained by securely attaching a wire to the cold water pipes. Inasmuch as a good ground is essential for best operation, it is advisable to carefully clean the joint before soldering the ground wire to the pipe. Acid soldering flux should not be used for this purpose because it will cause corrosion and result in a poor connection.

Connecting Batteries

In connecting the filament and the plate batteries, standard practice may be followed in most instances. The value and source of A battery potential depends entirely upon the kind of vacuum tubes employed. If ordinary tubes are used, it will be necessary to use a storage battery for the purpose. The polarity of the storage battery is plainly marked on the terminal posts. If dry cell tubes are used, the number of cells to be used depends upon the tube. It must be borne in mind in making connections, that the carbon rod in the center of any dry cell is positive and the outer zinc covering is negative.

The B or plate battery connections should be so arranged as to give the detector tube plate a potential of between

16½ and 22½ volts, and the amplifier tubes a potential up to 90 volts on the plate. The extra B battery voltage taps between 16½ and 22½ volts permit adjustment of the detector plate voltage to give best results. Each tube will be found to have one particular voltage at which it will function best, and any change in this voltage, in either direction, results in a loss of sensitiveness. The taps on B batteries are provided to aid in the careful adjustment of plate potential. The amplifier B battery voltage may be similarly varied so as to give sufficient volume, with no signal distortion.

In order to secure the most economical results possible from the B batteries, it is advisable to note the following suggestions:

Use the lowest B battery potential and the fewest tubes that will give the desired results. Unless operating a loud speaker, 45 volts on the plates of the amplifier tubes will be sufficient in most instances. A higher potential will, undoubtedly, produce louder signals, but this will greatly increase the flow of current from the B battery and consequently its life will be shortened.

Operate the vacuum tubes at the lowest filament temperature that will produce good results. The current flowing from the B battery will increase as the filament brilliancy increases. A triple economy in tube and battery life will result from burning the filament as low as practicable.

Turn the filament rheostats off as soon as the program is over. Remember that B battery current is flowing as long as the filaments are lit, whether or not signals are being received. Turning off the filaments when the set is not in use not only saves the tubes but the A and B batteries as well.

Vacuum Tubes Required

In providing vacuum tubes for the neutrodyne circuit receiver, it is recommended that wherever possible either the UV-201 or C-301 or, preferably, the UV-201A or C-301A amplifier tubes be used in combination with a UV-200 or a C-300 detector tube. While neutrodyne receivers will operate fairly well using any of the dry cell types of vacuum tubes, such as the UV-199, C-299, WD-11 or WD-12, it should not be expected that the strength of signal will be nearly as great as with the regular types of tubes, inasmuch as the current which the dry cell tubes are capable of handling is considerably less. The main advantage in using dry cell tubes lies in their exceedingly low filament current consumption. While adapters may be used in the regular standard sockets to accommodate the dry cell tube bases in an emergency, this practice is not generally recommended.

(Continued on page 24)

At Last!

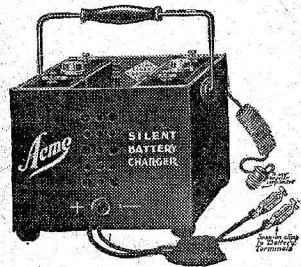
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FULLY GUARANTEED

ACME ENGINEERING CO.

DEPT. 4

LOUISVILLE, KY.

2-LO, LONDON, ENGLAND ON ONE TUBE

Another Record for the

ELGIN SUPER-REINARTZ

Tuesday, November 27, during the test period between 9 and 9:30 P. M., Rev. E. A. Cole in the residence of J. A. McIver, of Roodhouse, Ill., while operating a set made of materials and in accordance with the hookup furnished by the ELGIN RADIO SUPPLY CO., tuned in 2-LO, London, England, using receivers and but one tube. Later another tube was lighted and the loud speaker used, so that four people could hear the program and concluding announcement. The numbers, time, and the order in which they were played were

Officially Confirmed

by the St. Louis Post Dispatch in conjunction with the National Association of Broadcasters, who had charge of the tests. (See page 34, St. Louis Post Dispatch, Dec. 2, 1923.) This same hookup has been advertised extensively as the one which brings in stations 2000 miles overlaid on a loud speaker and one tube; and this has been demonstrated so often as to need no repetition.

Send a two-cent stamp for circular giving one, two, and three tube hookup, and price list of parts for this remarkable circuit. Address the

ELGIN RADIO SUPPLY CO.

207 Chicago St.

ELGIN, ILL.

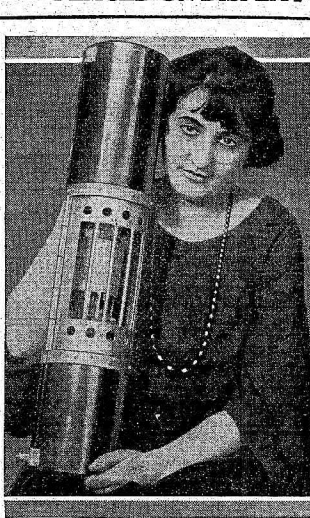
AN EVENING AT HOME WITH THE LISTENER IN (SEE INSTRUCTIONS FOR USE BELOW)

Table with columns: Station and City, Met., Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday. Lists various radio stations and their broadcast times.

Instructions for Use.—All the hours above are given in Central Standard Time. If your city uses Eastern Time, add one hour to each of the periods stated; if your city uses Mountain Time, subtract one hour; if your city uses Pacific Time, subtract two hours. If in addition, your city uses daylight saving time, add one hour to this result. This table includes only the evening broadcasts, and, on Sunday, the late afternoon program.

Recharging Phone Magnets Being an interested reader of Radio Digest and having secured a large amount of valuable information from its pages, I may be able to help some other fan with an idea of mine.—Many headsets and single phones, due to poor magnets or loss of magnetism give very poor results after continued use. A good way to charge these phone magnets is as follows: Remove the cap and diaphragm of the phone and place the remaining part on the field pole of a direct current motor or gener-

LARGE ENGLISH TUBE PLACED ON DISPLAY



The largest and most powerful English vacuum tube was placed on exhibition in this country recently. The tube, held by Mrs. H. Lesser, is a five-kilowatt tube, and was sent to the Radio department of the navy for test and research work. The tube is valued at \$1,500 and was brought to the United States by special messenger.

MIRAGE-LOST SHIP LOCATED BY RADIO

Captain Calls on Airwave Compass to Find His Way Through Illusion

SYDNEY, N. S.—When approaching Sydney, Nova Scotia, recently, Captain Bauge of the Hospital Ship St. Joan of Arc, was confronted by a mirage which distorted the shore lines so they could not be recognized. Calling his Radio compass into service, he took bearings from North Sydney, Magdalen Island and Cause, with the result that he succeeded in locating his position.

Endeavoring to find the proper point at which to land in a fog, Captain Bauge and a native fisherman who was on board, were greatly confused by a mirage which changed the appearance of the coast. They knew they were not in front of Scarati, for a steep cliff could be seen behind the lighthouse, obviously not the gentle sloping hill of the Nova Scotia shore, five miles' distant from the lighthouse.

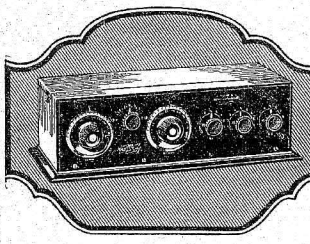
Standing by temporarily until the sun came out, the skipper took an altitude, which plotted with his Radio bearings, interested in a triangle of error of less than three miles on a side. He was east-northeast of Scarati. Soon the lighthouse appeared in its natural place. The Radio compass proved correct, he stated, despite the "evidence" of their eyes.

These magnets of the phone will be much stronger and also the diaphragm. Remove these from the motor or generator and wipe off the magnets and diaphragm, then replace the diaphragm and cap.—Robert C. F. Eardley, Verdun, Canada.

Pope Pius XI has installed and uses a receiving set in the Vatican in Rome.

ator, then place the diaphragm on the next field pole to it with the current flowing through these field poles. In a short time

COAST-TO-COAST RECEPTION - and Beyond -



Radiodyne

"The Voice of the Nation" NO LOOPS - NO AERIAL

WITH the RADIODYNE you can select broadcast programs from all parts of the country. Honolulu and London have often been picked up by operators in the central states without interference from nearby stations.

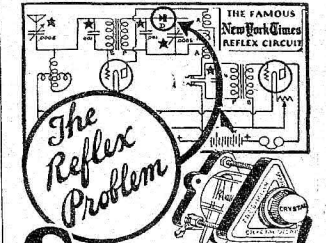
The Radiodyne is ready for operation by simply grounding to a water pipe or radiator, and throwing a few feet of wire on the floor. Uses any standard tubes—dry cell or storage battery. Extremely selective. Simple to operate—Only two controls you can tune in on any program you wish—any wave length from 200 to 700 meters.

For use in apartments, boats, automobiles, railroad trains, etc., the RADIODYNE is enjoyable where other receiving sets would not be practical.

Price, \$150.00

Write for illustrated folder which describes the RADIODYNE in detail. Every radio fan will be interested in this new type (antennaless) receiving set.

Western Coil & Electrical Co. 312 5th St. Racine, Wisconsin



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DOUBLE ADJUSTABLE CRYSTAL DETECTOR

The World's Best for crystal or reflex sets

This crystal detector makes two tubes do the work of four!

FREE! Send for Freshman Building Plan of N. Y. Times Reflex

—gives panel layout, circuit and parts required. Operates Loud Speaker on two tubes!

FRESHMAN Double Ad-justable Crystal Detector for panel or base use, complete with crystal.

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Freshman Super - Crystal 50c With Non-Metallic Housing

No more searching for the sensitive spot merely turn the knob as you would a dial!

At your dealer's; or send purchase price to be supplied postpaid.

Chas. Freshman Co. Inc. Radio Condenser Products 106 Seventh Ave., N. Y. C.

Coto 'Built First to Last' 'Very Much Better Than Your Advertising Claimed' COTO-COIL CO. 87 Willard Ave., Providence, R. I. Includes an image of a Coto coil and descriptive text about its benefits.

30 Minute A-B-C Lessons for Radio Beginners

Chapter IX—Radio's Cast of Characters

By P. E. Edelman

IN this series of articles the story of Radio is told in so simple a manner that the uninitiated can follow theory and practice whether he knows anything about electricity or its application to broadcasting and reception or not. The series consists of twenty-five chapters, of which the five next will be: Chapter X—What a Vacuum Tube Does, Chapter XI—The Short-hand of Radio—Diagram Reading, Chapter XII—Catching Radio Waves, Chapter XIII—The Radio Detective, Chapter XIV—Tuning In.

JUST as the enjoyment of a play or motion picture is enhanced by knowing the cast of characters, so is the understanding of Radio increased by knowing who's who among some of the common terms used.

The Radio words and terms most heard are firstly, the slang class; secondly, the trade name variety; thirdly, the technical, and fourthly, the scientific. Without attempting to print a Radio dictionary, one can point out the gist of terms in common use.

AERIAL AND ANTENNA. These are used synonymously to mean the insulated wire used to radiate or intercept waves.

ALTERNATING CURRENT. This term is usually written A. C. It is a current that goes in one direction, stops, and reverses in recurring cycles. Pulsating or fluctuating current is a current flowing in one direction but varying from time to time in amount.

AMPLIFIER. This usually refers to the circuit used to amplify Radio or audio frequency current, but sometimes means the vacuum tube used for this purpose.

AMPLITUDE. Means the measure of the value or energy in wave motion.

AUDIO FREQUENCY. Means vibrations within the range the human ear can hear, usually below 10,000 cycles, and more particularly between 16 and 6,000 cycles per second.

RADIO FREQUENCY. This is the vibrations in wave form, or electrical current alternations, occurring in the range usually limited by 10,000 cycles, up to 2,000,000 cycles per second.

AUDION. The first trade name given to the three electrode vacuum tube.

RADIOTRON; TRIODE. Present-day names for the same thing, namely, a Radio vacuum tube.

BROADCAST RADIO. Intelligence in form of sound waves carried by Radio waves and transmitted in all directions.

WIRED WIRELESS. Radio waves particularly guided by a wire line in one direction and limited by it.

CAPACITY. The size or electron holding ability of a condenser.

CONDENSER. A device for holding electrons.

DETECTOR. A Radio frequency rectifier or device for changing Radio frequency current into direct flowing current.

ELECTRIC CURRENT. A flow of electrons. It occurs substantially instantaneously.

ELECTRONS. May be considered as raw electricity in its thinnest unit.

E. M. F. Electromotive force, or voltage, in electric terms means the same thing as head or water pressure in hydraulics.

ETHER. This is a word used to designate what is left after taking all known material substances from space, and can be regarded as space. Radio waves

extend through the ether in the form of expanding fields of force.

FREQUENCY. The inverse of wave length and means the vibration or recurring change of wave energy. Radio frequency is thus an extremely high rate of vibration.

GRID. This refers to the controlling electrode of a vacuum tube.

GRID POTENTIAL. Means the E. M. F. applied to the grid for control purposes.

GRID LEAK. The resistance used to discharge the grid condenser slowly.

GRID CONDENSER. The tiny condenser used to control the grid of a vacuum tube for detecting purposes.

GROUND CONNECTION. The connection made with the earth, often by connecting a wire to the water pipes.

HARMONIC. The overtone of the fundamental vibration and can occur at Radio frequencies also. There is a tendency of any frequency to set up harmonics.

HENRY. Usually expressed as millihenry or microhenry, and is a unit measuring value of inductance.

IMPEDANCE. The resistance in addition to the direct current resistance value of a coil or conductor. It is caused by the reversed E. M. F. set up by magnetic lines of force collapsing back through the coil or wire. At Radio frequencies large values of impedance can be set up, and this action is sometimes referred to as choke coil action.

INDUCTANCE. Usually describes the action of a coil of wire.

INDUCTION. The transference of energy via lines or tubes of force without direct electrical contact or circuit.

KILOWATT. A thousand watts, the unit of electrical power, and the term micro-watt means a millionth of one watt.

LOOP. The coil or inductance used to intercept Radio waves and usually comprises ten to twenty turns of wire on a frame two to four feet in diameter. It is directional.

LOUD SPEAKER. Device for reproducing electric pulsations in form of sound waves.

NEUTRALIZING. Opposing two fields of force that have substantially zero effect. Two coils can be connected in opposite sense or a coil can be combined with a condenser to accomplish this action.

PHONES. The ear pieces or headset used in reproduction.

POTENTIOMETER. A resistance device for obtaining gradual differences of E. M. F. or potential.

PATENT. A limited monopoly granted by the Government for alleged new and useful improvements. Infringement means the use without the owner's permission of the invention or idea claimed.

PHASE. The time relation in electrical circuits.

RECTIFIER. Aside from its meaning in detectors refers to a device for changing alternating current into direct flowing current. For charging storage batteries, rectifiers are of magnetic, or electron bulb, or chemical types.

REFLEX. Relates to the double use of vacuum tube amplifier at both Radio and audio frequencies.

REGENERATIVE CIRCUIT. A circuit employing the principle of a tuned plate to the grid circuit feedback.

RESISTANCE. The opposition offered by a circuit or wire to the flow of current.

RESONANCE. The term applied when a circuit is adjusted to exactly fit a certain frequency.

RHEOSTAT. An adjustable resistance for controlling current.

SQUEAL, HOWL or WHISTLE. Undesired audio frequency currents set up in certain receiving sets.

STATIC. This defines the natural interference from discharges, thunder storms, and electrical changes in the atmosphere, which transmit Radio energy to the receiving set.

SUPER-CIRCUITS. Super-heterodyne, super-regenerative, etc. are names for combination circuits. The super-heterodyne changes the incoming frequency before rectification. The super-regenerative circuit modifies the grid potential to permit the use of increased regeneration.

TRANSFORMER. This is a magnetic device for transferring energy via the field of force set up in a coil. In Radio special forms are used for power, amplifying, telephone, and tuning purposes.

TUBES OF FORCE. The electrostatic field set up by the condenser action.

TUNING. The process of adjusting a circuit to fit a certain frequency. This is done by altering capacity or inductance.

VACUUM TUBE, ELECTRON TUBE, THERMIONIC TUBE. Other terms for the combination of a filament, grid and plate in an evacuated bulb. Such a tube can be used as a detector, oscillator, generator, or amplifier, according to the connections made with it.

WAVE LENGTH. The distance from crest to crest of two adjacent waves. Sound waves are relatively short, but travel slowly and so have moderate frequency. Radio waves are usually longer, but travel much faster and so have higher frequency.

WAVE TRAP. A combination of inductance and capacity used to absorb or oppose a certain frequency, for tuning purposes.

ZERO BEAT. Two oscillating sources that have the same frequency and do not heterodyne. Heterodyne means that two sources of oscillations slightly differ in frequency and set up a third

frequency which is the difference of the two. A local frequency can be set up in a receiving system to heterodyne with an incoming frequency, and the resulting third frequency may be either audible or inaudible (Radio) frequency.

A Few Minor Expressions

There are a few minor common expressions which are much used but hardly accepted.

CRYSTAL. The mineral element used in crystal detectors and is often spoken of as the whole thing.

PICKLE TUBE. Slang for dry cell filament operated vacuum tube.

PERK. Slang for operate, or oscillate.

BROAD. Tuning which is not limited to one frequency but covers a band of several frequencies.

SHARP. Relates to tuning which is selective or limited closely to a particular frequency.

JUICE. A careless expression for electric current.

CONTROL. The manipulation or dial twisting, in adjusting tuning circuits.

INSULATOR. A substance which greatly resists or cuts off the flow of current, as porcelain, hard rubber, etc.

BIAS. A term for the potential or E. M. F. placed on a grid of a vacuum tube for control purposes.

BUS WIRE. The connecting wire used in wiring a circuit.

FILAMENT. The electron emitting hot wire in a vacuum tube.

FADING. The swinging or temporary disappearance of incoming Radio waves due to natural reflections, atmospheric conditions, or other causes. Signals sometimes fade, and then reappear.

HEAVY-SIDE LAYER. The upper strata of the atmosphere from which Radio waves are sometimes said to be reflected.

FIELD OF FORCE. The influence in space set up by an energized circuit or coil.

TAPS. The portions of a coil lead off for adjusting its effective size.

LEAD-IN. The wire connecting an aerial

(Continued on page 24)

BLUE PRINTS Make Your Own Set



Special Offer 5 Books for \$2.00

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Three Tube Receiver
Assembly Details
Tuning Instructions
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FLEWELLING
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Five Tube Receiver
Full Assembly Details
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Radio Digest

PROGRAMS Illustrated

REG. U. S. PAT. OFF. AND DOM. OF CANADA

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Aid in Selling Musical Instruments

Phonograph Dealers Join Hands with Radio

THE tremendous spread of interest in the Radio development which is keeping the manufacturers of instruments and equipment rushed to capacity to fill orders, is calculated to help rather than hurt the manufacture and sale of musical instruments. That conclusion seems to be concurred in by both makers and dealers in instruments. It is admitted by dealers in some sections that certain lines have been affected unfavorably by Radio development, but even these producers are not worried.

The reason for this is that the Radio has been a tremendous factor in musical education of the people all over the country. People who knew little and cared less about music have listened to Radio programs and enjoyed them. As the public becomes more familiar with music and with different kinds of music the musical trade is sure that a desire to reproduce familiar selections whenever they choose, and to branch out into personal musical expressions, will receive tremendous stimulus.

People who seldom ever heard good bands and orchestras are now more interested in musical instruments and are appreciating the difference in their tone. The phonograph has done much also to spread the appreciation of really good band and orchestra music.

Some of the phonograph people are turning their attention more closely to Radio and some contemplate going into that line. They are not greatly worried, however, although at first glance it might seem strange that they are not. The reason is that ultimately the Radio will help sales just as it will help player piano sales, since so many Radio fans will hear popular pieces by the best orchestras and performers and thus have created within them a desire to play these selections at home on their own instruments.

The remarkable improvement made in the simplification of Radio sets has been fully equaled by the betterment of the broadcast programs. While the hearers have not been able to signify by applause or hisses their approval or disapproval of individual programs, they have not been backward in letting broadcasting stations know by letter and telephone what they liked and what did not appeal to them. Their comments have been carefully studied and programs now are being worked out along lines calculated to amuse and interest as many Radiophans as possible.

Mysterious Air Waves

Very Little is Discovered About What's in the Air
THE air is full of mystery. Few people realize what a wonderful opportunity is waiting them in the air. The discovery of the Radio has made it easier for the air investigators and great results are predicted for the pioneers in this new field of scientific research.

It is but a seemingly brief step backward to the time when the Simon Lake submarine made its appearance and when the Wright Brothers brought out their airplane and Elmer Haynes exhibited his automobile. Each of these seeming mysteries was proven practical as the years have passed. Why not then grasp the opportunities for utilizing the marvelous invention or the Radio to further the experiments with the hidden secrets of the air?

Scientists, astronomers and dreamers are seeking the heavens for new things heretofore thought mythical, but the advent of the Radio will make it easier for them to solve some of the seemingly impossible mysteries.

Study of Radio

Listeners Would Be Benefited by Systematic Education
THE amateur, to increase his knowledge and to obtain the best results, should study Radio in the following order: "Construction, arrangement, operation, function, care and principle of operation.

Attention to details which seem unimportant has often made it possible for many a homemade Radio set in the hands of a careful operator to establish a long-continued record of clearness of signals; far superior to the instruments of a careless operator with an elaborate set of instruments. In Radio the reception of current is being dealt with.

W. L. Detroit, Mich. current is being dealt with.
News Orchestra: 7:00, "Dea."
Campbell, Detroit. News post.

RADIO INDI-GEST

The D-X Hound

I've sung of father's Radio and mother tuning in,
I've rhymed on Radio rous at home and worn the subject
thin.

It almost seems that nothing else to write on could be found,
And yet there's one pest still unrhymed, the D-X Radio-Hound.

I've watched him turning dials and I've noted how his face
Would light up when he got a sound from some far distant
place.

You'd surely think that getting miles was Radio's delight,
For them alone the D-X Hound will stay up half the night.

He's not content to listen to a program anywhere,
It's distance that he's trying for, at that he is a bear,
For him the artists do not count, they only serve to hold
The stations on his set until call letters all are told.

I never saw his equal in ambition to achieve,
Nor have I seen the like of him in Jolly, I believe,
For hours that he wastes each night if rightfully used, would
bring
More tangible results I'm sure, than D-X monkeying.

They tell us every family has some bug who fills this bill,
Who hugs the Radio each night and tries his distance skill,
And does not care if others worship their leisure time employ
In listening to some nearby place where programs do give
joy.

I'm sure that normal folks will feel as I do towards his
kind,
I'm working on a scheme for him, I have it now in mind,
'Tis this, a station powerful enough to broadcast folks as
well

As songs and words, and then, oh, joy, I'd D-X him to—
(Tophet.)
CHARLES L. H. WAGNER.

(By the bye, how many of you have read poet Wagner's
new book of poems? They're all about Radio and very en-
joyable. B. J. Brimmer company of Boston are his publish-
ers.—Indi.)

Sure Cure

By Simply Waddles

OH, WHY should I worry with useless repining and
futile despair at my lot. A turn of the dial will
start me inclining away from my gloom on the spot.
The cheer and the music that's out on the air will
sure help a fellow along, and to forgetfulness banish
his care on the lilt of a Radio song.

Wash Out on the Line

If Mandy, she should ever
Hang her clothes upon my aerial
You folks will all be reading
About a colored burial.

DICK AXMAN.

Mrs. Partington Speaks Out



Dear Indi: Mizz Partington says Radio politics down to Washington is fading out fast, lately, but Mr. Scandalip, of New York and Gasston Demens are still on the wrecking crew.

She says Senators Brokeheart and Wheelhorse didn't listen to quite enough broadcasting while they were in Russia to learn all about how to take our government apart and build it into a nice little Soviet set of their own, but they got some blueprints and are trying their best. Senator Wheelhorse says it makes him tired, all this broadcasting about the little bit of oil stock he got out of it, and anyway it wasn't dishonest for him and McAdough to take it, like it was for everybody else. Sen. Lafollet's batteries have sort of run down, so Magnavox Johnson hasn't blowed his horn much lately, but these two still hope for "Dirty work at the Cross-roads" to scramble things up, when they expect to be the Lenin and Trotsky boys for our country. She says Radio has cured deaf folks so she is praying that it will help the blind so as they can see how to vote in some static strong enough to fade this wrecking crew out forever more.

SIGNING OFF.

"Our Mary"

Mary has a little set, she takes where e'er she goes
To use the silvered tubes therein to powder up her
nose.
She took the set to church one night, and as she knelt
to pray.
Somehow the thing commenced to work and caused
a wild dismay.
And so the usher put her out, for the set did loudly
bawl:
"Last night, on the back porch, I loved her best of
all."
PAPRIKA.

New Returns from an Old County

Dear Indi: Re my 10c wave trap. Some fellows say the strays hang on tight to their traps. That's because they used shellac on them which they shouldn't do. Carbolik acid is the stuff.

I see in your paper the three letters R.C.A. and I asked a feller what they meant and he said Rights Copping Ability. A lady next door told the Mr. he could build any more Radio stuff until he built her a house with a room all to himself & he said dearie when I finish this set you'll haff to build the house around it. Yessirre, it's one of them super-howldimes.
INS U. LATIION.

A New Member of a Large Family



Condensed

By DIELECTRIC

Radio played its part in the two-day athletic carnival held on Franklin Field at the University of Pennsylvania, when WDAR broadcast the results of the various events. In doing this the Quaker City station gave to many collegians the opportunity of listening to the cheering, music and announcer's statements and—perhaps—to some saddening news. Sports in general have received a very fair share of attention from the broadcasting stations in this country. But it is to the varsity men in particular a great boon; many cannot attend, tho they may hear.

In looking about for new fields to enter Radio broadcasting would seem to have little left to choose, yet we read of unusual stunts performed by faithful "mike." Possibly one of the latest of these to attract attention from the listening audience was the "barking" of a circus orator through the loud speaker. Stations KYW, WGY, WJZ had all served as mediums through which the wonders of circus life were made to thrill the heart of boys and men, then WOR gave a part of its program to a description of what goes on under the "big tent." My boy—you know!

Not so long ago, during a heavy wind, listeners tuned to a low wave were able to hear the call of an operator on one of the Army observation planes. He gave weather conditions at an altitude of 2,000 feet, named the land marks over which his plane flew and described the action on his tubes when the speed reached 75 miles an hour—caused them to burn too brightly. Again, we heard stations give weather conditions and other needed information to the pilots of the balloons racing from Texas to such points as they were forced to land. Tax fires? Never!

Quite stringent rules have been applied to the residents of Washington, D. C., who have aerials, or who intend having them. Of course, it was not intended to discourage the Radiophan from indulging his pet hobby, but to safeguard the lives and property of its citizens that these ordinances were passed. Recently an aerial in Montclair, N. J., broke and came into contact with a high voltage feed wire. Two firemen who attempted to put out the fire resulting therefrom were killed. Now the authorities propose preventing a repetition of such a thing. It would be of immense benefit to have laws prohibiting stringing of an aerial so that it could become a menace to life. Is yours safe?

The fifth annual convention of the Third Radio District was held in the Hotel Adelphi, Philadelphia, not long ago. Two young women were headed in that direction when their auto ceased to function. One of them was the operator of private station 3BCK, Baltimore, Md. What she did to secure help might put an idea into your head. The car was equipped with a sending set, and the young lady promptly sent out a call for help. It was picked up in the convention hall, from which a rescue car was dispatched to their aid. Be prepared for auto trouble—Radio.

In the home town of WSAI and WLW a contest was recently held over this "music for publishers only" scheme. After losing there, it was the intention of J. H. Remick and company to have the subject brought for final decision before the United States Supreme court. After the case was lost in Cincinnati steps were taken to bring suit against the General Electric company. I read in Musical America an urgent plea to prevent the passage of the Dill bill, as it would lead to ruination of modern "composers" and "publishers." The theory advanced was that one of these innocuous songs repeated over and over at a broadcasting station would so nauseate the Radio listener as to effectually establish an alibi for his not purchasing of same. If a song can't stand on its merit, why let it live?

How to Construct a Super-Heterodyne Receiver

Part III—Assembly and Base Layout

By Allen C. Forbes

The title to this article is very misleading and does not cover what is intended at all. Merely stating that we are now going to show, or rather tell you how to lay out the apparatus on the base, doesn't convince the writer that you realize how important this subject is, so for this reason it's going to take a lot of explaining to put you on the right track.

Let it be distinctly understood right now, before we go any further, that the thing to be borne in mind at all times is that you must get started right. If you get off on a tangent and start varying from the procedure already outlined, you are going to have a hard time trying to get straightened out. Follow the method we lay out for you exactly to the letter and your set will function and it will do just what the set that has already been made has done and is doing. After you have made the set just as we have told you and it works, then and then only should you start changing and experimenting. You can try any one of a dozen different hook-ups. Try anything you like, for that matter, but for goodness sake do not attempt to make the set as the writer has been telling you and at the same time try "Bill Jones" and "Jim Smith's" advice also, because if you do you are in for a peak of trouble.

Build Set as Described

If you can't have confidence in what we are telling you just take it for granted that it must be somewhere near O. K. and go ahead and get all the advice you can. Write the different suggestions on or in a little notebook under the title of "What I am going to try when my set works," and then make the set exactly as we tell you; then you won't have any trouble and your set will work and you will get some real enjoyment in listening to a real set operate.

You can easily see that it isn't a very hard matter to change a .005 mfd. condenser to a .001 mfd. or to substitute a grid leak for that or to even change a transformer after the set is working correctly, but if you start right in taking the other fellows' advice and changing this or that, how in the name of goodness can you expect it to work? If by any chance it does work it will be nothing but luck, so why take a chance?

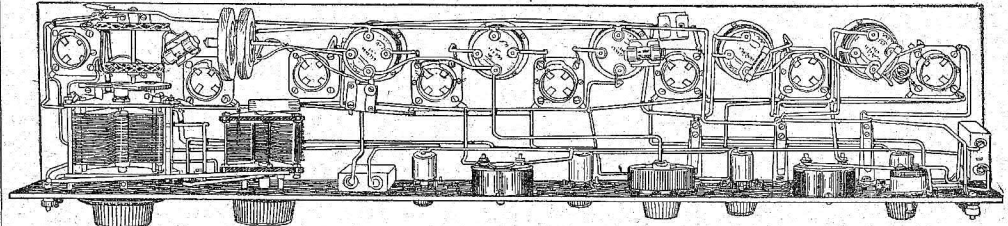
It has always seemed very queer to the writer as to just why the average person contemplating the building of a set—any kind—should purchase blueprints or booklets, paying out real hard, honest-to-goodness cash for them for the express purpose of learning how to build

the set and what parts will be needed and recommended, and then turn right around and ask his neighbor or some casual citizen (the chances are ten to one that they themselves have never built the set, probably they have never even seen one) how to build it.

and they in turn can develop more efficient apparatus, but that doesn't change the fundamental principle at all. An ordinary, simple regenerative set is just the same today as it was yesterday, except that it is more efficient through the use of better apparatus.

unnecessary leads than through almost any other cause.

I cannot understand why people will not mount the various pieces of apparatus just as close as possible. As an illustration, take the fellow building a simple set. He buys a couple of transformers



Get the Right Information

I tell you this curbstone advice is sometimes very costly. I know for a fact that it's troublesome. Just to prove it and satisfy yourself that we know what we are talking about, go out now and confidentially inform a few friends that you are about to construct a super-heterodyne set as recommended by Mr. Allan C. Forbes in the current issue of the Radio Digest.

This one will tell you that the circuit is obsolete, the next one will tell you to try this kind of a change, the next one will tell you that so and so is better and so on down the line. Now as you get these various suggestions from the interested citizens, just ask the following questions: "Have you constructed the set as outlined by Mr. Forbes?" If he says "No," then ask: "Have you ever built a superheterodyne?" If he says "Yes," then ask: "Did you make the changes you are now telling me to incorporate in my set in your own?" If his answer is "Yes," then ask the final question to which none can answer "Yes"—here it is: "Did you make an actual comparison between the set as recommended by Mr. Forbes and your own with the changes you suggest using the same tubes, loud speaker, loop and batteries?" You can govern yourself by his answer.

There no doubt will be improvements on the circuit from time to time—also as the manufacturers make more money through the sale of present-day apparatus they can employ more research engineers

On the other hand, if we all sit back and wait until the ultimate in perfection is reached, then there will be no Radio because we must use what we have now in order to pave the way to better things later on.

Start Here to Make Set

With these few words of explanation, we are now ready to take up the laying out of the base board. The first thing to do is to put the panel with the apparatus mounted on it up in the attic or down in the basement anywhere away from you so that by no possible chance can you fasten it on to the base board before you are through mounting the apparatus.

The next thing in line is to take the oscillator coil, the filter coils, the intermediate and audio frequency transformers and tube sockets and place them in position on the board. Bear in mind this caution: Be sure and mount all the apparatus so that all leads are as short as possible, the shorter you can get the leads the more efficient a set you will have, and this applies more particularly to this than any other set. More trouble has been caused in supers through long,

for the audio stages and asks which are the best, and the clerk tells him to take those that have shields on them. This he does. Then he asks if there is any special way to mount them, and the clerk informs him that to prevent interference, distortion and other major complications, he should mount one this way and then six or eight inches away he should turn the other one at right angles and mount it. Now if the clerk had only told him to make the leads just as short as possible and mount the apparatus as close as possible, the only possible trouble that could occur would be the reaction of the magnetic field of one transformer on the windings of the other transformer, and if this happens there will be distortion.

Distortion Eliminated

With a cheap, poorly designed transformer you might get distortion provided they were placed closer than two inches apart, assuming of course that they were unshielded. With a shielded transformer the probability of distortion due to this cause is very remote. Of course if you set up an oscillatory circuit around the (Continued on page 24)

S. HAMMER RADIO CO.
303 Atkins Ave. Brooklyn, N. Y.

NEW COCKADAY DISTORTIONLESS AMPLIFIER

List Price	Our Price	List Price	Our Price
\$4.00	\$2.60	1 Pr. Como Dup. P. P.	\$10.00
1.00	7.00	1 3000 mfd. American	5.00
2.50	2.00	1 Dubilier 60025	.40
2.00	1.80	3 500 mfd. Dubilier .005 Cond.	3.50
1.50	1.70	1 10 Ohm Binding Post	.20
		1 Panel Tx12	1.95

\$28.50

Complete parts exactly as specified by Mr. Cockaday. List Price, \$40.00.
THE ABOVE PARTS MAY BE BOUGHT SEPARATELY.

COCKADAY Four Circuit Receiver
Complete parts as described by Mr. Cockaday

- 1—Cockaday Precision Coil
- 1—Amplex Grid-Densator
- 1—Bradley Leak, 1/4 to 10 mcs.
- 1—Molo Sockets
- 1—Amplex 5 ohm Rheostat
- 1—Amplex 20 ohm Rheostats
- 1—Pacnet Single Jack
- 1—Pacnet Double Jacks
- 1—Comtran Transformers
- 1—Amplex Push-Pull Transformer
- Input
- 1—Comex Push-Pull Transformer
- Output
- 1—Switch Levers
- 1—Switch Points
- 2—Switch Stops
- 1—Dubilier Condenser—.0005
- 1—Dubilier Condenser—.00025
- 1—Durham Variable Grid Leak
- 1—Laxite Resistances—4,000 ohms
- 1—Amplex 400 ohm Potentiometer
- 1—7"x2" Panel
- 1—3"x2 1/2" Sub Panel
- 1—1"x12" Panel

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1.20	1.80	1.80	1.30
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2.50	1.85	2.75	1.65
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6.00	4.95	4.50	3.10
4.50	3.50	4.00	2.95
4.00	2.95	6.50	5.65
5.00	3.60	5.00	3.45
4.50	3.35	4.50	3.35

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For a year the Crosley Engineering Department has been working on a new circuit. This has now been perfected into an unusual radio receiving set—a triumph in radio engineering.

This remarkable set is equipped with two condenser dials, two rheostats and a slide trigger. It uses three tubes; one stage of non-radiating radio frequency amplification, regenerative detector with perfectly stabilized control of regeneration from which the signal goes back to the first tube, using that tube over again for one stage of audio frequency amplification and then traveling into the third tube, an additional stage of audio frequency.

From this combination of three "R's"—Radio Frequency Amplification, Regeneration and Reflex—we have coined the name Tri-R-Dyn, which will be written Trirdyn.

Advantages Never Before Offered

The advantages resulting from this successful circuit have, to our knowledge, never before been offered. Regeneration is reduced to an absolute minimum; the signal is intensified before it goes to the detector, thus giving the detector an unusually strong signal upon which to function and the dials can positively be calibrated to any wave length between 200 and 600 meters. With only two dials, the most inexperienced person can pick up station after station, without calibration and without difficulty, bringing stations in volume equal to any four or five tube set on the market.

See this latest Crosley achievement at your dealers or write for further complete information concerning it.

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USE-IS THE TEST

ADVANCE PROGRAMS

(Continued from page 18)

8:20 a. m., Sunday school; 11:00, Church of the Covenant services, First Presbyterian Church, Rev. Francis N. McMillin, pastor; 8:15, Concert, Little Symphony Orchestra, Pa. (Eastern, Daylight Saving, 395).

Monday, May 19

8KAC, Montreal, Can. (Eastern, 423), 1:45 p. m., Mt. Royal Hotel luncheon concert; 4:30, Mt. Royal Hotel Dinner.
8KFA, Seattle, Wash. (Pacific, 455), 8:30 p. m., Pacific States Electric Co. program, dance music.
8KFI, Los Angeles, Calif. (Pacific, 462), 8:00-9:00 p. m., Evening Herald concert; 9:00-10:00, Examiner concert; 10:00-11:00, Examiner-Max Fisher's Organ Concert, Grove Orchestra.

8KGC, Montreal, Can. (Eastern, 423), 1:45 p. m., Mt. Royal Hotel luncheon concert; 4:30, Mt. Royal Hotel Dinner.
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Advertisement for Myers Tubes, featuring 'AROUND THE WORLD' and 'Practically Unbreakable' text. Includes a diagram of a tube and pricing information for various tube sets.

Advertisement for STA-RITE BATTERIES, featuring 'And Guarantee you in Writing 2 Years of Better Battery Performance' and 'TRY TO BEAT THESE PRICES' table. Includes an image of a battery.

How to Install a Radio Set in Your Automobile

Part II—Ford Installation and Circuit Diagram

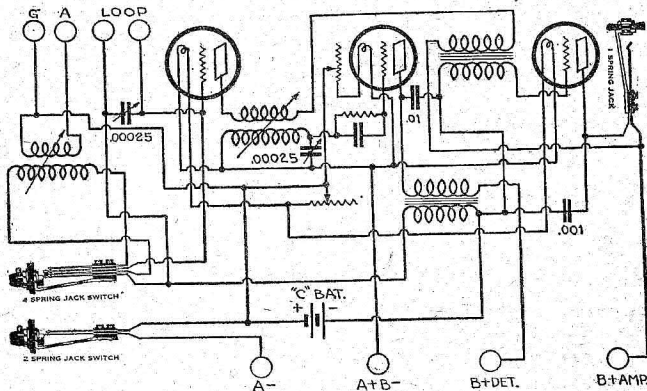
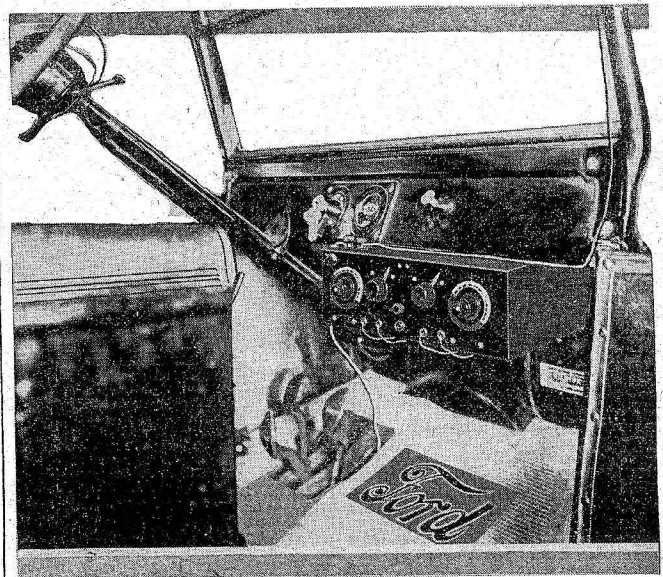
By Harry J. Marx

THE writer does not know how many fans are the owners of a Ford automobile, but undoubtedly there are many flivver enthusiasts as there are owners of other makes. So the first of these installation pictures is a Ford car equipped with a special portable set.

The aerial for this type of installation was described in the May 3 issue of Radio Digest, which contained the first part of this series. This set was especially developed for this purpose and will be de-

work in back of the dash board out of sight. A C battery was found of value, as it reduced the drain on the B batteries. Since the small B battery units are used, this feature was found necessary in order to avoid too rapid a replacement.

The ground connection is made to the framework of the car, or when stopping, to a metal stake driven into the ground. This ground connection can be used to advantage very often in conjunction with the loop aerial.



The Circuit

scribed in full detail. It has an additional advantage in that it will operate very satisfactorily with a loop aerial; in fact, there is but little difference in volume of reception between the auto antenna and the loop aerial. There are some fans, no doubt, who would very much prefer to use a loop rather than install the four-wire cover antenna.

Storage Battery Used

The circuit can make use of a storage battery in the car if so equipped, or dry cells if desired. The B battery consists of four of the small 22½-volt units placed in a cigar box and fastened to the frame

The illustration above shows the circuit used. It consists of one stage of Radio frequency, vacuum tube detector and two stages of audio frequency amplification, one of which is reflexed. The Radio frequency amplification consists of the tuned transformer coupled type. An optional feature is the use of a variable coupling between the primary and secondary windings of both units. These units will be described later.

The four spring switch disconnects the

first tuning unit when the loop aerial is to be used. The single-circuit switch is an A battery circuit switch. The rheostat adjustments therefore need not be touched when the set is to be turned off.

The pack permits plugging in of either the headphones or loud speaker as desired. It was not found necessary to provide means of plugging in on either stages since compactness was decidedly a necessary feature. This factor is more readily appreciated in view of the fact

that this entire set has overall dimensions of 12x8x5½ inches.

The set can readily be put into a suitcase for portability, making it adaptable for canoeing, yachting, camping and other vacation trips away from the automobile.

The entire operation appears to be dependent on the two fixed by-pass condensers, that is, the .01 and .001 mfd. capacity. Both of these decidedly affect the efficiency of operation. It is recommended

(Continued on page 26)

BUILD YOUR OWN
5 Tube Neutrodyne Set
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- 3-2 Genuine FADA Neutrodyne..... 3.50
- 4-4 inch Mahogany Dials..... 2.25
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- 6-1 Detector Rheostat..... 1.25
- 7-1 Amplifier Rheostat..... 1.50
- 8-2 Genuine Deitzen Audio Freq. Transformers..... 12.00
- 9-5 Vacuum Tube Sockets..... 3.95
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- 11-1 Freshman Grid Leak and Mica Condenser..... .65
- 12-1 Dubilier Micadon .001..... .40
- 13-1 Mica Condenser .005..... .75
- 14-1 Frost Battery Switch..... .30
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- 16-8 Engraved Binding Posts..... 1.40
- 17-2 Lengths Black Varnished Tubing..... .30
- 18-1 Complete Instruction Book and Blueprints..... .50

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WORKING MODEL ON DEMONSTRATION
AMERICA'S GREATEST RADIO RETAILERS

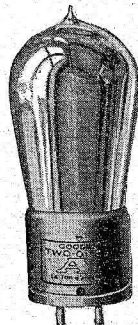


- *191 FULTON Cor. Church
 - *14 CHURCH Cor. Cort.
 - *21 W. 42d St. Corp.
 - **1 Cortlandt Near Washington
 - **15 Whitehall St. Post Radio Elec. Corp.
 - **21 W. 42d St. Corp.
 - **Open Sat. Ev'ns) Bet. 7th & 8th Aves. (**Open Ev. Evg.)
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HANSEN BIRD CAGE LINE
"NIGHTINGALE"
4-TUBE RADIO SET

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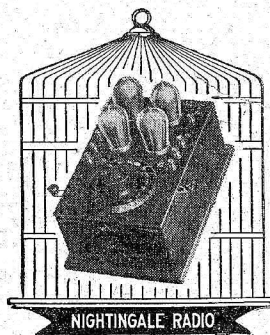
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One stage of R. F. helps to reduce static.



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- Penn. Nightingale Co..... Bellevue, Pa.
- Badger Radio Co..... Milwaukee, Wis.

SUPER-HET DETAILS

(Continued from page 21)

audio transformers so that placing the hand within eight inches of them will cause howling, you have a different problem entirely to deal with. This is not due to the transformer, but to the circuit construction and I venture to say that if you shorten all the leads in the set most of the body capacity effect can be eliminated. If you are using a high grade transformer you do not need to worry about reaction, just place them so they make a very short lead necessary to connect them.

The general arrangement to be followed in mounting the apparatus on the base board should be one that permits of short leads and no criss-crossing of wires. It's very easy to get the general layout of the parts from the illustrations. Try following this layout exactly and note in placing the apparatus just where the connections to the internal capacities of vacuum tubes of the same type do not vary to any great extent, it may require new adjustment of the neutrotons, whenever a tube is changed. This also applies particularly when there is a change in the type of tube used.

The accompanying photographs show a front view and a top view of a commercial neutrodyne circuit five-tube receiver. Neutralization is accomplished by means of metallic shields placed between the neutroformer condenser units. Jacks are provided for listening in on detector and first and second audio frequency stages. Three filament rheostats are shown, one for the Radio frequency tubes, one for the detector tube and one for the audio frequency tubes.

While a large proportion of the constructional details of the neutrodyne set are quite similar to those used in constructing any receiver, there are a number of important constructional and operating hints which might be profitably heeded. The panel drilling should be such as to place the neutroformers at six-inch centers and so mounted that they are at an angle of 54.7 degrees from the horizontal. This will prevent magnetic interaction between coils.

Device for Making Holes

A small gimlet that you can purchase for about ten cents makes an ideal instrument to make the holes for the mounting screws, where you are using a hard wood base board. If you get a gun, box wood or poplar base board (this is what the writer recommends) you can use the ice pick for a hole puncher. Try to get the apparatus placed symmetrically. Exercise just as much care in lining up the apparatus as you would in placing the parts on your panel. Remember this, a set well laid out and securely mounted has more of a chance to get wired up correctly than one that just has the apparatus laid around haphazard, some mounted with one screw, some not even screwed down and some left out of the picture entirely. Then when the wiring is started it is discovered a part is missing and a place has to be made for it.

Care taken in the proper assembly and laying out of the apparatus both on the panel and on the base board will reduce wiring errors eighty per cent.

Always bear in mind that the apparatus cannot think—all it can do is to perform along certain lines. If has one thing to do and usually will do it if given half a chance. You who are constructing the set must do all the thinking and if you fail to reason correctly then failure is the result.

One of the most common causes for failure on the part of the average individual who attempts to construct a set, is lack of confidence in their ability to assemble the parts and then wire them up correctly. Another failure is due to over-confidence. This is made manifest more

prominently by the person who has made a set simply by throwing the stuff together and then getting good results with it, which inspires over-confidence as the person is apt to think that if a set can be built so easily a super should not be such an awful job—so he tackles it in the same manner, then he wonders why it doesn't work.

The next and last article will take you through the wiring and operating of the set, so go ahead with the layout and base board assembly and be all ready for next week when we tell you how to wire it, and best of all, how to operate it. (TO BE CONTINUED)

FIXING WHAT'S WRONG

(Continued from page 13)

ommended. Special size sockets made for these tubes may be secured at small cost. It should be carefully noted that while the internal capacities of vacuum tubes of the same type do not vary to any great extent, it may require new adjustment of the neutrotons, whenever a tube is changed. This also applies particularly when there is a change in the type of tube used.

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Types of Transformers

The regular type of Radio frequency transformer cannot be used since the ratio of turns and the neutroton tap are of utmost importance in the proper operation of this type of circuit. It is advisable to purchase the neutroformers and neutrotons of some reliable make and guaranteed for mechanical and electrical efficiency.

The precaution should be taken to see that the audio frequency transformers are not located so as to lie in the electromagnetic field of the neutroformers, because under such conditions the interaction may cause distortion and howling. This is especially important when one stage is reflexed.

While it is desirable to use a separate filament control rheostat for each circuit, it is not absolutely necessary. A rheostat for the detector tube and another for all

the amplifying tubes together will generally suffice. It is recommended, however, that a standard vernier rheostat be provided for controlling the detector filament current.

In arranging the sockets for the Radio frequency tubes, care should be taken to place them sufficiently far apart to prevent intertube capacity effects. The detector and audio frequency tubes can be mounted close together without being susceptible to interference.

Before assembling the sockets back of the panel, it is important to ascertain if the contact springs are firmly attached to the base of the socket, and so arranged and adjusted as to insure good contact pressure when the tubes are inserted.

It is advisable to see that the fixed plates of the variable condensers are connected to the grids of the tubes, while the movable plates should be connected to the positive side of the filament on the Radio frequency amplifier tubes, and to the positive side of the filament on the detector tube.

In wiring, be sure that all connections are made strictly in agreement with the wiring diagram. Then, if the receiver is constructed and operated in accordance with the detail instructions given, there is no doubt but that satisfactory results will be obtained. (THE END)

THIRTY MINUTE A-B-C

(Continued from page 19)

to a receiving set. Lead wires, describe the connection between a tapped coil and a control switch.

SPAGHETTI. The tubular insulation sometimes used to cover wires in a receiving circuit.

B. C. L. Broadcast listener. Sometimes called listener.

TIGHT COUPLING. Two coils close together. Loose coupling means that the two coils are arranged with less of the magnetic field of one cutting the other.

LOAD COIL. An extra inductance added to a receiving set to lower the frequency range to which it may be adjusted.

SHORT WAVE. Radio wave from 10 meters to 200 meters.

LONG WAVE. A radio wave from 2,000 to 20,000 meters, or lower frequency.

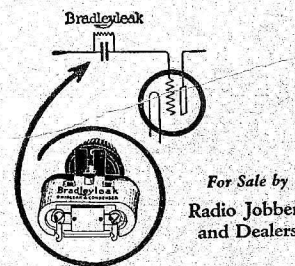
HAM. A colloquial term for an amateur Radio operator.

NATURAL WAVE LENGTH. The inductance of a coil with its self capacity which resonates at a certain natural frequency. The same term is applied

to the natural combination of capacity and inductance of an aerial or other circuit. MAGNET WIRE. Insulated wire used in winding coils and is furthered described as sec. single cotton covered; dsc. double silk covered, with numbers in B&S, brown and sharpe gauge, or size. ROTOR. The movable winding and stator means the stationary winding of a variometer or variocoupler. (TO BE CONTINUED)

ELECTRASOTE RADIO PANELS Give the Best Results and Cost Much Less Electrasote, the new panel material introduced by The PANTASOTE COMPANY, Inc., has highly desirable radio-electric properties—greater volume and surface resistivity than any other panel, therefore less surface-leakage and power-loss in the set. Remember—a good panel deserves proper handling. To get the best results use a new, sharp drill with slight pressure. All Standard Sizes At 25 to 50% Less than any other standard panel JOBBERS AND DEALERS Write for our interesting proposition. M. M. FLERON & SON, Inc. Exclusive Sales Agents for Electrasote Radio Panels TRENTON NEW JERSEY

What Grid Leak?



An Important Item

The following table gives the approximate values of grid leak resistance recommended by vacuum tube manufacturers: Audion (DeForest) DV-6, 2 Megohms C-200 2 Megohms C-299 2 to 5 Megohms C-301-A 2 Megohms UV-199 2 to 5 Megohms UV-200 2 Megohms UV-201-A 2 Megohms WD-11 3 Megohms, or more WD-12 3 Megohms, or more

The noiseless, stepless control of the Bradleyleak enables you to operate your tubes as precisely as the best point. Remember, too, the Bradleyleak is not affected by moisture or atmospheric changes. Try one, now!

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Radiophony on Less than Two-Meter Waves

By Rene Mesny, Professor of Hydrography, French Dept. of Marine

FOR a long time waves of the order of a meter in length have been realized.

It was just this class of waves that were first produced by Hertz in 1887, in order to apply experimental verification to the ideas of Maxwell, but until the present time they have not passed beyond the laboratory stage.

Since the first successes of Marconi, constant search has been made to increase the scale of waves which can be utilized for communication. After having made use of greater and greater lengths in order to assure distant communication, interest has turned to short waves and these have yielded unhopd-for results in the hands of amateurs. The recent success of bilateral communication across the Atlantic Ocean upon a wave length of 100 meters, between M. DeLoy of Nice, France, and F. H. Schnell of Hartford, Connecticut, is known to all.

Short Waves Hold Direction Solution

There is interest in descending still lower; it is hoped in fact to solve a capital problem—that of directed waves. We should like to speak of transmissions concentrated in a channel equally narrow to that of a projector, and not of those in favored directions which have been obtained for some time by means of frames.

One of the most available means of obtaining such a channel is by the use of parabolic mirrors, but the mirrors must

case of a more general circuit permitting the obtaining of polyphase oscillations at high frequency, which we conceived in 1921 in insisting upon the particular type of circuit with two triodes and upon its advantages. This assembly with two triodes was also presented by Eccles in 1919.

Arrangement for Short Waves

Two inductances A and B, wound inversely, connect in one part the grids, and in the other part the plates of the two triodes. A variable condenser is in par-

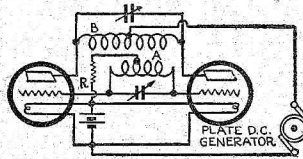


Figure 2

allel with each of these inductances; it is dampened in order to obtain the shortest waves, Figure 2.

The centers of the windings are connected to one of the poles of the filament by means of two wires G and P. The lead from the grids is interposed by a resistance R of several thousand ohms in order to diminish the continuous filament-grid current. In series with the plate lead is placed a potential of a hundred or of several hundred volts. The homologous elements of the two triodes are, therefore, at each instant at equal potentials but of contrary polarity, and the oscillations are contained in the inductances of the grids and of the plates and also in the wires connecting the filaments heated in parallel.

Advantages of Circuit

No oscillating current passes into the common wires of the grids or of the plates and it is possible, to dispose of these at will without taking any precaution. In that lies the advantage of this type of circuit arrangement of the assemblies with a single triode tube in which the oscillations propagate themselves by necessity in traversing the conductors connecting the filament to the grid and to the plate.

With the ordinary receiving triodes used

by the French Military Radio Telegraph we have obtained very stable oscillations upon wave lengths of 2 meters; we may also decrease to 1.50 meters, but the operation then becomes irregular and it is impossible to obtain strength.

Have Made 1.20-Meter Waves

By modifying slightly the plates of these triodes, we have obtained wave lengths of 1.20 meters and have accomplished very stable operation upon the wave length of 1.50 meters. With two triodes of this type we have sent 0.6 ampere over an antenna whose natural period is one-half the transmitted wave and which is coupled inductively with the inductors of the generator. Thus is obtained what corresponds to a broadcasting strength of 20 watts.

Whatever the length of the wave, telephony is done just as easily as telegraphy. The arrangement of the modulation for telephony is indicated by Figure 3. It is the application of a principle briefed by M. Beauvais. The resistance (Figure 2) in the grid lead is replaced by the filament-plate interposition of a triode of which the potential of the grid is varied by means of a modulation transformer energized by the microphone circuit. The modulation is excellent and the results obtained in communication are comparable, whatever the wave length used.

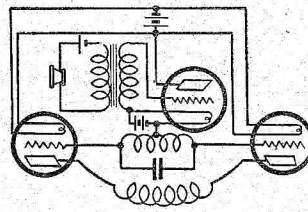


Figure 3

Reception may be accomplished by the usual methods, detection is possible by galena or by tube.

Have Been Heard Twenty Miles

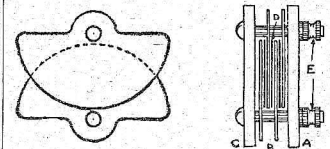
The super-regenerative arrangement by

Armstrong furnishes excellent results for receiving the short waves.

Tests have been made in the country with short waves (we have obtained good telephonic communication at a distance of 3 miles), but the tests were interrupted by the bad season before we were able to use all of the power that is now at our disposal. Further, our first tests were made without reflectors, for we sought only to verify the functioning of the apparatus for transmission and reception. The experiments will be renewed soon and, according to the results of measurements made in the laboratory, we are now certain to obtain results a little over 20 miles.

Homemade Fixed Condenser

The illustration shows how I made a fixed condenser that can be adjusted to various capacities by the use of plates



taken from a variable condenser. The plates should be lined up as shown, with waxed paper between them. The pieces A and C can be made of either cardboard or thin wood. B represents the rotor plates taken from a variable condenser and D the waxed paper separating the plates. Two binding posts E make the connectors. A condenser of any capacity may be made up in this manner.—Clarmount Carlberg, Rockford, Ill.

Filament Voltage

Never increase the filament voltage of a tube above the value recommended by the manufacturer. Keep it below that point if possible. It is a matter of economy as well as efficiency. If in doubt, use a voltmeter across the terminals of the tube socket.

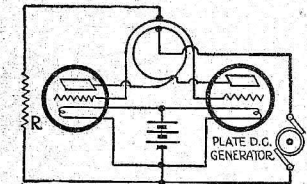


Figure 1

have dimensions of from 1½ to 2 times the length of the wave to be reflected, and these considerations lead to the use of wave lengths of only a few meters.

Work of Franklin and Dunmore

It is known that Franklin in England and Dunmore in the United States have studied the question and have obtained transmission upon wave lengths of 3 to 4 meters and of 10 meters, respectively.

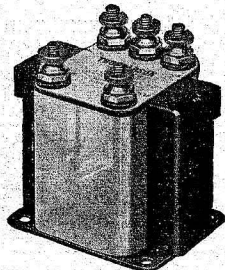
It is proposed to set forth here the principles of the researches which we have carried out with M. David upon the question of very short waves.

One of the difficulties of producing very short waves is the capricious functioning of electronic tubes on the waves and it appears that actually other systems can not be resorted to for the production of sustained short waves.

Basis of Double Triode Circuit

We have had recourse to a circuit with two symmetrical triodes (audion bulbs) of which the principle is indicated by the diagram of Figure 1. It is a particular

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Unlike any wave trap, THE TWITCHELL AUXILIARY TUNER does not ever decrease but in many cases increases the volume from distant stations.

These TUNERS are in daily use within 400 feet of large broadcasting stations and enable their owners to easily and completely cut out the local station and bring in distant stations at any time on a loud speaker.

This instrument will also enable you to bring in programs sent out on longer waves than you can tune in without it, thus bringing all the broadcasting stations within the wave length range of the many sets of limited range now in use.

Copyrighted diagram of this tuner, 50c, or with all parts, \$9.00. Complete instrument in walnut cabinet, ready to use, \$15.00.

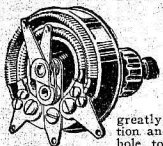
A New and Wonderfully Efficient Coil for the Reinartz circuit for those who want the best. Price \$4.00, or with blueprint for either one or three tubes, \$4.50.

This circuit brings in both coasts loud and clear and is the most successful Reinartz modification yet produced.

All goods prepaid. These instruments are easy to build, easy to operate. Everything clearly shown

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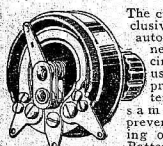
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\$3.00

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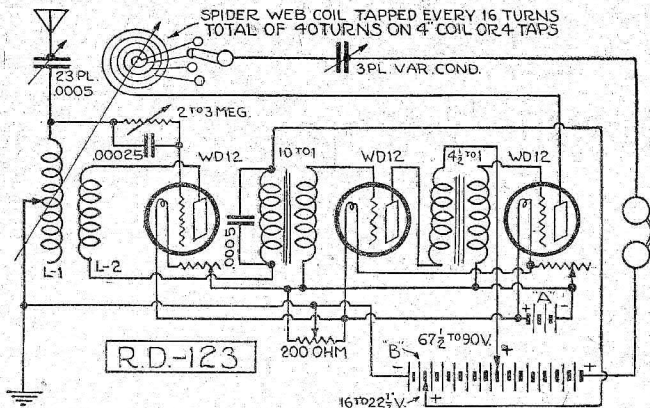
PREMIER "DOUBLE-DISCONNECT" POTENTIOMETER
Trade Mark



The circuit breaker is exclusively Premier and automatically disconnects A and B battery circuits when not in use, thus positively preventing "A" battery drain and at the same time absolutely prevents accidentally bringing out tubes with "B" battery voltage. Genuine "Nichrome" wire wound, Bakelite base, Silver etched dial. 250 ohms \$2.50. 500 ohms \$3.00. Write for Free Bulletin No. 92. Ask your dealer.

Premier Electric Company
3310 RAVENSWOOD AVE. CHICAGO

R.D.-123 THREE-TUBE CIRCUIT



MR. E. L. EDMONSON, of Bluefield, W. Va., submits the circuit shown with the following comments:

"Noting that your paper seems to specialize on the 'tried and found true' circuits various fans all over the country are contributing. I thought perhaps you would be interested in the accompanying sketch. I have such a set now and its operation is a genuine delight, 'reaching out' all over the country and covering every wave length being broadcast.

"It may be 'old stuff' or something already in print, but while carrying out some experiments in trying to couple back from the last audio frequency plate circuit, I accidentally discovered this freak, and a treat it is. After becoming familiar with its action, no difficulty is

experienced in tuning even though it has the disadvantage of many tuning controls.

"Last summer in Cleveland with three strands of number 14 copper aerial in the attic, I tuned out WKH and WJAX and picked up 'Skinner Organ recitals' in New York. I heard Havana several times in the wee small hours, WWJ and WCX at Detroit every day at noon, which is some accomplishment as the steamers on Lake Erie 'pound brass' all day long.

"Using a 7-strand galvanized wire I picked up the following stations: KDKA, WOAW, WGY, WCR, WCAE, WPAE, WOS, WOO, WOR, WLAG, a station in Columbus, one in Washington, D. C., the U. of Kansas, and several others.

"The set has a tendency to oscillate

easily and it is this I am working on now.

"The antenna used is on a hillside, the highest point 9 1/2 feet from the ground and 68 feet long.

"Would you very much like to have opinions about the circuit. The coupler L¹ and L² is a composition affair 4 1/4 inches in diameter, wound with 36 turns of number 24 dsc., the rotor is wound with same size wire and has 54 turns. The primary is tapped in units of 1 and 10. All the tubes used are WD12's. The first transformer has a ratio of 10 to 1, the second 4 1/2 to 1 or 4 to 1. The variable grid leak is a panel mount type, and unless connected right 'squeals' very bad—try changing leads until right connection is found. The aerial variable condenser is a 23-plate vernier affair. The last two tubes are on rheostat, 30 ohms. The A batteries in parallel are 6 dry cells. The grid condenser which I tore out of an old variable grid leak and condenser, is connected across the variable leak. I wound the spider web on a 4-inch form and has a total of 40 turns, tapped every ten. The switch and points are panel mounted directly over the coupler or between the coupler and aerial condenser. In mounting the instruments I was crowded for space, so I fastened the second transformer to the end piece of the cabinet."

- #### LIST OF PARTS REQUIRED
- 3 Sockets
 - 2 Rheostats
 - 1 Single-circuit jack
 - 1 Single-circuit switch
 - 1 Double-circuit switch
 - 2 Radio frequency special transformers
 - 2 .00025 variable condensers
 - 1 .00025 grid condenser
 - 1 2-megohm grid leak
 - 2 Audio transformers
 - 1 .01 mfd. fixed condenser
 - 1 .001 mfd. fixed condenser
 - 8 Binding posts
 - 4 Piece panel stock
 - Miscellaneous angle plates, screws, etc.

is of the fixed tubular type that slips into clips on the grid condenser.

Diagrams of the panel layouts and arrangement of the apparatus, with details of windings and assembly will be taken up in further articles.

(TO BE CONTINUED.)

PORTABLE SET FOR AUTO

(Continued from page 23)

that only the mica type be considered for use. As is obvious, one rheostat is used for the two amplifier tubes, and a separate one for the detector.

Tubes to be Used

In the original set A tubes were used for the amplifiers and a soft tube in the detector socket. An A tube can be used there also, or the 199 and 299 types can be used in all three if desired.

The resistance of the rheostats depends of course upon the type of tubes used. In the set made by the author the rheostats have removable cartridge type windings, so that any values of resistance desired can be inserted.

Form for Bank Wiring

When used for a bank winding, the winding form should be grooved, in order that the bottom turns can not slip out of place, when the following turns are placed above them. If a grooved winding form cannot be obtained, grooves must be cut for the first two or three bottom turns and for the last two or three turns. With a tightly wound winding this arrangement will be satisfactory, as the grooves keep the turns in place.

A little sealing wax dropped on the edge of the windings of a coil will prevent the wires from slipping.

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Switch to Eliminate Dead End Losses

Thirty Turns of Coil Cut Out of the Circuit

Dead end losses in variocouplers and other forms of tuners may be eliminated by the use of the switch here illustrated. A rear view, front and cross-section of the

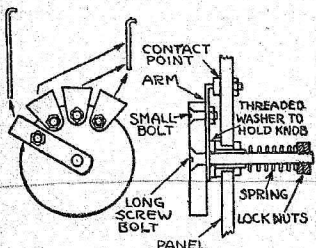
WORKSHOP KINKS? EARN A DOLLAR—

THERE are many little kinks worked out at home that would aid your fellow Radio worker if only he knew about them. There are new hook-ups, new ways of making parts and various unique ways of operating sets that are discovered every day. Radio Digest is very much interested in obtaining such material. Send them in with full details, including stamped envelope, so rejected copy may be returned. The work must be entirely original, not copied.

RADIO KINKS DEPARTMENT,
Radio Digest,
510 North Dearborn St., Chicago

switch is clearly shown. The duty of the short arms is to connect the succeeding groups of 10 turns each, which will be seen disconnected until the switch arms cover the switch points.

The arm resting on the point 7 is the one to which the connection is made. The long arm is made to rest on any of the odd numbered switch points. As many of



these arms may be inserted as desired, which will depend on the number of turns used on the tuner.

By means of this switch 10, 20, 30, or even more turns may be thrown out and there are no more than 9 turns connected at the start.

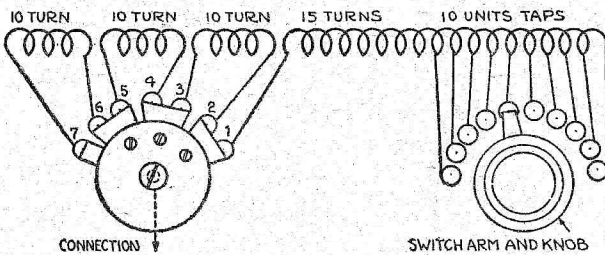
When the long arm, for example, is on point 1 any number of turns may be brought in from 15 to 24 turns in the circuit and at the same time the other 30 turns are not in the circuit at all.—Geo. A. Selzo, Worcester, Mass.

Use of Spaghetti Tubing

Where the wiring of a set is close and complicated, spaghetti tubing should be used to cover each wire. Spaghetti or English tubing is made of varnished cambric and can be obtained in a variety of colors. Some fans prefer using thin rubber tubing instead of the spaghetti. The live rubber tubing is no doubt a better insulator, but spaghetti is more popular because it is cheaper and looks much better.

The variety of colors in which spaghetti can be procured is another great

DIAGRAM OF CONNECTIONS



advantage. By using a different color for each circuit, such as red for the battery circuit, yellow for the primary or aerial circuit, green for the secondary circuit, etc., the wiring will have a neat appearance and the subsequent tracing of finished wiring will be an easy matter.

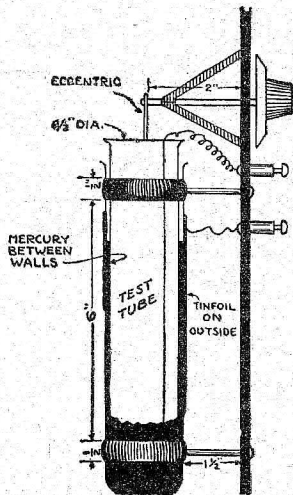
Test Tube Condenser

A variable condenser which works well can be easily made from two test tubes and some mercury. The tubes should be of such sizes that one will slip easily inside of the other. Mount them in an upright position with clamps and coat the outer tube with tinfoil. Pour mercury in the largest tube to a depth of about 1 1/2 inches and place a cork or stopper over the inner one. Paste a piece of felt on the inside of the outer tube so as to provide a guide for the smaller tube and to prevent it from touching the outer sides. Mount an eccentric on a shaft and make it of such a size that when the dial is set at maximum the mercury just reaches the felt guide. Connection with

a piece of 1/8-inch oak or hard pine to the size of a silver dollar and mounting the shaft about 1/4-inch from the edge. The tube supports are made from scraps of sheet brass and the supports of the shaft are made of oak. Care must be taken to mount the foil close to the wall of the outer tube as the capacity depends upon the distance between the conductors as well as the glass. The thinner the tubes the higher the capacity. Two such condensers may be mounted with one dial to give a higher capacity with a single control. A piece of thin and narrow oak is placed over the inner tubes and one eccentric forces the tubes down from the center of the wood. The mercury brings the tubes back when released by the eccentric.—Loren C. Hurd, Northfield, Minn.

Some Causes of Interference

Interference in a Radio set is often due to the action of a simple electric device in the home. A toy electrical train may become a miniature transformer of Radio waves, a defect in an arc light or in an electric power transformer, such as is found on many electric poles, X-ray machines, passing trolley cars, motors in factories, vacuum cleaners and other electrical devices cause interference, although fortunately these disturbances mostly are limited to a very small radius.



the inner conductor may be made by passing a piece of number 28 bare copper wire through the felt to the bottom of the tube.

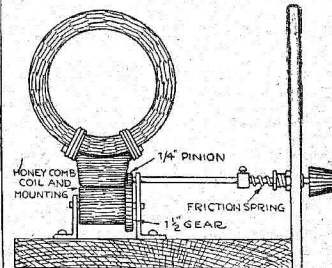
The eccentric is easily made by cutting

Gear Attachment for Vernier Drive on Coil

The accompanying illustration shows a vernier tuning device I am using on my fivelling set. I find with this arrangement that much more satisfactory results can be obtained from this set from the standpoint of volume and steadiness of the set. The hand capacity effect on the coils is entirely eliminated with this arrangement, and the shortest possible leads can be had.

In referring to the sketch, the shaft that extends through the coil mounting is of fiber, which makes the gear and knob insulated from the circuit. A friction spring is used to hold the coil in any position that it is set. I use the gearing arrangement on the tickler coil in order to make the well-known grid circuit as short as is possible. The tickler coil has pigtail connections.

This arrangement can also be used to



make the coils work like scissors by putting the large gear shaft through the width of the mounting instead of the length of the mounting as shown.—Arthur J. Myers, Davenport, Iowa.

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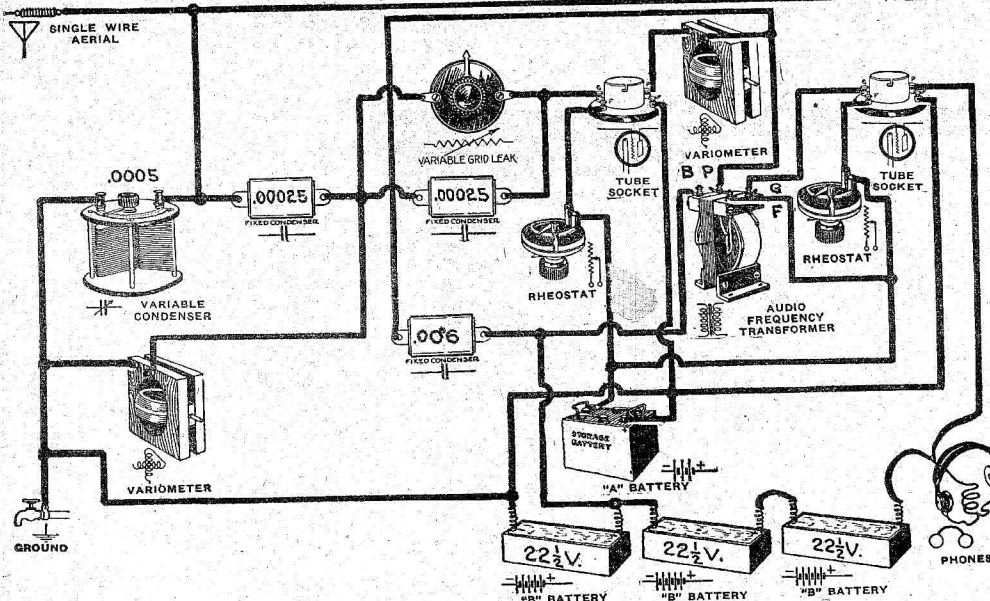
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REAL DX RECEPTION ON A TWO TUBE CIRCUIT



YES, sir: here's a long distance circuit with two tubes. This gives you a chance to make use of that loud speaker once in a while. Two variometers—no, they are not split this time—one good variable condenser, a variable grid leak, a good audio transformer, some fixed condensers and the usual assortment of necessities.

One of our fan friends sent it in to us; his firm name is Tonkawa Plumbing Co., of Tonkawa, Oklahoma. The whole staff got together and worked it out to their satisfaction. Now they pass it on to you. They frankly state it's an improvement on the simplex diagram given in the December, 1, 1923, issue of Radio Digest. Not only do they get coast to coast

stations, but they find it easy to tune and very selective, with plenty of volume. UV-199 and C-299 tubes can be used, but then 45 volts will be necessary on the detector stage instead of the 22 1/2 shown in the illustration. The circuit does not resemble any of our standard circuits, so it will give you something new to play with.

The Reader's View

Results with Wave Trap

As a regular reader of the Radio Digest I noticed in the issue of January 19, 1924, an interesting article on wave traps. Being a DX hound, I have been experimenting with various wave traps for the last two months, trying ten different hook-ups. I have found Figure 3 in the Radio Digest of that date the best. By using a hook-up similar to Figure 2, I have tuned through WDAF on their Nighthawk Frolics and received KHJ and KGW on one tube.

At present I am using a hook-up similar

to that of Figure 3. On a 3-inch tube, using number 24 dcc. wire, wind 40 turns and connect the ends to a 23-plate variable condenser; then cover the coil with wax paper. Over the wax paper wind 10 turns of number 24 dcc. wire. Connect

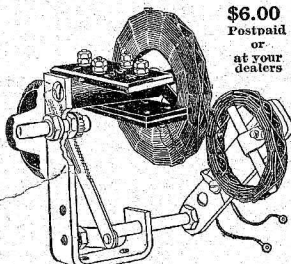
one end to aerial and the other to the set. With this hook-up I have tuned through WHB and received as high as 50 stations in one evening. On Tuesday evening, January 14, while WHB was on the air,

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 Branston Kit No. R. 100 Complete \$36.50
 Contains—7 Intermediate R. F. Transformers, each.....\$6.50
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HETERODYNE Pfanstiehl Oscillator

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It corrects the usual cause of failure by adjusting the strength of the oscillations to that of the incoming signal.

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The new 1924 Model F Per Pair Complete \$6.50
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"Red-Heads" sent prepaid on receipt of price if you are unable to get them at your dealer's.

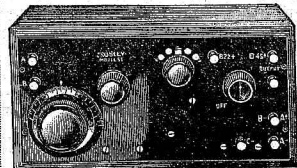
THE NEWMAN-STERN COMPANY
 Dept. R. D., Newman-Stern Bldg., Cleveland

I tuned in WKAQ at San Juan, Porto Rico. This is over 2,000 miles, straight air line measure. Success of a wave trap depends upon the quality of the variable condenser. Always use a low loss condenser, for good results.—S. Lebrecht, Kansas City, Mo.

Use Test Board First

Radio amateurs, when deciding what type of set they wish to build, should never begin by mounting the parts on a handsomely grained panel or installing them in a beautifully grained finished cabinet. Get a plain wooden board and lay out the parts afterward following the diagram as closely as possible as to the arrangements of the assembly of the parts.

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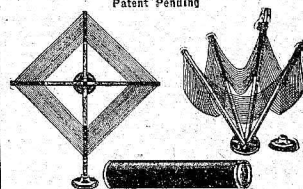
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A Good Portable Receiving Set for Travelers

Carry Radio with You on Your Tours

By Edward Thomas Jones

THE portable set is undoubtedly gaining widespread favor among Radio enthusiasts, and a considerable number of these sets are being built. The satisfaction and added pleasure in owning a portable Radio receiving set is only known to those who are fortunate enough to own one.

The convenience with which the entire outfit can be carried about from place to place is another feature well worth considering. You say to one of your friends, "You ought to hear my set work." Why not carry it over to his house and demonstrate the remarkable ability of the set to pick up concerts from the powerful distant broadcasting stations. That is only possible with the portable set.

To appreciate that feeling which only comes to the owners of such types of receiving equipment, it is necessary to build one yourself. No matter where you carry it, you can look on it proudly and say, "I built it," and that means a lot; especially when you have succeeded in building a portable like the one shown in the photograph.

Homemade Except Parts

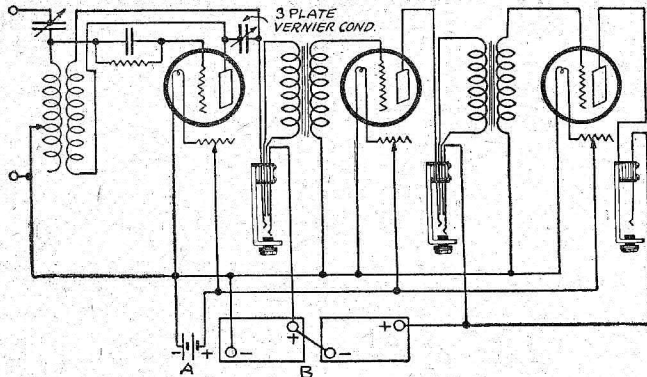
This set was built by one of the happiest Radio men in the city of New Orleans, Mr. W. J. Geary. Although new in the Radio field, Mr. Geary is gifted with the knack of welding tools in a very artistic fashion, as you will note from the perfect workmanship throughout. Not only that, but he also carries the stuff required to push planes through pine knots—note the right and left hooks.

Cabinet Dimensions

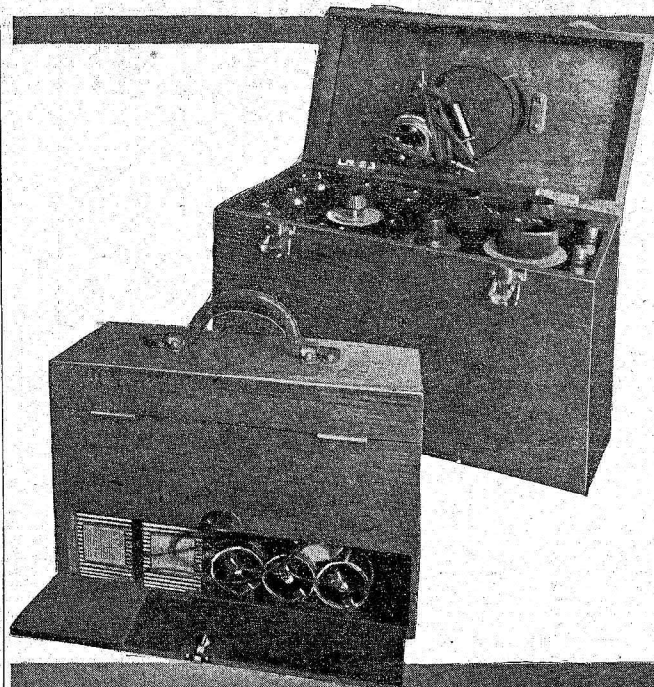
The cabinet in which the instruments are installed measures 16 inches long, 8 inches wide by 14 inches high. Three-eighths-inch oak is used throughout. The cabinet and cover are in natural color and finished dull by applying wax to the wood. Complete, with batteries, tubes, etc., the entire outfit weighs 32 pounds.

The set consists of a single-circuit receiver with detector and two stages of audio frequency amplification, jacks being provided in order to permit plugging in on the detector, one stage or two stages of amplification.

For those interested in reproducing the set described, the diagram, Figure 1, and the list of parts used will prove of value.



The arrangement of the apparatus in the cabinet is clearly shown in the photograph. The tops of the detector and amplifier tubes are seen protruding just a trifle out of the bakelite panel. Three holes have been cut in the panel to allow the tubes to be inserted in their respective sockets, which are installed at the right distance below the panel. The three jacks



are mounted to the right of the first tube. The vernier rheostat, employed for delicate adjustment of the detector filament, is mounted in front of two plain rheostats which control the filaments of the ampli-

controls the tickler coil of the variocoupler. The large dial is the latest development in vernier attachments and is employed in adjusting the 3-plate condenser, which is shunted across the tickler coil to a very fine degree of selectivity. This makes it possible to obtain maximum response from distant broadcasting stations without distortion.

The two binding posts at the extreme right of the panel are for the antenna and ground connections.

PARTS REQUIRED

- 1 variocoupler.
- 1 23-plate variable condenser.
- 1 3-plate vernier variable condenser.
- 1 15-point switch.
- 2 amplifying transformers.
- 1 variable grid leak.
- 1 .002 fixed condenser.
- 3 phone jacks.
- 3 tube sockets.
- 2 plain rheostats.
- 1 vernier rheostat.
- 3 tubes.
- 6 binding posts.
- 2 22½-volt B batteries.
- 3 dry cells.
- 1 panel, 7½x15¼x¼ inches.
- 1 dial.

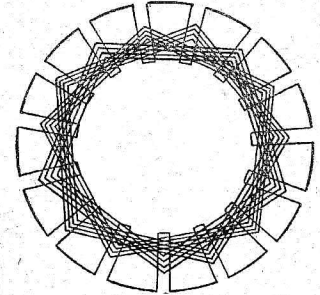
With a one-wire antenna 90 feet long and 30 feet high at both ends, the following broadcasting stations were intercepted and their concerts enjoyed on many occasions: WEAJ, KSD, WBAJ, WQAW, WMC,

WSY, WTK, KDW, WSB, WDAJ, KYW, WQX, KDKA, WOC, WJAM, WOS, WDAK, WAAJ, WHAS, WCAJ, WGV, WDAT, WDAN, WWJ, WDAF, WGAT, WJX, WEAM, WGY, WJAX, WCCB, WHAB, WFAA, WGM, FWX, WJAD, WKAF, WLAJ, WGAJ, WFAL, WBL, WLGA, WLW, WBAJ.

Mr. Geary uses the headphones most of the time, as it is not very practical to carry about a loud speaker of any type. If a loud speaker is desired, provision should be made for it in the cabinet.

Winding Spider Web Coils

I procured several fiber disks with fifteen spokes all 4 inches in diameter. When winding in the usual spider web manner I found that 50 turns of wire could not be run on them. In order to overcome this difficulty I first wound on a five sided figure or pentagon. This left two slots free. I wound on 18 or 20 turns then skipped to one of the vacant slots and wound on another five sided figure. After 18 turns I skipped to the other



vacant slot and wound on turns as before. This makes a very neat looking coil and about twice as many turns can be wound on the same form. When finished the coils will look like a fifteen point star. This system of winding can be adapted to any form having any number of spokes.—Fred W. Wallace, Rochester, N. Y.

Lambert's Reach-Out Crystals

The kind I use on my famous DX Crystal Sets that reach out and bring in concerts

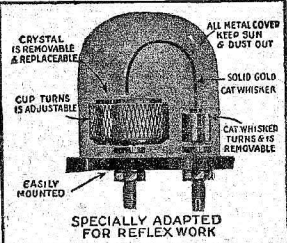
400 to 1000 Miles Away

Mounted 50c each, two for \$1.00. Unmounted 40c each, three for \$1.00. Fixed detector, \$1.50. Mailed post-paid the day I get your order.

Leon Lambert

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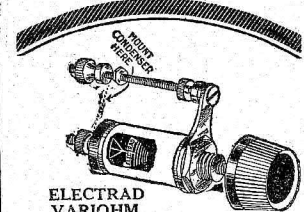
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Note the solder terminal and contact are made in one piece and so shaped that when the contact arm swings from one to the next, there is a slight click, which indicates a contact is made. An exclusive Carter feature.



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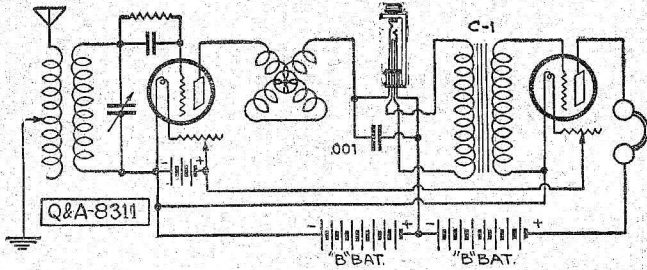
ELECTRAD VARIOHM

Doubles Your Distance Eliminates Circuit Noises

Correct grid resistance for your tubes and set. From ¼ to 30 Megohms by simply turning the knob. Once set, stays permanently. Moisture proof and non-microphonic. Can be used with any standard fixed condenser.

Price 75c; mounted, \$1.00. At your dealers, or direct. Absolutely guaranteed.
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Questions and Answers



One Stage Audio.

(05311) AAS, St. Louis, Mo.

I am enclosing a hook-up which may interest some of your readers. I have had especially good results, in fact, I have your Miloplex and also a single-tube reflex set but this has them beat in my estimation, both in distance and clearness. I have picked up KFI, KHJ, WDAF, WQTA, KYW, WJAP, WJZ, WCAE, WCAL, WDAF, WOO, WEAS, WJZ, WLIV, WDAW, WTAM, and lots of other stations of lesser importance. I use a UV-200 detector, a skeleton-wound variocoupler with primary tapped at every seventh turn. A 23-plate variable condenser with vernier, a Freshman .00025 grid condenser with variable leak.

Best results are found on stations of 400 meters or over. I use very little filament current, with the plate voltage at about 16 or 18 volts and on stations less than 400 meters, more filament current and 22½ volts on the plate. I have tuned down as low as 226 meters. There is practically no body capacity effect in tuning.

I wish to add another tube to this set and would leave it to your good judgment as to Radio or audio frequency, and also want to use a variometer in the plate circuit. If you would be so kind to publish this addition to my circuit I would be very much obliged to you and you may also publish the hook-up if you think it would be of any benefit to your many readers. This hook-up may be used with or without ground.

A.—We are herewith enclosing a sketch of circuit conforming to your specifications for addition to that of your submitted sketch.

Conventional Regenerative Set

(4874) CBH, Smith Falls, Ont., Canada. I have been an interested reader of your paper since becoming "involved" in the building and operating of a set some months ago, and have received a great deal of good advice from your columns. I am therefore coming to you now for advice on some points still bothering me.

My set is the conventional regenerative one, three honeycomb coil arrangement. The set is in two units, one comprising tuner and detector, the other a two-step amplifier. The coils are in a standard mount, with secondary fixed, and primary and tickler variable in their relation to secondary.

Why should set not work efficiently on stations using 430 meters or over? If different arrangement of coil values is recommended, what sizes would you suggest? Is a larger condenser needed across secondary?

Is there any advantage in putting the

PATENTS procured. Send sketch or model today for examination, prompt report and no charge for preliminary advice. Write for free Booklet and blank form on which to disclose your idea. Highest references. Promptness assured. Clarence A. O'Brien, Registered Patent Lawyer, 210 C Security Bank Building, Directly across the street from Patent Office, Washington, D. C.

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PARTS \$71.50

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FORBES RADIO CO.

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3000 mile

RADIO "B" BATTERIES
At Factory Prices
Greatest Radio "B" battery on market. Full number voltage lines.
QUALITY GUARANTEED—LOWEST PRICES; brings in concert LOUDER AND STRONGER; will work on any tube or loud speaker. Order by number TODAY with check, money order or pay postman C. O. D.
No. 3218—2½ volt, variable, regularly \$2.25 **\$1.55**
No. 3217—2½ volt, variable, regularly \$2.25 **\$1.82**
No. 3216—2½ volt, variable, regularly \$2.25 **\$1.82**

grid leak direct from grid lead to filament circuit instead of across grid condenser? I notice diagrams show it both ways, but none give a reason for the varied arrangement.

Diagrams of detector unit alone almost invariably show fixed condenser across phones, as I have it, diagrams of detector-two-step built in one complete unit omit this, but sometimes show one across phone outlet after the amplifiers. Which is correct, or what are the advantages of each position over the other?

Primary condenser apparently plays unimportant part in tuning; all my receiving is done at either 50 (plates half in) or 100 (plates out) on this condenser, and it seldom makes any difference moving them from these positions after picking up the station on the secondary condenser; only two or three in my list require any other position, and very occasionally it helps to shift a few degrees one way or the other. This is not true, come in at the 50 position cannot be picked up at 100, and vice versa; on the other hand three or four of the powerful ones can be received nicely on any position of the primary condenser up to 100; the question naturally arises, just what is the function of this condenser?

My secondary condenser is very fine vernier, with 180-degree graduated scale; in turning it to pick up stations at random, sometimes I get the whistle first, which is then tuned into music by varying the coupling between primary and secondary coils, alternately with the regeneration coupling between secondary and tickler; this is the general procedure; on the other hand frequently the turning of the secondary condenser dial will bring in the music or speech clear and distinct with no warning whistle or other wave signal to indicate anything being picked up, and this may occur with both couplings left as tight as possible; i. e., none of increasing the regeneration or coupling. I should be glad to know the reason for this, for it is evident the tickler is away inside the point of oscillation, and yet there is no evidence either of re-radiation to bother the neighbors, or of internal noises created by oscillation.

Regeneration; sometimes when station is picked up on the carrier wave, and has to be tuned down to clear signals, by varying the two couplings, it is noticed that decreasing the tickler coupling, to tune out the oscillation, or spilling, leads across a point where the signals cease

with an abrupt click in the phones, just as though the circuit had been cut somewhere with pliers, and to get it again the coupling has to be closed in away beyond the point at which the regeneration apparently begins, before the oscillation commencing with a crash, instead of a gradual increase. If the tickler is moved out of reach so to speak, off the secondary, should the set not function as a simple two-circuit non-regenerative one, just as though the tickler coil were not there at all? And why this sudden behavior of the oscillations? Sometimes it is not possible to get the station clearly at all; it can be heard loudly through the spilling, but not clearly, and of course the spilling has to be eliminated for the sake of others operating nearby. Does the best point of reception, that is, the point just below the spilling point, vary with different stations, when the filament rheostat is left stationary? That is, on the same evening reception is being received. I notice it varies from night to night for the same station, but put that down to different atmospheric conditions.

Is there any book on the market which explains in simple language suitable for a complete novice, how to tune a set of this description; not in general terms, but with details of how and why for each control;—primary condenser, secondary condenser, coupling, regeneration, and filament rheostat. I do not include variable leak under this head, as I presume it is left stationary, how to tune a set of this used, after the point of best reception has been determined.

I recently read in answer to an inquiry that Radio frequency amplification could be applied to a standard regenerative set, by an arrangement of tuning coil, transformer and tube, so that the output from the tube could be connected to the antenna and ground posts of the set; can you advise me whether this applies to the honeycomb set, or the variocoupler-variometer regenerative set only; it was not stated in the article I saw. Also can you tell me whether there is any firm, of standing such that its name on the instrument would guarantee the quality, who makes Radio frequency amplifying units, one or two stage, which can be connected in front of a set such as the one under discussion. In your issue of the 11th inst, there is an advertisement of Amrad amplifying units, "either audio or Radio," not advertised by the Amrad people themselves, but by a jobber, which leads me to make this inquiry, considering the difficulty apparently in handling Radio frequency, it occurred to me that while the very amateur would not hesitate to build his own audio amplifier, as I have done, he would much prefer to buy the Radio amplifier if it were available and built by known firms, and stick it out in front as desired.

A.—Inability to accomplish higher wave lengths is due to size of coils. For stations using four hundred and ninety meters and over it will be necessary to use coils of 50, 75 and 100 turns for primary, secondary and tickler respectively.

The advantage in putting grid leak direct from grid lead to filament circuit is

5-TUBE COCKADAY

A four circuit receiver that is the real set for distance. Ask the old timer.
Complete Parts \$49.65
All genuine standard parts furnished. Everything in Radio. Write for circulars.
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FOR RADIO TROUBLES

This book, 12 chapters, 13,000 words, devoted entirely to the elimination of radio troubles, is yours for only fifty cents, postpaid.

"The Radio Trouble Shooter"
Of the press March 15, 1924. A plain, practical, useful book you need if by circumstances you are obliged to keep your own receiver in working order. Applies to any type of receiver.

It will be your expert assistant; always at your elbow to remind you of the simple things you have overlooked. It's test systems, trouble tree, hints for efficiency, advice for prevention of trouble, explanation of noises and what they indicate, are designed to help you put your finger on the source of trouble and thus purify and strengthen reception and get stations you lost before in the hubbub of parasitic noise. Complete instructions for the care of batteries.

The range of your vacuum tube, without circuit noises and interference, is practically unlimited. Resonance troubles are attacked by receivers absolutely silent in operation, while needless noises only rack your nerves.

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so slight as to be negligible. It may be placed in position most convenient.

A phone condenser should be connected across the output of the detector tube in any case (meaning when detector only is used across terminals; when amplifier is used, across primary of first audio frequency transformer). None is needed in the amplifier circuit as the phone condenser of detector circuit by-passes any Radio frequency current that would otherwise enter amplifier circuit.

The primary circuit of a three-circuit tuner is very broadly tuned, consequently the primary condenser does not tune at all sharply. Its purpose is to tune primary circuit to somewhere near the wave length desired.

From action in operation as described your circuit seems to be functioning normally. However, tuning is not a matter of simply turning dials and you are not proceeding in a manner contributing to the best results. Tuning is an art and not possible to transmit without a personal operation of circuit. An understanding of what is taking place is essential and we are recommending that you pursue the subject underlying the operation of tubes and regenerative tuners. The whistle, as you term it, is the carrier wave and can be heard only when circuit is oscillating. When you tune with secondary condenser, without set oscillating, naturally no carrier wave is heard.

Condition of oscillation encountered is in all probability due to the characteristics of detector tube. Occasionally it becomes necessary to use a variable grid leak to secure such control of grid voltage as to permit gradual increase of regeneration, rather than a sudden spilling over. This point varies with wave length, and as very few stations are on identical wave lengths, it might be said that it varies with the station received.

The addition of Radio frequency amplification to your present circuit would prove of surprisingly small advantage. However, it can be added if desired. A number of manufacturers make Radio frequency units.

We are referring you to the Book Department of Radio Digest in the matter of a text book to cover the principals you are desirous of studying.

Miloplex Amplification

(05971) HB, Wautoma, Wis. I cannot distinguish between the primary and secondary of the audio transformers in your hook-up of the Miloplex amplifier; please explain.

A.—As always, the secondary circuit is connected to the grid and filament of succeeding tube, the primary to the plate and positive B battery of preceding tube in amplifier.

NOISE KILLER
Kills Noise in Radio Sets!
Can also be operated to put expression in musical numbers, to modulate tones of human voice and to secure natural tonal quality without distortion.
Price \$17.00, PAID
Inter-State Signal Company
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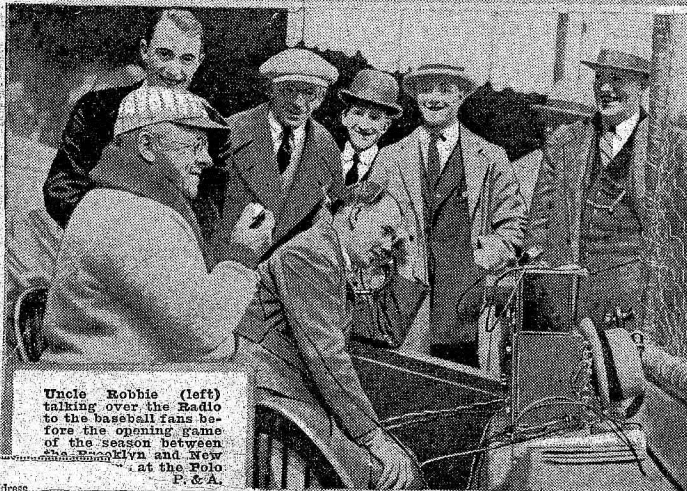
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Postpaid. Use your headset for two purposes—exceptional combination value—every pair of phones tested.
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1500 Miles for \$9.75
Ben Franklin Air Key, Single Tube Knockdown Set. \$9.75
This outfit consists of the following material, packed in an individual carton, necessary to build the famous Ben Franklin Air Key Triple Circuit Set:
1 Ben Franklin Air Key Coupler
1 Pausin 23-Plate Condenser
1 7x12 Hard Rubber Panel
1 Rheostat, 1 V. F. Section
2 3-inch Dials, 1 Mica .0025 Condenser
1 Grid Leak, 1 Lengths Bus Bar
2 Marked Binding Posts, 1 Phone Condenser.
1 Wiring Diagram
These parts will build the famous Ben Franklin Triple Circuit Non-radiating Set; has a receiving range of 1,500 miles.
Ben Franklin Air Key, 3 \$19.75
Tube Knockdown Set. \$19.75
This outfit consists of the same material as the 1 tube set with the addition of 3 audio transformers, 1 1x3 panel, 2 extra couplers, 2 extra busbars, 3 jacks. Will bring in distance on Loud Speaker.
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MANHATTAN RADIO CO.
112 Trinity Place New York City

Radio Illustrated



It is known that some animals enjoy music as much as some human beings. Here we have the faithful steed of Marcella Swanson, popular musical comedy star, listening in and seemingly enjoying the concert received over his mistress' Radio. The photo was taken on the beach at Atlantic City. Atlantic Photo



Uncle Robbie (left) talking over the Radio to the baseball fans before the opening game of the season between the Brooklyn and New York Yankees at the Polo Grounds, N. Y. P. & A.

Address.....



This Orang-Utan at the Bronx Zoo in New York is attempting to talk to the folks back home over the Radio. P. & A.

WIGAN