

Radio Digest

EVERY WEEK

Illustrated

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SATURDAY, FEBRUARY 16, 1924

No. 6

RADIO TO BE TEACHER



GET FULL CREDITS FOR AIR STUDIES

Kansas Aggie Gives Regular Recognition in Radio Farm Course

MILFORD, KANS.—Station KFKB, the Brinkley Jones Hospital here, is broadcasting an agricultural extension course by direct wire from Kansas State Agricultural College, Manhattan, Kans. The feature is an innovation in broadcasting for full college credits will be given upon satisfactory completion of the course and passing of a written examination. The first announcement of the course reported that Station WTG, Kansas State College, would broadcast the course. This report was in error.

Cecile Arden Makes Appearance

NEWARK, N. J.—A notable feature of a recent program from WOR was the appearance of Cecile Arden, mezzo-soprano and prima donna of the Metropolitan Opera Company. Miss Cecile Arden is a young American artist who has come to the fore through her artistic merit. She has accomplished her vocal and artistic training in America under the instruction of Buzzi-Peccia.

BROADCASTS TO EDUCATE PUPILS, PLAN

Illinois Educators to Act Will Soon Discuss Putting Three R's and Sunday School Lessons on Air

CHICAGO.—Plans said to be ready for discussion in Chicago during the latter two weeks in February by delegates to the annual meeting of the department of superintendence, National Education association, and the executive committee of the International Sunday School Council of Education, each of which directs the instruction of millions of persons, are likely, it is said, to make, through Radio, the people of the United States a nation

At the left, dainty Maidie Dantzer, lyric soprano, who recently charmed WHN listeners with her sweet voice. Directly below, Virginia Howell—not unknown to Radiophans, for she entertained them not long ago from WOR—whose darksome beauty peculiarly fits her for portraying passionate daughters of hotter climes, in which, indeed, she delights.



The fairy godmothers were good indeed to this winsome young lady—Gloria Marshall, a weekly feature of WHN's programs and recently heard from WJAX and other eastern stations—for she is not only a writer and composer of popular ballads and other music but is also gifted with a coloratura voice of rare beauty.

radiant with temporal and spiritual knowledge.

Each of the organizations, the most powerful and comprehensive of their kind, is to consider, it was said, the practicability of the electromagnetic wave in relation to broadcasting the three R's and higher subjects, and the New and Old Testaments, to the people throughout the land. "The department of superintendence meets in Chicago during the week of February 24," said Dr. William B. Owen, principal of Chicago Normal college. "I shall urge that the national association begin at once thorough investigation as to

(Continued on page 2)

Broadcasters Release New Song 'Bout Lovin' Enough

CHICAGO.—Another ballad whose burden evidently was built on the blasted affections as aired in divorce courts was released here a few days ago by the National Association of Broadcasters. The song, the name of which was "If You Want to Get All the Lovin' I Got, You've Got to Save All Yours for me," was composed by Grace Ingram of the Harmony Girls, widely known to Radiophans, and George Hill.

"How to Dance" Is New Course Offered by WGY

Arthur Murray Tells How to Step the Fancy Ones

SCHENECTADY, N. Y.—If you want to learn to dance, or knowing how to dance, wish to learn a few new steps, tune your set to Station WGY Tuesday evening. The course began January 29. Arthur Murray of New York, nationally known dance master, will personally tell you how to do the modern dances.

Seated at the microphone he will explain in slow, distinct words the correct steps of the correct dances, outlining the figures so that you, in the privacy of your home free from the embarrassing presence of others, may follow his instruction. His description will be supplemented by music and if you stumble a bit don't let it worry you for there is no one around to laugh at your mistakes.

Mr. Murray is giving a series of six lessons. The talks have been carefully prepared and charts for the steps will be found in the recent back numbers of Radio Digest.

WJAX AERIAL TO BE SWUNG 375 FEET UP

CLEVELAND.—WJAX, station of the Union Trust Company here, will shortly move into its new location on the twentieth floor of the new Union Trust Building, the second largest bank and office building of its kind in the world. The antenna will be swung between its towers at a height of 375 feet above street level.

WEATHER BUREAU AT SEA, NEW PLAN

SHIPS TO RADIO REPORTS TO FLOATING STATIONS

Great Value Seen in Ether Wave Service as Advanced by Ship Board

WASHINGTON.—A plan to establish at least three sea-going weather bureaus in the North Atlantic depends upon whether a congressional appropriation of about \$30,000 is forthcoming. This departure is based on the results achieved by the French meteorological ship Jacques Cartier, now on a Pacific cruise. Details of the scheme were worked out by the United States shipping board and the weather bureau but money for the marine forecasters is needed.

The shipping board is to furnish quarters, subsistence and radio facilities for two men on three of its trans-Atlantic vessels. The weather bureau will furnish and pay the skilled observers. A minimum estimate for a year's salaries is placed at \$30,000. It is understood that Congress will be asked to make such an appropriation.

Ships Floating Bureaus

If the plans carry through, three government vessels will become floating weather bureaus where data received by radio from other vessels on the North Atlantic will be compiled, and forecasts broadcast periodically, as the work done in branch offices ashore. Such a service, it is said, will be of great value to ships at sea, seaports and coastal regions.

The weather bureau and the shipping board have been in co-operation for some time on marine meteorological reports. One new feature, just accomplished, is the scheme for all governmental vessels at sea to report as to the weather twice daily to the weather bureau.

Masters of 300 Vessels Report

The masters of more than 300 shipping board vessels recently began taking weather observations twice daily. This co-operation on the part of the meteorological service and the shipping board will mean much to the weather forecasters ashore, as it will insure numerous regular reports from ships at sea in various localities.

Orders to the masters of the shipping board fleet are to the effect that weather observations be taken daily at 7 a. m. and 7 p. m., 75th meridian time, and sent to the nearest naval radio station as soon as possible, whenever the vessels are more than 100 miles at sea. Off the South Atlantic coast, when there are indications of hurricanes, observations are to be reported regardless of the distance off shore.

Messages Handled Free

The shipping board and the navy department have agreed to handle such messages free. The observations will consist of direction and force of wind, state of weather, barometric pressure and pressure changes in past two hours, and notes on unusual conditions, such as signs of hurricanes or storms.

Ships in the North Atlantic, Gulf of Mexico and Caribbean sea will transmit directly or through relays to the government observer, Washington. In the North Pacific, they will transmit to the government observer, San Francisco.

RADIO TO BE TEACHER

(Continued from page 1)

whether Radio can be used to teach the children in the schools.

Radio Soon in Schools, Leader Says

"The work that could thus be accomplished would be almost incredible. There is no question that radio will in the near future be one of the most important factors in the educational system of this country. The sooner the National Education association starts the radio survey and applies its conclusions, the better." (The National Education association includes almost every school teacher in the United States.)

Executives of the Sunday school organization, whose members, it was said, number about 20,000,000, are to discuss the availability of radio during their annual meeting here this month. "The utilization of radio was discussed informally a few weeks ago," said Dr. Hugh S. Magill, general secretary, headquarters Chicago. "It will doubtless be brought before the executive committee for discussion. It seems to be the general opinion that radio could be used to great advantage in the Biblical education of children and of adults."

The people of Illinois perhaps are foremost, it is said, in their attitude as to the use of radio not only in the public but in Sunday schools. Impetus was given an inclination to investigate the feasibility of radio as an educational instructor by the motion of R. L. Sandwick, principal of a township high school in Highland Park, Ill., suburb of Chicago, during the recent annual meeting in Springfield of the Illinois State Teachers' association. Sandwick proposed that a broadcasting plant in Chicago be employed to place on the air during a certain school period

the addresses or other utterances of personages who may be in this city.

Sees Schools and Parents Nearer

"My plan was and is twofold," Sandwick said. "Radio could be used, I am quite sure, to bring words of wisdom and amusement to the hundreds of thousands of children in the public schools of Illinois; it could be used, too, to acquaint their parents and other taxpayers with what the schools are doing for the children." That radio could be applied to the education of children who, because of illness or other disability, may be unable to go to school, was suggested by Sandwick. "When the words of our leading men and women are brought directly to our children," said he, "when the opinions of president, governor, mayors, eminent preachers and lawyers, when the works of great musicians are carried vocally to the children in the high schools, the resultant educational values will be extremely large."

The application of radio as urged by Sandwick was to have been discussed in detail at the recent meeting in Bloomington, Ill. (Normal, Ill., a suburb), by members of the executive committee of the state teachers' association. Radio will also be an important phase of the program of superintendents in the association during a meeting this month in Bloomington.

O. L. Manchester of Bloomington is president of the Illinois State Teachers' association, which numbers about 30,000. The sum of \$10,000 has been appropriated by the association for the establishment of headquarters whose duties will be in part to investigate the practicability of radio as an educational factor.

Many of the public schools of Illinois already are equipped with receiving sets. (Recent research showed, too, that most

of the pupils owned sets.) Schools not fitted with radio receiving sets or unable financially to acquire them may, according to a proposed plan, buy them by means of funds raised through public entertainments, fairs or the like.

Illinois Sunday Schools Favor Plan

Sunday schools in Illinois, whose enrollment, according to G. N. Burnie, general secretary of the state association, headquarters Chicago, is about 1,000,000 children and adults, are likely soon to adopt radio in a manner similar to that proposed for the public schools. "The executive committee of the state association will undoubtedly act definitely this month as to the use of radio to carry religious instruction," Mr. Burnie said. "The state association debated the feasibility of radio a few weeks ago as the result of a growing demand for such an instrument of information."

There are about 6,000 Sunday schools in Illinois, according to Burnie. If the plan of the association is put into practice a broadcasting station in Chicago may be retained to place on the air every Sunday, and perhaps one evening in the week, lessons pertaining to the Bible and allied subjects.

If the vision of public and Sunday schools is fulfilled little Johnnie and Maggie may soon hear, say on Monday mornings after recess, the voice of a great singer or of a political pundit. And as Johnnie and Maggie, millions of 'em, cock their heads to listen, they will heed. Their teachers say so. Even so will it be with John and Margaret, well garbed and grave, as the voice of a famed minister or evangelist comes to them through the air, beseeching them to harken to the Good Word and to the call of the Spirit.

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Looking Ahead

Constructional Details for a Reflex Neutrodyne Set by H. J. Marx to begin next issue. The whole outfit, four tubes, is mounted on a panel measuring but 9 by 14 inches.

Amplifying the "Wizard," According to the **Mystery Man**, will give you "plenty" volume. See how to build the amplifier next week.

How's Your Wave Trap? More descriptions of manufactured wave filters will appear next week.

Another Fine Article on Trouble Finding and Operating Standard Receiving Sets will be given in the February 23 issue. A great help for the non-technical fan, aren't they?

Program Information Galore—When you think of broadcast programs, think of Radio Digest. All of the important stations give their programs a week in advance every issue of "The National Broadcast Authority."

Dry Cells Will Go "Dead," but how is the average Radiophan to know, especially when they're in the plate circuits? Read what M. W. Thompson tells about this next week.

A Four Tube Armstrong Circuit Variation is the "kink" Charles L. Ross of Urbana, Ohio, recommends to fellow fans. Circuit and values will appear next issue.

The Fallacy of Trick Circuits—a series of three articles by Thomas W. Benson to appear soon. Hit or miss selection of hook-ups is wrong, says Mr. Benson. You've read his articles before in Radio Digest.

Newsstands Don't Always Have One Left

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Radio Digest

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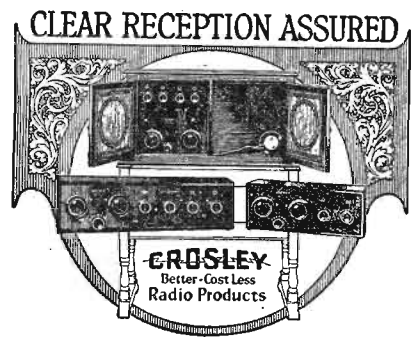
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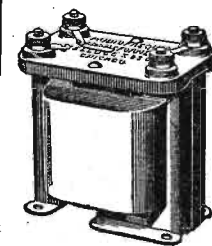
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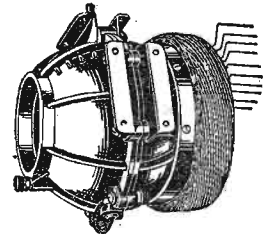
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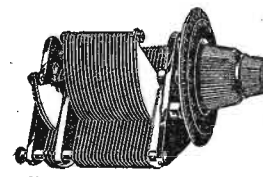
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PICK PLANTS NEAR PERFECT ON WAVES

CAN BE USED TO BRING SETS UP TO SCRATCH

Bureau of Standards Announces Interesting Data on Frequency Research

WASHINGTON, D. C.—If every Radio transmitting station maintained exactly the wave frequency assigned to it, there would be available a standard frequency wave every time any station was in operation. However, at present this is the case only with certain stations, and because it is a matter of difficulty to maintain exactly the assigned frequency, and also because this is of great importance, the Bureau of Standards has been collecting some interesting data on the subject.

As a result of these measurements it is possible to give out information from time to time on stations which maintain a sufficient accuracy to be useful as frequency standards.

Several Plants Nearly Perfect

Several stations, which use special means for maintaining constant frequency, have very nearly attained the goal of remaining within the limits of variation of 0.25 percent of the assigned kilocycles frequency, as recommended by the Second National Radio Conference.

At this time it is possible to give data on the following stations, the transmissions from which may be used in standardizing wavemeters and other apparatus, by the methods given in Bureau of Standards letter circular 92, "Radio Signals of Standard Frequency, and their Utilization." Data on other stations will be issued from time to time as the work progresses.

Stations with Low Variance

Sta. Call Signal and Location—	Assigned Frequency Kilocycles	Number of Times Measured	Greatest Deviation	Average Deviation
WQL—Coram Hill, L. I., New York.....	17.13	16	1.2%	0.3%
NSS—Annapolis, Md.....	17.48	30	0.5%	0.2%
WQE—Rocky Point, L. I., New York.....	18.21	22	0.4%	0.2%
WQQ—Tuckerton, N. J.....	18.85	36	0.4%	0.1%
WSO—Marion, Mass.....	23.80	36	0.5%	0.2%
WGY—Schenectady, N. Y.....	790	34	0.5%	0.2%
KDKA—Pittsburgh, Pa.....	920	30	0.6%	0.3%

More Standard Broadcasters

Besides broadcasters WGY and KDKA, a more recent announcement includes WWJ, the Detroit News; WCAP, Chesapeake and Potomac Telephone Co., Washington; WOS, State Marketing Bureau, Jefferson City, Mo., and WSB, Atlanta Journal, as reliable stations for calibrating radio sets and apparatus.

These stations have been tested as to accuracy of assigned frequencies transmitted, and found to be sufficiently constant to serve as standards for the setting of receiving apparatus and wavemeters.

Station	Owner	Location	Assigned Frequency Kilocycles	Average Deviation
WWJ	Detroit News	Detroit, Mich.	580	.1%
WCAP	Chesapeake & Potomac Telephone Co.	Washington, D. C.	640	.1%
WOS	Marketing Bureau	Jefferson City, Mo.	680	.0%
WSB	The Atlanta Journal	Atlanta, Ga.	700	.2%
WGY	G. E. Co.	Schenectady, N. Y.	790	.1%
KDKA	Westinghouse	Pittsburgh, Pa.	920	.1%

Inventor Relates Rise from Serbian Herdsboy

Prof. Michael Pupin Makes Radio Debut at WOR

NEWARK, N. J.—Quite the feature of the last Wednesday evening program at WOR was the broadcasting debut of Michael Pupin, professor of electromechanics at an eastern university, once a Serbian herdsboy, who broadcast the highspots of his interesting career, "From Immigrant to Inventor." Professor Pupin was presented to the Radio audience in a

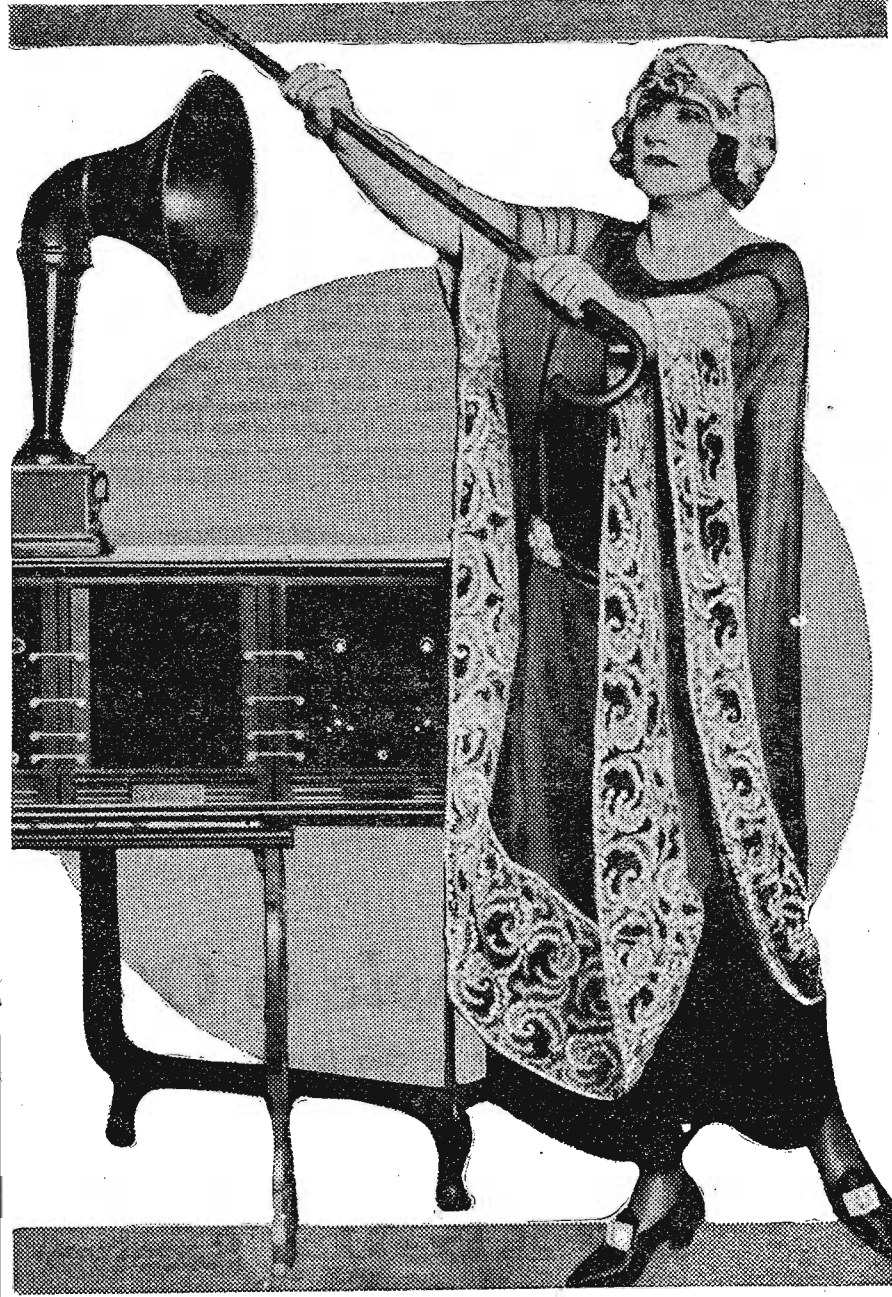
WOC FINDS UNKNOWN FATHER OF DECEASED

DAVENPORT, IA.—Unknown parents of a young man who died in a hospital at Maryville, Tenn., were located a few days ago by Station WOC when it broadcast a description of the deceased furnished by Dr. F. A. Zoller of Maryville. The father of the boy was identified by a WOC listener as L. O. Berg of Rockford, Ill.

HERE'S HOW THEY DO IT AT N.Y. EXCHANGE

NEW YORK.—Jason Westerfield, on Thursday evenings from WEA, describes the workings of the New York Stock Exchange. Frequently more than a million share change of ownership takes place in the course of a single day through trading on the floor. How this occurs is described in the talks.

DIVA EXERCISES TO RADIO



To be or not to be (a star) is a question that involves—for the operatic artist—other considerations than vocal perfection alone. Bodily vigor and suppleness are almost as important. Beautiful and gifted Cyrena Van Gordon realizes this, and so we see her here "tuning up" in the morning by tuning in the Westinghouse Station KYW lessons in physical culture. She is also a Radiophan in the ordinary sense.

short address by Professor Robert Bridges.

The present day Radio development owes much to the genius of Prof. Pupin. It is he who also invented the "Pupin Coil" which enables telephone talks across the continent. He was the first to obtain an X-ray photograph for the uses of surgery in America and is one of America's leading scientists. Although he has done much for Radio for many years, his WOR address was his first public microphone appearance.

2,000 Ask for Morse Code Copies After WOC Lesson

DAVENPORT, Ia.—Deep interest was evinced, it was reported here recently, by listeners in to instructions broadcast Wednesday and Friday evenings by Station WOC, Palmer School of Chiropractic, this city, as to the international or continental Morse code. The station reported that it had received more than 2,000 requests by mail for copies of the printed code.

WLW HAS NEW ONE IN BEAUTY CONTEST

FIRST BROADCAST PULCHRITUDE SHOW FEB. 14

Listeners to Hear Beauties and All About Them—Must Send Votes by Prepaid Telegrams

(See Center Picture, Pages 16-17) CINCINNATI.—Lavish descriptions of feminine pulchritude in close competition will crowd the ether about WLW when at 10 p. m. Central time, on Valentine's night, that illustrious station of the Crosley Radio Corporation here stages the first Radio Beauty Contest ever held in the world.

While King Tut's sarcophagus is still being unchiseled it remains to be seen whether or not Tut had a broadcasting station to shout about the complexion of Cleopatra, but as far as 3,000 years later is concerned, WLW wins the medal of first class originality decorated with four blown 250-watt tubes and a short-circuited counterpoise.

How is a beauty contest to be held without the aid of optics? Easy—

Verbal Descriptions of Beauties

In strange contrast to the beauty contests so familiar to all where the girls appear in person before the judges or where photographs are made the basis of the decisions, the young ladies participating in this first Radio Beauty Contest will be judged by persons living hundreds and perhaps thousands of miles away!

They are to be described from the WLW studio, where they will be, and then each is to say a few words to the vast Radio audience. In this way every auditor will receive a very definite mental picture of just what the girls look like.

How to Vote; Contestants' Names

The exciting feature of the contest will be found in the fact that the voters are to voice their sentiments by telegraph. The telegraph company will have lines direct to the WLW studio and there receive the votes from all over the country. The telegrams are to be prepaid, and every telegram sent should bear the name and address of the sender.

The contestants, picked arbitrarily, are Helen Hamilton, music student; Statira Childress, secretary; Hilda Brooks, advertising; and Mary Costello, millinery fashion girl.

To make it interesting for the girls there will be a special theater party at the Grand Opera House, given by Thurston the Magician. Suitable presents also will be awarded.

MARCOSSON TELLS OF GREAT MEN HE'S MET

"Dean of Interviewers" Talks from WBAP

FORT WORTH, TEX.—Isaac F. Marcossan, famous writer and economist, recently made his first Radio talk from WBAP. He is in Texas, garnering material on the oil industry for a well-known weekly publication.

"The oil 'game' is a misnomer," Marcossan stated, "as it is a great industry and one of the most important in the world today."

Marcossan turned to the subject of great men he has interviewed. "It is easy to interview a great man," he said, "as he always has a vulnerable point in his armor. Once find out what his hobby is, his weak point, talk about that with him and the interview is easy."

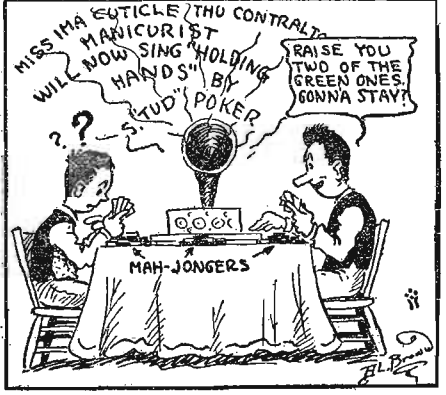
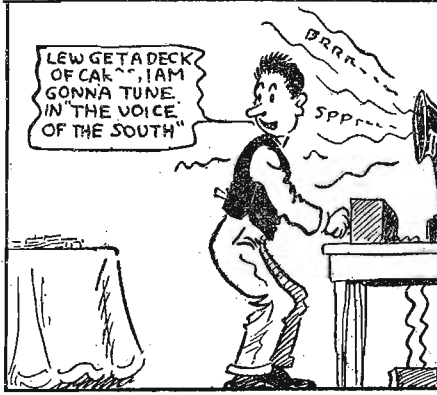
He characterized Lloyd George as the most interesting man in the world today; while Hugo Stinnes was named as the most powerful. Kemal Pasha, the "George Washington" of Turkey, was picked by this "dean of interviewers" as the most sensational success of the world today.

The Lafayette station in France was built by the American Navy Department during the war, but was turned over to the French government in December, 1920.

THE ANTENNA BROTHERS

Spir L. and Lew P.

Suffering Dragons!



COMMERCIAL FIRMS CUT INTERFERENCE

VOLUNTARILY AGREE TO QUIT 450 METERS

Will Use Tube Instead of Spark, Representatives of Big Concerns Decide

NEW YORK.—Radiophans in the East have been bothered since the start of broadcasting by spark interference which a few knowing ones recognized but which was blamed on youthful amateurs by millions of listeners. Then Uncle Sam decided that the amateur-owned transmitters must stay off the air during broadcasting periods and the boys kept quiet.

However, the interference still persisted; the dah-de-dah-de-dah continued to break up soprano solos and syncopated dance music. The complaints were so numerous that Radio Supervisor Batchelor asked the big commercial companies to send representatives to a conference to talk things over.

What Caused the Trouble

For years the traffic between ship and shore stations was carried on at 300, 450 and 600 meters. With the arrival of broadcasting 300 meters was abandoned. Broadcasting was confined to 360 and 400 meters. Then the Department of Commerce extended the broadcasting range to above 500 meters, and interference between broadcasting and the commercial code traffic on 450 and 600 again caused trouble.

One of the chief causes of trouble was the old spark transmitter in which a high voltage transformer caused a crashing blue spark to jump an air gap. To tune it sharply so that it could be heard only on a narrow band of wave lengths was practically impossible; leaving it broadly tuned meant that it could be heard over a range of one hundred meters.

Commercial Companies Co-operate

Since the companies had already begun the replacing of transmitters of the spark type with modern vacuum tube outfits it was decided to rush this work. Although continuous wave or interrupted continuous wave transmission would cause but little interference it was deemed advisable to carry on traffic at higher wave lengths.

The meeting and resolutions were entirely voluntary and unofficial but it is likely that legislation will be made to adopt the rules voluntarily accepted by the commercial companies.

Radio Wire and a Dog Save Fan from Flames

Swings Self and Pet to Safety on "Fire Escape"

DETROIT.—A Radio wire and his dog recently saved the life of Julius Flath at Escanaba, Mich., from death in a fire which destroyed his home with a loss of \$7,000.

The dog awakened Flath, whose wife and children were visiting in Minneapolis, after the fire had gained considerable headway. He found every exit cut off by flames. Taking his dog under his arm he swung himself out on a Radio wire that hung near his window and slid down to safety.

It is apparent Mr. Flath makes substantial outside Radio connections or otherwise would not have escaped so successfully. It might be well for others to follow his example, not necessarily as a means of fire escape but of preventing contact with high voltage electric wires.

Husking Bee Gives Way to Radio Parties on Farm

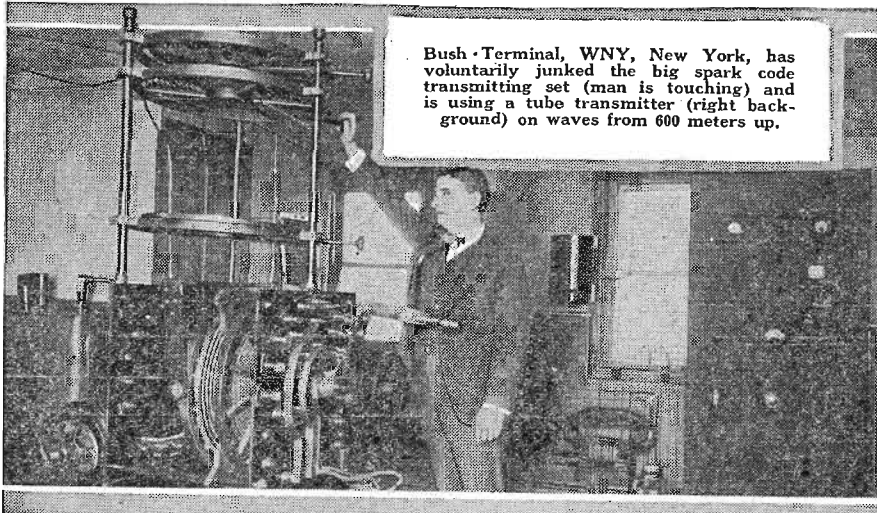
LONDON, OHIO.—The quilting party and husking bee of the nineteenth century has given way to the Radio party of the twentieth century in the homes of Madison county farmers. Instead of the hum of conversation which always accompanied the gathering of neighbors at the farm house in the days gone by, the casual observer now finds a death-like silence among the small groups which gather nightly around the Radio outfit.

In a recent survey made by the United States Department of Agriculture Ohio farmers were found to be among the leaders in Radio activities. The advantage of getting up-to-date market reports and weather charts via the ether route has met with great favor and in addition the high-class musical and entertainment programs have done much to remove the farm home from the isolated position that it once held.

Industrial Adds Transmitters

DETROIT.—The Michigan Alkali company, one of the largest manufacturing concerns here, is increasing its Radio equipment to facilitate handling ship-to-shore communication on the Great Lakes. Seven 1,500-watt sets have been purchased for this work.

BUSH TERMINAL, WNY, REFORMS



Bush Terminal, WNY, New York, has voluntarily junked the big spark code transmitting set (man is touching) and is using a tube transmitter (right background) on waves from 600 meters up.

The Chatham stations of the Radio Corporation of America, WCC and WIM, are now using tube transmitters on 2300, 2200, 735 and 600 meters, far out of range of broadcasting. Bush Terminal, WNY, for months bugbear of Manhattan listeners, is now on good behavior operating on 600, 680 and 2,000 meters with tube transmitters.

Shipowners Radio Service, The Inde-

pendent Wireless Telegraph Company and Tropical Radio Company also agreed to the suggestions made and will do everything possible to eliminate interference by their stations. It is declared by a representative of one of the companies that 75 percent of all ocean-going vessels are now using tubes on 1800 to 2500-meter wave lengths and that therefore broadcast fans should be experiencing little trouble.

LONDON LECTURER TALKS FROM WOR

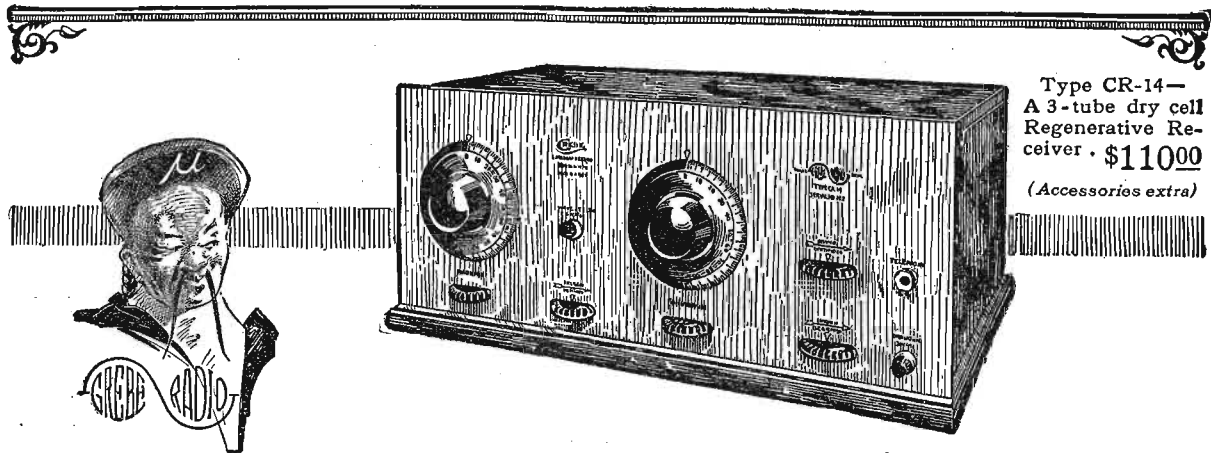
William Montgomery McGovern Tells Adventures on Trip Over Himalayas

NEWARK, N. J.—Dr. William Montgomery McGovern, Ph.D. (Oxon), member of the Royal Geographical and Royal Asiatic Societies and lecturer at the University of London, at present on a tour of the United States, stopped off to broadcast from WOR recently a highly interesting travel talk describing an adventurous trip to Lhasa, over the Himalayan passes, 18,000 feet high.

This trip was made by Dr. McGovern in January, 1923, at which time were taken the only motion pictures ever made in the Forbidden City. Unaided and even hampered by the British authorities, after much suffering and in peril of his life, he penetrated to Lhasa in disguise.

Encounters Countless Difficulties

Hourly vigilant of his every gesture and intonation of the difficult language, Dr. McGovern painfully trudged these cold, barren heights disguised as a Tibetan coolie. His entire body was stained with walnut juice and iodine. The color of his eyes was camouflaged with lemon juice and glue. He nearly lost his life in the snowdrifts. His native companions continually gave trouble. Then, after entering the Forbidden City, he was confined for weeks by the Dalai Lama, the Buddhist Pontiff of Lhasa, in order to protect him from being torn to pieces by the fanatical monks.



Type CR-14—A 3-tube dry cell Regenerative Receiver • \$1100 (Accessories extra)

Very Simple to Operate

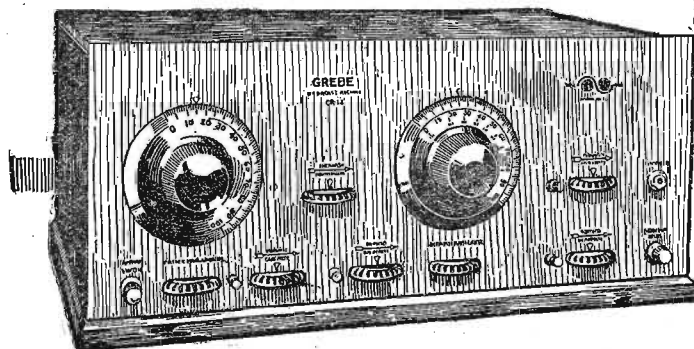
ANY member of the family can tune in the delightful radio concerts from near and far when you own a dependable

GREBE Broadcast Receiver

Supplied in two types, each an Instrument of high efficiency, in a walnut cabinet that will add charm to any room. Hidden compartments accommodate all necessary dry batteries. Every detail of craftsmanship is an assurance of trustworthy performance.

Ask your dealer for literature or write us

A. H. GREBE & CO., Inc. RICHMOND HILL, N. Y.

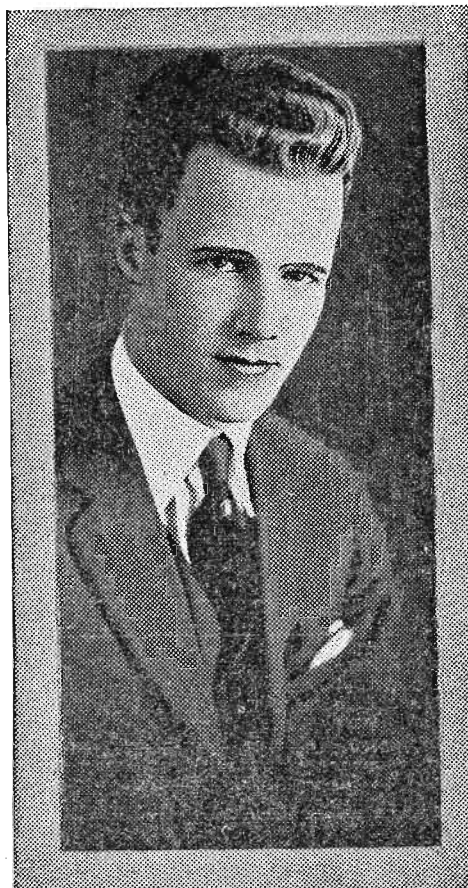


Licensed under Armstrong U. S. Pat. No. 1,113,149



Type CR-12—4 tubes. Combines Regeneration and Tuned R. F. \$17500 (Accessories extra)

AND STILL SOME MORE ANNOUNCERS



Here we have, to the left, M. A. Rigg, Jr., manager of WGR, the Federal Telegraph & Telephone Company's broadcasting station at Hotel Statler, Buffalo, New York, and beside him the station's announcer, Edward Stanko. In the circle is Earl Martz, director of programs and announcer for WDAL, Jacksonville, Florida. This plant is owned by the Florida Times-Union.

Meet Mr. Rex F. Palmer, the "Father of Broadcasting" in England! He derives his title from his double position as managing director and chief announcer of the British Broadcasting company. Gilliams' Photo

COIN IN THE SLOT NEWEST NOVELTY

"TUNES IN" MUSIC FOR BARBER SHOP PATRONS

Dial Is Set, Button Is Pressed and—Presto!—There's Your Concert

WASHINGTON, D. C.—A coin controlled Radio receiver just invented by D. J. Richardson of this city, is causing considerable comment here. The first coin controlled set to make its appearance is in a barber shop.

The device presents unique features and differs from other vending machines in that it assures patrons that it is in working operation before deposit of a coin.

By setting a dial in accordance with the printed directions and pressing a push button on the box, programs, if any are being received, are heard. The pressing of the button also sets in action an interrupter which cuts off and on reception every few seconds and gives an intermittent effect to the program received.

But One Control Used

When it has been ascertained, in the manner thus described, that programs are being received, the deposit of a nickel in a conventional coin receiver permits uninterrupted reception for a limited time. For the accommodation of patrons desiring longer service the device is equipped with an automatic announcer which, twenty seconds before the device cuts off, flashes a red light and thus permits the patron by the deposit of an additional nickel to continue uninterrupted reception. Only one control or dial is used to "tune" the set. By its manipulation a volume extremely loud or exceedingly low may be secured. In reality the dial "tunes" nothing at all but merely controls the filament rheostat.

Necessity Mothers New Wave Trap Invention

Oatmeal Box, Pie Tins and Wire Successful

WASHINGTON.—Necessity mothered another invention when Irving F. Hand of this city was forced to find an effective wave trap to keep WGY, Schenectady, tuned in while a powerful local station was operating.

Mr. Hand is a Union College alumnus and WGY was recently broadcasting addresses by students and instructors of his Alma Mater. The local station blanketed out WGY. He improvised a wave trap using an oatmeal box four inches in diameter wound with thirty turns of wire in series with a condenser fabricated from two pie plates, separated by a piece of paper—and it worked.

LISTENING IN FROM 'WAY UP NORTH

By Vera Brady Shipman

ANOTHER snow, resting heavily on the pine trees before its predecessor has thawed. A house party for the week-end is coming. They come by sled the twelve miles from the railroad station. I hear the sleigh bells as the team turns the last corner over the hill. Laughter as they unload. Greetings to the north woods in winter. You better be sure you wear your heavies, for it's cold up here. Guess I know how McMillan feels. Surely it's not more than 12 degrees from the North Pole here if he is 11 degrees from it.

Let's turn on the Radio and dance. Adolph brings in a great log and another lies beside the fireplace, for we'll need it tonight. Tune in on WGY, Schenectady—they're playing a dreamy waltz. There's another—it's Cleveland WTAM, playing "Marcheta." The Drake, WDAP, and WJAZ, Edgewater Beach, of Chicago, play wonderful dance rhythm. You don't know how much you want a perfect rhythm until you try to dance to an orchestra 500 to 1,000 miles away. KFI, Los Angeles, is playing jazz; it's faint, but you can manage to catch its rhythm. WBAP, Fort Worth, offers "The Meanest Man in the World." (It must be the Hired Hand, he admits it—oh, is that the name of a new fox trot? Pardon me!). WMC, Memphis, in its weekly midnight frolic.

Let's listen a while to KFAP, Denver, singing "It's a Good World After All" (but it's a cold one). WGR, Buffalo, has a reader giving Ben King verse. WCB, Zion City, in a piano solo playing MacDowell's Concert Etude. WDAR, Philadelphia, from the Arcadia Café playing "The March of the Wooden Soldiers." WOC, Davenport, has a group of musicians from Muscatine. Their quartette is singing "Drink to Me Only with Thine Eyes" (regular prohibition number).

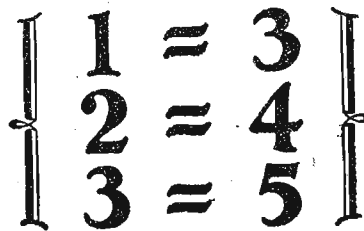
I tuned in on KPO, Hale Brothers, San Francisco, Monday night. Pinelli was playing an accordion solo, "Do, Re, Mi," by popular request. WOS, Jefferson City, has another jazz. Its Novelty Six has a wicked swing. We'll just have to dance that one.

WHB, Sweeney, Kansas City, sends a soprano over the air singing a "Madame Butterfly" aria. And would you believe it? KDKA, "The World's Pioneer Broadcasting Station" (they say so themselves) sends choir and organ of T. Carl Whitmer's Pittsburgh church. I knew him eight years ago down in Arkansas, when he was on concert tour and I was on the same program. KHJ, Los Angeles, has a violin solo, "Nocturne," by Chopin, and a piano solo, "Norwegian Wedding March," by Grieg, followed by the eternal jazz. It's Art Hickman's orchestra—we'll just have to dance that, too! Troy, WHAZ, signs off with "Good morning, good night." WTAS, Elgin, is singing "Sleep" (it's time, too); and Cleveland, WHK, is playing "Home, Sweet Home" as a piano waltz.

What's more befitting the end of a dance, a perfect day and a Radio night in the North Woods?

Reduce Tubes by Half With Erla Synchronizing Transformers

Vacuum Tubes in ERLA Duo Reflex Circuits



Vacuum Tubes as Ordinarily Employed

Nation Wide Loud Speaker Reception With Only Three Tubes

Greater range and volume with fewer tubes than ever before are attained through Erla Duo-Reflex circuits, using Erla synchronizing radio and audio transformers.

In Erla circuits, tubes do triple duty, as simultaneous amplifiers of received radio frequency, reflexed radio frequency, and reflexed audio frequency currents. Through accurate superimposition of currents identical in phase and frequency, by means of Erla synchronizing transformers, this triple function is flawlessly performed, resulting in tremendously magnified amplification without distortion.

Even one tube provides excellent loud speaker reception over a wide range; two tubes blanket the zone ordinarily covered by four; while three tubes bring in stations on the loud speaker from coast to coast.

Other notable improvements, contributing vitally to the superiority of Duo-Reflex circuits, are the Erla fixed crystal rectifier and Erla tested capacity condensers. Combining advanced characteristics for reflex work with unduplicated uniformity, they are indispensable to complete stability and purity of reproduction.

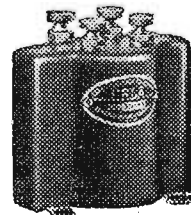
Detailed diagrams and descriptions of Erla Duo-Reflex circuits are presented in Erla Bulletin No. 16. Ask your dealer, or write, giving your dealer's name.

Electrical Research Laboratories
Dept. A 2515 Michigan Avenue, Chicago

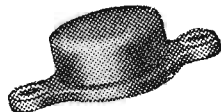
ERLA



Increased amplification and elimination of distortion inevitably follow installation of Erla transformers. Reflex and cascaded types. \$5



Erla audio transformers add tremendously to the purity and volume of any receiving unit in which they are used. Ratios 3 1/2 and 6 to 1. \$5



Crystal troubles vanish on installing an Erla rectifier. No adjustment required. Proof against jolt and jar. Lasts indefinitely. List \$1

Jobbers—Sweeping success of Erla circuits fosters continually increasing demand for Erla products. Write for terms and discounts.

NEW YORK EXPERT LINKS TWO SUPERS

CONNECTS HETERODYNE TO SUPER-REGENERATOR

George Eltz Tells Result of Experiment to Get Best from Both Famous Circuits

NEW YORK.—“Combining the Super-Heterodyne and Super-Regenerative Receivers,” was the talk given by George Eltz of the Manhattan Electric Company at the last meeting of the Radio Club here. These two hook-ups are the work of E. H. Armstrong, also patentee of the regenerative circuit, who was present at the meeting.

Each circuit has its advantages and faults and Mr. Eltz explained his attempts to combine the desirable features of each without its disadvantages. The super-heterodyne has remarkable selectivity and sensitivity; the super-regenerative has tremendous volume and sensitivity. The former requires from six to nine tubes; the latter is noisy.

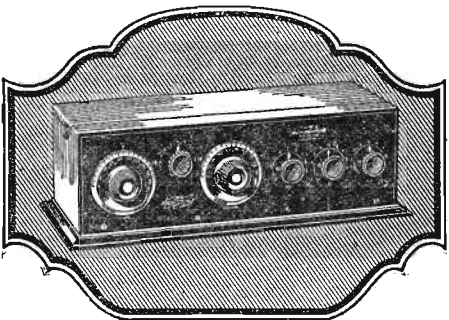
“It Works,” but Not Perfect Yet

The circuit shown herewith is the outcome of Mr. Eltz’ experiments to date. It works, although its designer admits it is still far from perfect. It is presented here in order that other experimenters who

Navy’s Cape May Plant Up for Highest Bidder

WASHINGTON.—The navy recently offered its abandoned Radio station at Cape May, N. J., for sale to the highest bidder. The bids had to “cover” buildings, equipment, etc., but not the land.

The transmitting set was a ½ kilowatt with all accessories. Two receiving sets were included in the material for sale.



Radiodyne

“The Voice of the Nation”

NO LOOPS — — NO ANTENNA

THE RADIODYNE is operated 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.

Stations within a radius of 2000 miles can be picked up on the loud speaker; any wave length from 200 to 700 meters. You can select the best programs with the Radiodyne.

PRICE \$150.00

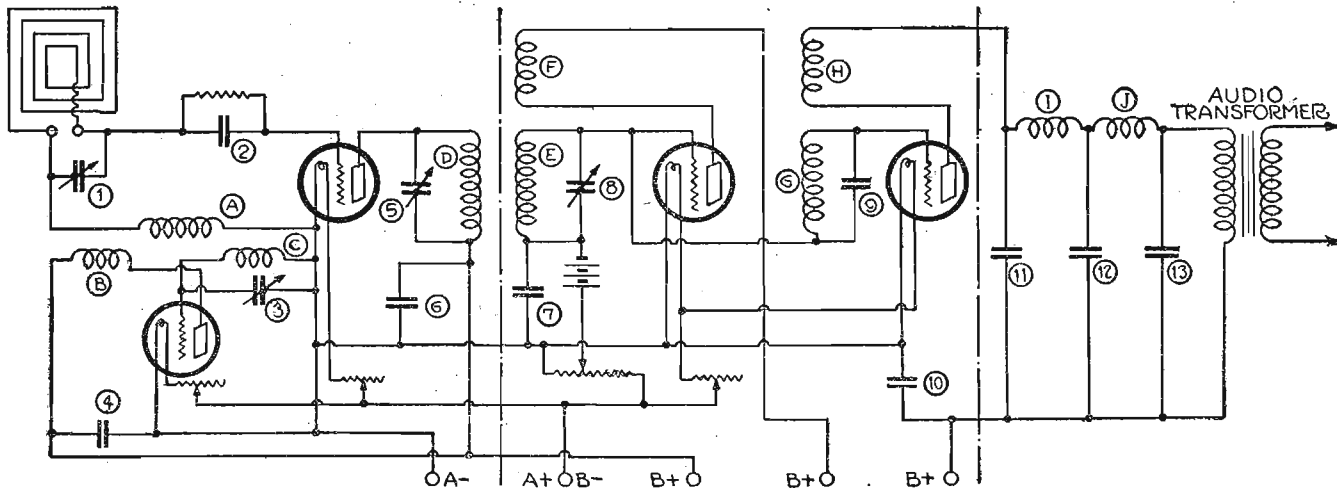
For use in apartments, boats, automobiles, railroad trains, etc., the RADIODYNE is enjoyable where other receiving sets would not be practical.

When interference, strays, static, etc., make other types of reception utterly useless, the RADIODYNE picks up broadcast programs clear and distinct.

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

NEW SUPER-REGENERATIVE-HETERODYNE HOOK-UP



While not recommended for the average B. C. L., the above circuit may be interesting to the fans who have progressed to the stage of research. For those dyed-in-the-wool parts buyers, the constants are given as Mr. Eltz found them to be in his case. “Cut-and-try” is the only rule for success here. The constants are: Capacities, (1) .0005 mfd., (2) .0025 mfd., (3) .0005 mfd., (4) 0.1 mfd., (5) .0005 mfd., (6) 0.5 mfd., (7) .01 mfd., (8) .0005 mfd., (9) .005 mfd., (10) 0.5 mfd., (11) .002 mfd., (12) .004 mfd., (13) .002 mfd.; Inductances, (A) 40 turns No. 30 on 2” tube, (B) 30 turns No. 30 on 3” tube, (C) 43 turns No. 30 on 3” tube tapped at 15 and 31 turns, (D) 35 turns, (E) 21 turns, (F) 80 turns, (G) 1500-turn honeycomb, (H) 1250-turn honeycomb, (I) 2.28 Henries (approximately), (J) 2.28 Henries (approximately).

care to do so may work to develop it.

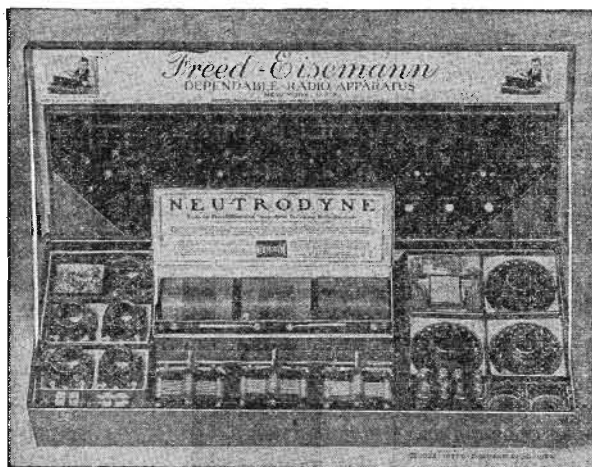
The reader will note that the hook-up is divided by dot and dash lines into three parts. At the left is the oscillator and “first detector” of a super-heterodyne, in the center is a two-tube super-regenerative. To the right is the filter necessary

to take out the high pitch whistle, developed within but essential to, the super-regenerative.

Shielding is necessary, as is careful placing of the parts to avoid undesirable capacity and inter-magnetic effects. As Mr. Armstrong stated in some remarks,

after Mr. Eltz had finished. “Pre-determined sizes and calculations count for little when building such a set. Only the cut and try, build and rebuild method will get results,” so every fan has an equal chance with the Radio engineer and mathematician.

A Freed-Eisemann KNOCKDOWN NEUTRODYNE RECEIVER



Unassembled Model KD-50, Freed-Eisemann Neutrodyne Receiver

NOW the opportunity is presented to obtain a complete set of parts, recommended by the manufacturer, to work with each other in building your Neutrodyne set. An illustrated 32-page book on how to build the Neutrodyne with full-sized diagrams and templates included.

Complete with Full Instructions \$80

Dealers Write for Name of Nearest Distributer



Front View KD-50, Neutrodyne Being Assembled

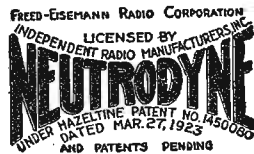
NEUTRODYNE has taken the country by storm. It is the remarkable distance getting, powerful, non-oscillating and non-whistling receiver.

A 32-page book answers every question. The panel is accurately drilled. A baseboard is furnished; in fact, everything down to the very last screw and nut, including all necessary parts excepting the cabinet.

Besides the book there is furnished schematic blueprints and template for drilling the baseboard, also full-size pictorial perspective wiring diagram, so that it will hardly be possible for the amateur with ordinary care and skill to make an error.

Remember that here are licensed parts—not a collection of apparatus trusting to luck that they will assemble properly. Each part is designed and fitted to work with each other part in this particular set. The instructions are so complete and the parts so accurately matched that you will be grateful for the manner in which we have eliminated guesswork in the amateur construction of this receiver.

For sale by dealers of the better class throughout the country, for amateur and experimental building. Builders are cautioned against attempting to build a Neutrodyne Set with parts which are not recommended and designed by the manufacturer to work with each other.



32-page illustrated book of instructions on “How to Build the Neutrodyne” with full size pictorial wiring diagram and full-size panel and baseboard templates, \$1. At your Radio Dealers.

Freed-Eisemann Radio Corporation

SPERRY BUILDING MANHATTAN BRIDGE PLAZA BROOKLYN, N. Y.

FEDERAL COMPLAINT AGAINST R.C.A.

Full Report of Trade Commission Gives Facts Vital to Industry

Tells How R.C.A. Started

How Corporations Charged with Illegal Monopolistic Efforts Are Organized

(Believing that Radiophans in general are interested in the recent complaint against the Radio Corporation of America filed by the Federal Trade Commission, Radio Digest has undertaken the complete reprinting of the material contained in the report of the commission. While the complaint is in true legal form and is not easily read by Radiophans other than lawyers, the direct reprint is undertaken because it is believed no other publication will give the information in so complete a form.—Editor's Note.)

United States of America—Before Federal Trade Commission; in the matter of: General Electric Company, American Telephone & Telegraph Company, Western Electric Company, Inc., Westinghouse Electric & Manufacturing Company, The International Radio Telegraph Company, United Fruit Company, Wireless Specialty Apparatus Company, and Radio Corporation of America.

Docket No. 1115 Complaint

ACTING in the public interest pursuant to the provisions of an Act of Congress, approved September 26, 1914, entitled, "An Act to create a Federal Trade Commission, to define its powers and duties, and for other purposes," the Federal Trade Commission charges that the various persons, corporate and individual, mentioned in the caption hereof and more particularly hereinafter described and hereinafter referred to as respondents, have been and are using unfair methods of competition in commerce in violation of the provisions of Section 5 of said Act, and states its charges in that respect as follows:

General Electric Company

PARAGRAPH ONE: The General Electric Company is (and was at all times hereinafter named) a corporation organized and doing business under the laws of the State of New York. Its principal place of business is in Schenectady, New York. It is engaged in the manufacture and sale in interstate and foreign commerce of apparatus intended for the generation and application of electric current to various purposes, including communication by Radio or wireless waves. Prior to October, 1919, and subsequently it has employed a large staff of electrical experts in research and experiment with a view to developing new inventions, discoveries and devices applicable to any of the various uses of electricity, including apparatus for Radio communication, both transmitting and receiving. It was the owner of many patents and licenses or rights under patents for the manufacture, use and sale

of the articles above described and certain applications for patents covering important inventions for use in vacuum tubes, used in Radio communications. The General Electric Company is the largest manufacturer of electrical apparatus, including devices used in Radio communication, in the United States.

American Telephone & Telegraph Co.

PARAGRAPH TWO: The American Telephone & Telegraph Company is a corporation organized and doing business under the laws of the State of New York. It has its principal place of business in New York City, State of New York. It is engaged principally in the transmission of telephone messages by wire from point to point in the United States. The Western Electric Company is a corporation organized and doing business under the laws of the State of New York. It has its principal office and place of business in Cleveland, Ohio. It is engaged principally in the manufacture and sale in interstate commerce and with foreign countries of apparatus and devices used in wire telephony and in other applications of electricity. A large majority of the stock of the Western Electric Company was and is owned by the American Telephone & Telegraph Company. Prior to October, 1919, and subsequently, the said American Telephone & Telegraph Company and the Western Electric Company maintained a large staff of experts in research and experiment with a view to developing new inventions, discoveries and devices applicable to any of the various uses of electricity, including Radio communication. Each of them was the owner of many patents and licenses or rights under patents, relating to such inventions and devices, and particularly of important patents relating to vacuum tubes as used in Radio communication. The Western Electric Company manufactured and sold in interstate commerce various articles under the patents of the American Telephone & Telegraph Company and its own patents, including the aforesaid vacuum tube patents. The Western Electric Company is one of the largest manufacturers of electrical apparatus, including apparatus used in Radio communications in the United States.

Westinghouse Electric & Mfg. Co.

PARAGRAPH THREE: The Westinghouse Electric & Manufacturing Company is a corporation organized and doing business under the laws of the State of Pennsylvania. It has its principal place of business in Pittsburgh, State of Pennsylvania. It is engaged principally in the business of the manufacture and sale in interstate commerce and with foreign countries, of electrical apparatus for the generation of electric current and its application to various purposes. Prior to October, 1919, and at all times hereinafter named, it maintained a large staff of experts in research and experiment with a view to developing new inventions, discoveries and devices applicable to any of the various uses of electricity, including Radio communication. It is the owner of many patents and licenses and rights under patents relating to such inventions and devices, and particularly certain important patents covering inventions and devices known as the Armstrong "regenerator" and the Fessenden heterodyne patents, of primary importance in Radio communication. The Westinghouse Electric & Manufacturing Company is the second largest manufacturer of electrical apparatus, including apparatus used in Radio communication, in the United States.

International Radio Telegraph Co.

PARAGRAPH FOUR: The International Radio Telegraph Company is a corporation organized and doing business under the laws of the State of Delaware. It is the successor of the International Radio Telegraph Company, having been organized under an agreement of May 22, 1920, between the latter and the Westinghouse Electric & Manufacturing Company. The earlier company had been engaged in the business of transmitting and receiving wireless messages in a limited field prior to the war, and of manufacturing under patents and selling Radio apparatus in interstate commerce. The new company, The International Radio Telegraph Company, continued the business of Radio communication.

United Fruit Company

PARAGRAPH FIVE: The United Fruit Company is a corporation organized and doing business under the laws of the State of New Jersey. It has its principal place of business in New York City. It is engaged in the growing of fruit and the transportation thereof from Central and South America to the United States and the sale thereof, and in connection therewith operates a fleet of steamships. Prior to October, 1919, and subsequently, it had in connection with its business, through its subsidiary, the Tropical Radio Telegraph Company, owned and operated stations for the sending and receiving of wireless communications between the United States and various points in the territory where it produced and shipped its products and was equipped with the necessary apparatus for such purposes. These stations were also open to the public for the receiving and transmission of wireless messages. Prior to October, 1919, the United Fruit Company and the Wireless Specialty Apparatus Company, another of its subsidiaries, had acquired and were the owners of various patents and licenses and rights under patents, for the use, manufacture and sale of various important devices and apparatus useful in Radio communication, especially broad patents covering the use of crystal receiving apparatus. It and its said subsidiary, the Wireless Specialty Apparatus Company, employed staffs of experts in research and experiment with a view to developing new inventions, discoveries and devices applicable especially to Radio communication.

Radio Corporation of America

PARAGRAPH SIX: The Radio Corporation of America is a corporation organized and doing business under the laws of the State of Delaware, having been incorporated on or about October 17, 1919. Its principal place of business is in New York City. Its capitalization was 5,000,000 shares preferred stock, par value \$5.00, and 5,000,000 shares of common stock, no par value. It is engaged in conducting a public Radio communication service between points in different

(Continued on page 8)

More than half a million in service

Standard equipment on the better sets



ALL-AMERICAN

Amplifying

TRANSFORMERS

Moderately Priced Because of Their Enormous Sale

Here are the facts: All-Americans are the most widely used, most popular Amplifying transformers on the market. They are endorsed by more recognized radio engineers—are standard equipment on more high grade sets—are recommended by more good dealers—than any others. Their superiority is absolutely established! Due to their immense sale, they are moderately priced.

For ability to deliver volume without distortion, All-Americans lead the field. In all circuits they excel. Why experiment? More than half a million "radiophans" have already tried out All-American Transformers under every conceivable condition, and have absolutely proved them without equal. That is why All-Americans are the

LARGEST SELLING TRANSFORMERS IN THE WORLD

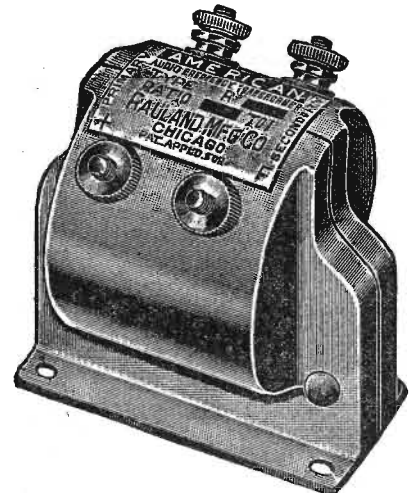
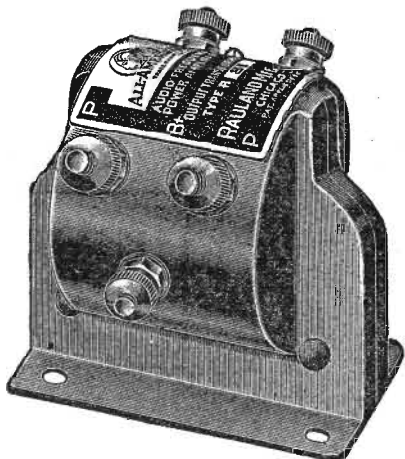
We Will Send You

the latest All-American diagram and circular, describing Power Amplification; also the famous All-American book of twenty-two Tested Hook-ups—on receipt of 4c in stamps to cover mailing charges.

RAULAND MFG. CO.

Pioneers in the Industry
2650 Coyne St., CHICAGO

ALL THE BETTER
Dealers recommend
THE "ALL-AMERICAN"



POWER AMPLIFICATION
—for utmost volume and pure rich tone.
All-American Power Amplifying Transformers for PUSH-PULL CIRCUITS. Each \$6. Unquestionably the best—no need to pay more!

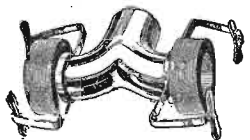


All-American Socket
One-piece molded Bakelite—for panel or base mounting. Finest socket money can buy. Only 75c.

AUDIO AMPLIFICATION
—to get ALL stations clear and strong.
All-American Audio Frequency Transformers. Three ratios: 3:1, \$4.50; 5:1, \$4.75; 10:1, \$4.75. Half a million fans say they're best—pay no more!

Watch for the new All-American Long Wave Radio Frequency Transformer suitable for Super-Heterodyne circuits

ekko



Listen to radio through your phonograph

Ekko adapter connects your head phones with the tone arm of your phonograph and turns the sound box into a loud speaker. The best loud speaker you can use—utilizes the scientific design of the phonograph sound box, producing a pure mellow tone. (Not adapted to crystal sets without amplification.)

For Double Head Phones . . . \$2.00
(Without Connectors)

For Single Head Phones . . . \$1.00
(Without Connectors)



Ekko fits Victor, Silver-tone, Sonora and other makes without connectors. Add 20c for connector for Pathé, Columbia, Vocalion; 25c for Edison; 30c for Brunswick. Or 75c for complete set.

Ekko Connectors at above prices also available separately to attach practically all loud speaker units to your phonograph.



The Ekko Clamp

For ground wire and battery terminal contacts. The Ekko Clamp bites through rust or corrosion and assures positive contact on all electrical connections. Also used to tap 2 and 4-volt current from a 6-volt battery. Ekko Clamp 25c. Pair (for battery terminals) 50c. Ekko Adapter and Ekko Clamp at your dealer's. Or order direct from us. Sent postpaid. Money back if not satisfied.

The Ekko Company

111 West Monroe Street Chicago, Ill.

COMPLAINT ON R.C.A.

(Continued from page 7)

states in this country and between ships and ships and shore, and between the United States and Cuba and foreign countries, and in the business of buying and selling apparatus and devices for use in Radio broadcasting and receiving and Radio communication and shipping the same among and between the States of the United States and to foreign countries.

Marconi Company

PARAGRAPH SEVEN: The Marconi Wireless Telegraph Company of America was, prior to October, 1919, a corporation organized and doing business under the laws of the State of New Jersey. It had its principal place of business in New York City, State of New York, and was engaged in operating a transoceanic Radio service and from ships to shore, and in the manufacture of apparatus and devices used in Radio communication. It owned and operated stations at various points in the United States and elsewhere for the conduct of its business, equipped with the necessary apparatus therefor, and through its connection with the Marconi Wireless Company, Ltd., of Great Britain, the largest holder of its stock, was equipped for transoceanic Radio traffic. It was the owner of various patents and licenses and rights under patents for inventions and devices used in Radio communication, and it manufactured and sold various articles under said patents, including important patents relating to the manufacture and use of vacuum tubes in Radio communication.

How R. C. A. Was Formed

PARAGRAPH EIGHT: Prior to this country's entering the war the General Electric Company, in connection with its research work in the Radio field, had developed and constructed a powerful rapid alternating generator known as the Alexanderson generator. The efficiency of this machine in transoceanic communication by Radio was demonstrated during the war. The movement for control of this machine and other patented Radio devices not owned by General Electric Company, led to the organization of Radio Corporation of America as above alleged, by persons among whom the interests of General Electric Company predominated.

On or about October 22, 1919, the General Electric Company entered into an agreement with the Marconi Wireless Telegraph Company of America, whereby the latter agreed to seek the approval by its stockholders of a proposed agreement between the Radio Corporation of America and the Marconi Wireless Telegraph Company of America, and the General Electric Company agreed to cause the Radio Corporation of America to execute and deliver said proposed agreement as soon as approved by the stockholders of the Marconi Wireless Telegraph Company of America.

This proposed agreement provided substantially for the sale to the Radio Corporation of America of the assets of the Marconi Wireless Telegraph Company of America, including its patents and physical assets and stock of various subsidiary corporations, in consideration of the issuance to it by the Radio Corporation of America of two million shares of its preferred stock and two million shares of its common stock, as more fully appears from said agreement. Thereafter, and on or about November 20, 1919, said proposed agreement between the Radio Corporation of America and the Marconi Wireless Telegraph Company of America was executed and delivered. In connection with said negotiations and agreements, the General Electric Company purchased the holdings of the Marconi Wireless Telegraph Co., Ltd., a British corporation, in the stock of the Marconi Wireless Telegraph Company of America, for the Radio Corporation of America.

In August, 1919, the Marconi Wireless Telegraph Company of America was dissolved, a trust, however, being created, with the corporation's directors as trustees, for the purpose of prosecuting claims of the corporation against the United States Government and accounting for any proceeds thereof. All the stock of the company has been exchanged for shares in the Radio Corporation of America, it being noted in the stock of the Marconi Company so exchanged that it was entitled to share pro rata in any moneys resulting from the prosecution of said claims against the United States Government, and it was provided further that such moneys were to be invested in the preferred stock of the Radio Corporation of America.

G. E. Gets Stock Melon as Gift

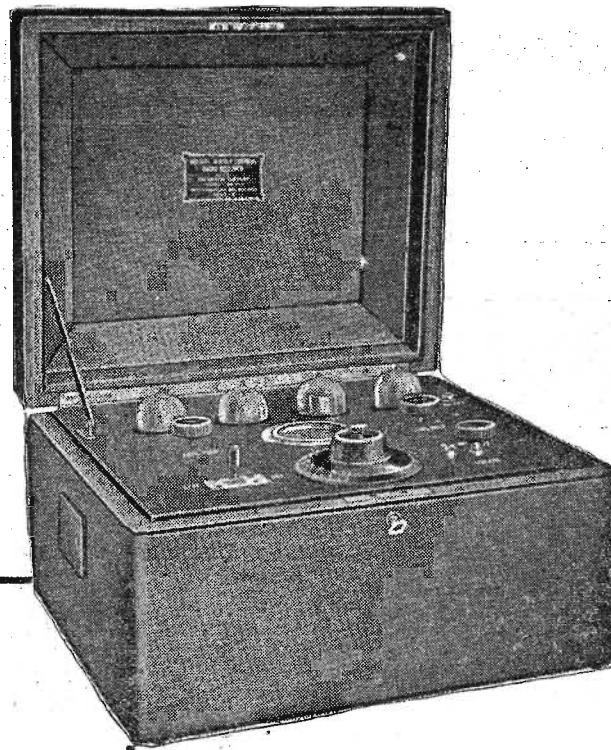
PARAGRAPH NINE: On or about October 22, 1919, the Radio Corporation of America agreed, by appropriate action of its directors, to issue to the General Electric Company, in consideration of its services and expenses in bringing about the purchase above described from the Marconi Wireless Telegraph Company of America, and otherwise, 135,174 shares of preferred and 2,000,000 shares of the common stock of the Radio Corporation of America. Among the considerations referred to was the procuring of an agreement between Marconi Wireless Telegraph Company, Ltd., a British corporation, and the Radio Corporation of America, for the conduct of international transoceanic Radio traffic.

Prior thereto the former corporation (British Marconi Company) had been the largest stockholder in the Marconi Wireless Telegraph Company of America, and had entered into agreements and contracts with it covering the exchange of traffic facilities and all equipment and apparatus under patent rights. By said agreement between the Radio Corporation and the Marconi Wireless Telegraph Company, Ltd., all said agreements and rights of the Marconi Wireless Telegraph Company of America under said contracts and agreements and specifically the agreement of April 18, 1902, were confirmed and continued to the Radio Corporation of America under an agreement executed on or about November 20, 1919, between the Marconi Wireless Telegraph Co., Ltd., and the Radio Corporation of America.

G. E. Grants R. C. A. Valuable Rights

PARAGRAPH TEN: On or about November 20, 1919, the General Electric Company and the Radio Corporation of America made an agreement by which the General Electric Company granted to the Radio Corporation of America the exclusive divisible license to use and sell (with certain reservations as to use) but not to make, unless the General Electric Company is not in a position to do so, apparatus for Radio purposes under all patents, present or future, owned or controlled by the General Electric Company, for the term of the agreement, namely, until 1945. The Radio Corporation of America granted to the General Electric Company the exclusive divisible right to make and sell Radio devices through the Radio Corporation only, under all its patents, present or future, for the term of the agreement, except certain patents acquired by purchase, for which special provision for apportioning costs was made; and the Radio Corporation agreed to purchase from the General Electric Company all Radio devices covered by patents, which the General Electric Company is in a position to supply, and not to sell patented articles except as a part of the Radio system; and generally to restrict its business to Radio supplies and not to enter with any patented device, process or system, the field of the General Electric Company or encourage others so to do as more fully appears from said agreement. On December 31, 1922, the General Electric Company owned 620,800 shares of the preferred stock and 1,876,000 shares of the common stock of the Radio Corporation of America.

(TO BE CONTINUED.)



BRISTOL SINGLE CONTROL RADIO RECEIVER

(NON REGENERATIVE)

Using Grimes Inverse
Duplex System

ONE CONTROL ONLY Makes It Most Simple to Operate.

SIMPLICITY OF OPERATION is the outstanding feature of this Receiving Set. One Control Dial includes every adjustment. To tune in, turn this Dial. A station once located can always be brought in again at the same setting.

NOT CONFINED TO LOCAL BROADCASTING—this four-tube set has power equal to six. Because the Grimes Inverse Duplex System utilizes the first two tubes for both Radio and Audio Amplification.

ANTENNA OR LOOP—either may be used to suit conditions.

SOLID MAHOGANY CASE with walnut finish encloses the complete Receiving Set. It is a beautiful piece of furniture fully in keeping with the most luxurious room.

The Price

Bristol Single Control Radio Receiver

\$190.00

Ask for copy of Bulletin AY-3013 describing this set.

THE BRISTOL CO.
Waterbury, Connecticut

IF it's the outdoor antenna that's been holding you off, you want D-7-A or D-10 Portable the De Forest Radiophones that use an indoor loop aerial the size of a small picture frame—and bring in the broadcast of half the American Continent.

Authorized agents everywhere.



DE FOREST RADIO TEL. & TEL. CO.
Dept. R. D. 6
JERSEY CITY, N. J.

G. LAYNG, GOTHAM, GETS KFKB'S GOAT

PEDIGREED CRITTER HAS TASTE FOR RADIO

Kansas Station Gives Unique Prize to Most Distant Wave Recipient

NEW YORK.—During the recent Radio show here, Grant Layng, 22 Ninth street, this city, was operating his receiving set. It was the night that Station KFKB, in Milford, Kansas, opened for its first broadcast.

Weather conditions were not the best for reception, but quite late, 3 a. m. to be exact, Mr. Layng after listening in on a few numbers of the concert, heard KFKB's signature.

The announcer put over his story regarding the new station, and lined up thousands of future friends for KFKB. In conclusion he made an offer—a very unusual offer, one entirely new to Radio. The following is its sum and substance:

KFKB Asks Who'll Get Their Goat

"As this is our first night on the air, we are most anxious to see what our station can accomplish in the way of distance. Therefore, we will award a prize goat—a pedigreed Toggenburg Goat, a magnificent animal, worth about \$500.00—to the person farthest located from the Brinkley Jones Extension Hospital, Milford, Kansas, receiving our broadcast. Now, who will get our goat?"

Mr. Layng immediately telegraphed "I've got your goat."

The answer was, "Where shall we ship it?"

The poor old pedigreed goat died in transit. A man rung the bell at 22 Ninth street, and sorrowfully announced the news to the expectant family. Gloom hung over the household. But—better things were in store.

Younger Brother Comes to Conquer East

When station KFKB heard of the demise of its plutocratic pet—it immediately shipped his full-blooded younger brother, which arrived in due time, in perfect health. This second shipment of live stock was a beauty. He won a home at first glance, and has endeared himself to the entire neighborhood.

This representative of Station KFKB is at present domiciled at Mr. Layng's house. He is a most aristocratic creature—gentle, beautiful, and odorless. He is very well

WOULDN'T THIS GET YOUR GOAT?

behaved except for the fact that he has a passion for paper. His appetite is insatiable for this delicacy, and he will eat anything and everything, just as long as it is paper.

One day the goat was found in the living room, near the receiving set that had started him east. In his mouth was a book on Radio that he had just started to devour. Mr. Layng still has the book, showing the goat's teeth marks on it. He says it is ample evidence of the goat's love for everything pertaining to Radio.

And after devouring a book on Radio, the goat of KFKB that Grant Layng got, proceeds to tune in on "Home Sweet Home" at Milford, Kansas, where he was born and educated by the Brinkley Jones Hospital. Photo by Garod Radio Co.



Charlotte Lund at WOR

NEWARK, N. J.—A Radio favorite whose many concerts have added dignity and charm to the WOR programs is Charlotte Lund, concert soprano, who again sang from WOR on a recent Sunday afternoon. Her concert was arranged in response to repeated demands on the part of the Radio audience.

ANOTHER PUBLISHER QUITS SONG 'TRUST'

QUIGLEY SEES ADVANTAGE OF INDEPENDENT STAND

Once Staunch Defender of Publishers' Society Becomes Broadcast Enthusiast

CHICAGO.—Thos. J. Quigley, formerly Chicago Manager, M. Whitmark & Sons for over twelve years, was one of the staunchest adherents and most ardent defenders of the American Society of Authors, Composers and Publishers.

Mr. Quigley opened headquarters in Chicago as general manager in the United States for a Canadian music publisher. He immediately started on a campaign to put over some numbers. Having heard much about Radio, he decided to do some broadcasting. The returns on such songs as George MacFarlane's sensational success "Forget-Me-Not (Means Remember Me)" and Jack Norworth's big hit, "You Can Take Me Away from Dixie but You Can't Take Dixie from Me," as well as five other numbers were such that he determined to remain an independent.

Says Society Members Cheat

Mr. Quigley is very emphatic in the statement that the results obtained by broadcasting from the various stations are so far in excess of any benefits that might be derived from membership in the Authors and Composers Society that there is no room for argument. He points out that many members of the Authors and Composers Society are now giving their songs to independent publishers.

In a recent interview he said: "I was first convinced of the value of Radio by the anxiety displayed by employees of members of the Authors and Composers Society to broadcast from the various unlicensed stations in Chicago, and their persistency in still doing so, regardless of their supposedly binding agreement not to do so. What benefit can be derived by joining any organization in which many members are constantly cheating?"

Mr. Quigley has been in the music business for a number of years. He is so convinced that Radio broadcasting is an asset to the music publishers that he has established a special Radio department to which he is devoting his personal attention.

Chicago's Opera Company Broadcasts from Boston

BOSTON.—On the opening night of the Chicago Opera Company season here, Station WNAC, The Shepard Stores, broadcast "L'Africana," and a few nights later "Carmen" direct from the Boston Opera House. Broadcasting operas and musical comedies has become an art with WNAC, as every detail is thought out carefully before they start it on the air, so that none of the charm of the performance is lost.

"Carmen," the second opera to be broadcast, is one well known and liked. Mary Garden sang the title role, and Edouard Cotreuil sang Zuniga.

The capacity of the average condenser can be varied quite easily by varying the pressure on its plates. Remember this when fastening one with screws.

The name "Federal" is your guarantee of perfection in manufacture.

EVERY radio set and each of the 130 different parts manufactured by the Federal Telephone & Telegraph Company is guaranteed to be absolutely free from defects of any nature.

Radio experts employed by Federal put all finished sets and parts to a severe test in order to make certain that they are constructed in accordance with the Federal guarantee of perfection in manufacture and uninterrupted service to the user.

First class radio dealers carry the Federal line. Investigate the value of Federal products when purchasing a radio set or parts. You will be happy at the result.

Federal Telephone and Telegraph Company BUFFALO, N. Y.

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



Federal Head Sets are used by Radio Experts because they are Federal Standard

Price
2200 OHMS

\$7.00

Federal

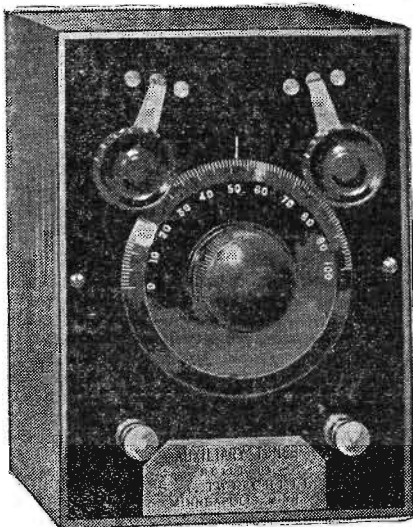
Standard RADIO Products

WAVE TRAPS NOW ON THE MARKET

AS HAS been previously stated, the supply of commercial wave traps is unusually small. It is surprising that so few manufacturers are making this device which will help so many fans, especially those in crowded cities where the numerous powerful broadcasting stations not only interfere with one another but also present a solid wall of interference which few sets can pierce to bring in the long distance stations.

In addition, in order to reduce the price, the wave trap is so simplified that its maximum efficiency is lost.

Another wave trap, known as the "Auxiliary Tuner," is manufactured by S. A. Twitchell of Minneapolis, Minn. The com-



ponent parts of this unit are quite a little more numerous than would be expected in such an instrument, but an examination and test emphasizes the efficiency of its unusual construction.

Best results are obtained by connecting the ground to the left-hand binding post, while the right-hand post is connected to the ground of the receiving set. The right-hand switch controls the coupling of two windings on the trap coil, trap 4 being the loose and trap 6 the tight coupling. The condenser is very sensitive and care should be taken not to pass the station by turning too fast.

The left-hand switch is a form of loading coil that has the effect of loading the antenna circuit in instances where it is desired to reduce the coupling in the tuner of the receiving set.

This tuner may also be connected in parallel with the receiving set, sometimes with better results.

Notes on Phantom Receiver

In answer to many letters on the Phantom receiver I wish to give the following information which is of value to anyone constructing this set.

The circuit works well on a canoe or any type of boat, by tacking on about 2 feet of 1-inch wide copper ribbon below the waterline for a ground and supporting a small aerial above the heads of the occupants. On larger boats there are always metal objects that can be used as a ground. A good aerial may be constructed by winding some hard-drawn number 14 copper wire on a 1-inch form like a spring and stretching this out above the canoe.

The tuner is not necessarily limited to any one design of coupler, but may be of any type so long as it is tapped as specified in the article. Almost every experimenter has some old coupler that can be rewound using 26 to 28 dcc. on the stator and number 30 dcc. on the rotor. The 180° types of couplers are best, as screws and nuts may be used on the edge of the rotor for taps and flexible wires to lead to the switch points on the panel. The diameter of the stator may be anywhere from 3 to 4 inches, with a rotor to match. The rotor and stator may be bank-wound using larger wire to advantage.

The grid leak was constructed by using the black paper tape in an old CRL grid leak and lowering the resistance of the paper with an extra-soft lead pencil until the results conformed to that specified in the article.

IXP is a private experimental station and does not manufacture or sell any of the parts. These parts are special and will have to be constructed by the experimenter unless some manufacturer puts them on the market.

This circuit greatly reduces static (QRN) and to judge by the number of people who have mentioned it in their letters seems to have given satisfaction.—Leon W. Bishop, Athol, Mass.

The average cost of upkeep for Radio equipment is about \$10 a year.

BRINGS IN EVERYTHING

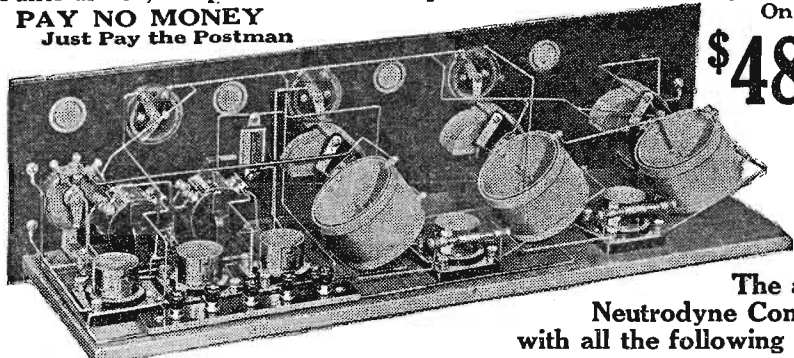
BEAUTIFUL MAHOGANY NEUTRODYNE

WHEN you get this magnificent looking set 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 Tate dials—a set fitted for the most exclusive home.

Panel drilled, all parts mounted on panel and baseboard ready for wiring

PAY NO MONEY
Just Pay the Postman

Only **\$48.50**



FREE
BLUE
PRINT

The above
Neutrodyne Complete
with all the following parts:

5 Genuine DX Tron Tubes.....	\$25.00	2 22½ Volt B Battery.....	\$ 6.00
1 110 Ampere Storage Battery.....	18.00		
1 Deluxe Homecharger.....	18.00		
1 Genuine Baldwin Headset.....	12.00	1 Fultone Loud Speaker.....	9.50
1 Complete Aerial Equipment.....	1.50		
1 45 Volt B Battery.....	5.50		
		TOTAL.....	\$95.50

The above parts and equipment complete would cost you \$144.00! **Our Price \$125.00**

It Works—NEUTRODYNE—All Standard Parts

3 Rheostats, 30 ohms.....	\$ 2.00	2 Transformers.....	\$ 9.50
1 Rheostat, 6 ohms.....	.90	9 Readem Binding Posts.....	.85
3 Air Core R. F. Transformers, mounted on gons.....	20.00	1 8x26 Mahogany Panel.....	9.64
2 Balancing condensers.....	20.00	4 Bezels.....	.80
1 Potentiometer, 600 ohms.....	1.85	3 Dials.....	4.50
3 Jacks.....	2.70	1 Baseboard.....	.50
1 Condenser.....	.40	24 ft. Square Brass Bus Wire.....	.60
1 Grid Leak.....	.65		
5 Sockets.....	5.00	Total.....	\$53.89

Only \$45.50 with blue prints FREE.

Complete Parts—MILOPLEX—2-Step Amplifier

Mounted on baseboard and panel. LIST \$21.06 **OUR PRICE ONLY \$16.50**

1 Panel 7x9x7/8".....	\$1.26	2 Sockets.....	\$2.00	1 Baseboard.....	\$0.25
2 Webster's 4-1 Trans-formers.....	9.50	2 Double Circuit Jacks.....	1.80	1 Cabinet Mahogany Finish.....	3.50
2 30 Ohm Rheostats.....	2.00	1 Set Readem Engraved Binding Posts.....	.75		

The above mentioned parts will include any Ohm Rheostat and All-American Transformers if desired.

Complete Parts—MILOPLEX—Cabinet FREE

1 .0005 Variable Condenser, Vernier.....	\$6.00	1 Socket Bakelite Base.....	\$0.90	ONLY \$28.50
1 Estru Variometer.....	5.00	1 Bakelite Panel, 9x14x7/8.....	2.50	
1 .0025 Variable Condenser.....	2.00	1 WD-12 Tube.....	6.50	
1 Variable Grid Leak.....	.75	1 B Battery, large, 22½ volt.....	3.00	
1 .0025 Mica Fixed Condenser.....	.40	3 Dry Cells.....	1.35	
2 .002 Phone Condensers.....	.80	12 ft. sq. brass Bus wire.....	.30	
3 3½-inch Dials, each 750.....	2.25	1 Set Readem Binding Posts.....	.75	
1 Potentiometer, 1850 ohms.....	2.20			
1 Rheostat.....	1.00	TOTAL.....	\$35.70	Blue print FREE only with order for complete parts

We Are Responsible Folks, Money Promptly and Cheerfully Refunded If You Are Not Satisfied

All Orders Mailed Promptly. Parcel Post Prepaid on \$5.00 or Over. No Stamps Accepted.

Every-thing in Radio Write Us

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

We Personally Guarantee All Goods



"What a difference just a few cents make!" **FATIMA**

RADIO TALKS

A receiving antenna for broadcast reception should never be over 100 feet long and 75 feet will be found better as a rule. A single wire of this length means just as much distant reception with the added advantage of greater selectivity. *E. J. Flewelling*

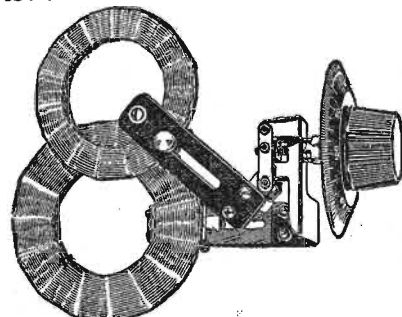
Genuine E. J. Flewelling PARTS

Flewelling is the recognized authority on quality Radio Apparatus. Naturally any part produced under his name will be up to his high standard. It is a lot safer to buy the parts designed by Flewelling; and made under his personal supervision—for nothing takes the place of the "genuine." These parts are manufactured exclusively by

BUELL MANUFACTURING COMPANY
2977 Cottage Grove Ave.
CHICAGO

Flewelling TUNERS \$8.00

Flewelling SOCKETS \$1.00



OPERATING AND TROUBLE SHOOTING

For the Owner of an ADAMS-MORGAN PARAGON Type RB-2

IN reality we have two receivers in one; the first being that of a three-circuit regenerative receiver with fixed inductive coupling, the value of that coupling being best for the average amateur antenna. In this condition the receiver is superior to the many single circuit regenerative receivers. The second is identical with the older type Paragon receivers. Both methods of manipulation produce great sensitivity and selectivity, the latter showing perhaps 20 per cent greater efficiency.

Tubes and Rheostats

With the new Paragon receivers any type of standard vacuum tube may be used. Rheostats of proper resistance for each type are included. Plug pin rheostat

This in itself is an important feature in regenerative receiver design.

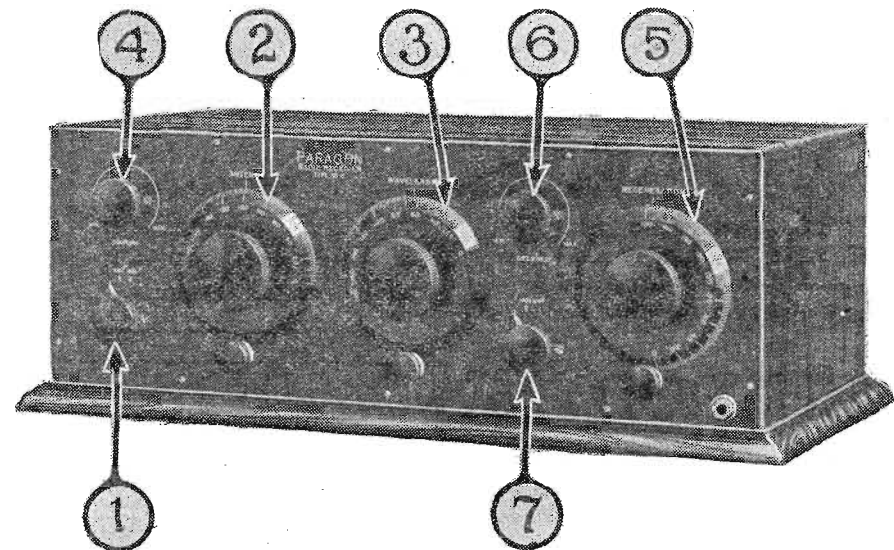
Other Features

Minor refinements include the following: Antenna inductance switch mounted behind the panel; more effective and smaller type of verniers used on control dials; all terminals eliminated from panel face; 95 per cent of wiring concealed; stage control switch labeled "Volume" for obvious reasons; telephone jack on panel cuts loud speaker when phones are used for tuning; hinged cover used and interior appearance improved.

The various parts, including the number 81 transformer with polished condensite housing, sockets, rheostat plug pins, necessary grid and by-pass condensers, etc., are assembled on a subpanel base, which also conceals wiring. The entire instrument is completely assembled on the main panel and the subpanel base, and is readily accessible and removable from the cabinet.

Cabinet

The type RB-2 is housed in a highly finished mahogany cabinet and includes battery compartment which will accommodate four 6-volt dry cells and three 22½-volt B batteries. Thus the receiver is made complete where dry cell operation is preferred. However, it should be remembered that greater sensitivity and volume, for a given number of tubes, is obtained



contacts are labeled as to voltages and types of tubes. The variable rheostat is still included in the filament circuit of the detector tube, since it will always be preferable to use the super-sensitive gas content detector tube.

New Condenser

Attention is called to the variable condenser now used for the first time in Paragon receivers. It differs from other condensers in that, despite its concentric pattern, a straight-line wave length curve is obtained. A feature is also the double-end cone bearing mounted in a single bushing held upon the insulating support plate. The design results in a condenser of many good qualities, such as low value at minimum setting; low losses of all sorts, and an instrument which will not alter its capacity due to a loose bushing when the operator's hand leaves the control dial.

with 6-volt tubes and storage-battery filament operation.

Dial Settings

The outstanding feature of the RB-2 model is a wave length control dial 3, and its calibration is indicated on a "wave length station location" chart accompanying each instrument. Each receiver is calibrated from a precision wavemeter at four points upon the scale. A chart sent with each receiver includes the scale of the dial divided into six divisions of thirty degrees each. For each 30 degrees there is a column of 60 spaces, making a total of 360 spaces upon the chart. These spaces are placed beside corresponding spaces representing the degrees on the dial. When a station is once located in tuning and its identity ascertained, the call letters may be noted for permanent record upon the chart and a line drawn from the call let-

"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 Adams-Morgan Paragon RB-2 is described. Radiophans with other sets will also find these articles worth reading, particularly the notes on trouble finding.

ters to the exact spot upon the dial scale 3.

A new method of coupling the antenna and grid currents is used. Variation of coupling (knob 4) is centered about a fixed point. The coupling control gives a variation about equivalent to that obtained by the former type of coupler when altered between the 40 and 50-degree settings on the scale. The novice may set the coupling control at "Max" and forget it. It is impossible for him to so manipulate the receiver that it lacks sensitivity and selectivity.

Operation

The operating procedure with the new Paragon receivers has been simplified and is as follows:

Light all vacuum tubes by turning volume switch, knob 7, to position 2. Set coupling control, knob 4, at "Max." If type UV-200 or C-300 vacuum tube is used

as detector, adjust rheostat, knob 6, to a point just below the hissing noise. If other type tubes are used for detector, set rheostat at "Max." Set antenna inductance, knob 1, at 3. Set antenna control, dial 2, at 160 degrees.

Set the wave length control, dial 3, at point where calibration chart shows a station should be heard.

Advance regenerative control, dial 5, until the conventional "cluck" is heard.

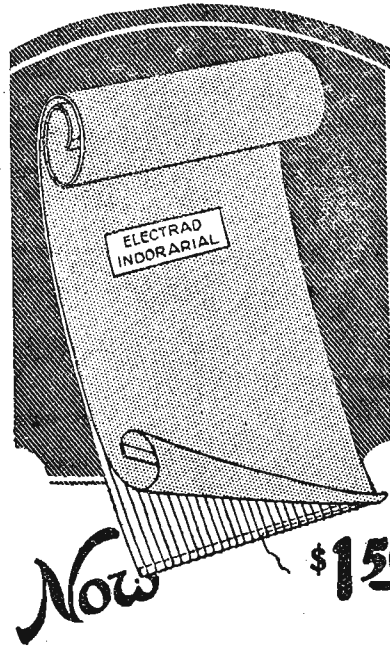
Revolve antenna control, dial 2, until a second cluck indicates that the circuits have stopped oscillating, and that the antenna circuit is in resonance with the vacuum tubes.

Readjust antenna control, dial 2, until the voice or music comes in clearly and strongly. (After the operator becomes accustomed to the manipulation he will always find it desirable to make adjust-

(Continued on page 12)

DEALERS Write for details on our Special Dealer offer.

Electrad, Inc.
Dept. "L"
428 Broadway
New York City



Electrad Products are of the highest quality electrically and mechanically. You are protected by an absolute guarantee of satisfaction when you buy them.

A Practical "Indorarial"

No need now, to risk your life putting up an outdoor antenna. This wonderful indorarial does more than any outdoor antenna. Hang it anywhere, behind draperies, on the wall, on the door, or lay under rug. Put it up or take it down in a second.

Ideal for sharp tuning. Reduces static. Wonderful directional effect, cuts out interference from local stations. Contains 600 ft. of wire. Use it as a ground.

Sold and recommended by most good dealers. If your dealer cannot supply you, send us his name and \$1.50 and we will send it to you. Satisfaction guaranteed.

Other Guaranteed Electrad Products

VARIOHM a variable grid leak. Enables you to get exactly the correct resistance for best results from your set. Any resistance from ½ to 30 megohms. Price 75c.

LEAD INS. No need to ruin your window frames. Electrad Lead Ins fit under closed windows. Covered with fire-proof insulation. Fitted with Fahstock clips. Price 40c.

FIXED GRID LEAKS Absolutely uniform to calibration. Come in all resistances ¼ to 10 megohms. Price 30c.

ELECTRAD

A Name stamped only on SUPERIOR Radio Products

New Coto Compact Variable Air Condenser with Vernier

Rugged and electrically efficient. Constructed on rigid metal plate from which condenser plates are perfectly insulated. Both rotor and stator plates are of copper, soldered firmly in place. Size only 2½ x 2¼ inches. Positive, delicate vernier action.

If your Dealer cannot supply you, write us, giving his Name.

Type 3505
.0005 Mfd.
\$5

Type 3510
.001 Mfd.
\$6

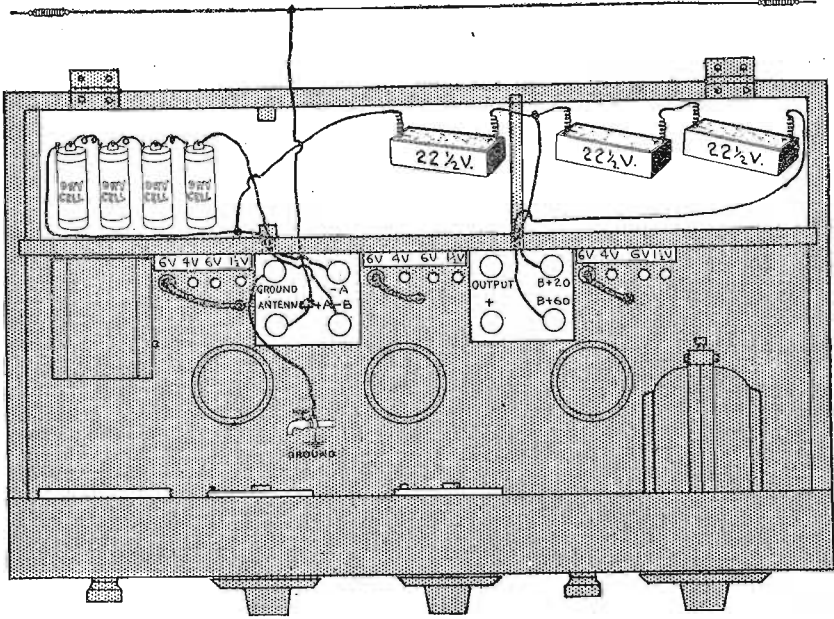
COTO-COIL CO.
87 Willard Avenue Providence, R. I.

BRANCH OFFICES:
Los Angeles, 329 Union League Bldg.; Minneapolis, Geo. F. Darling, 705 Plymouth Bldg.; Atlanta, C. P. Atkinson, Atlanta Trust Co. Bldg.; CANADA: Perkins Electric Co., Ltd., Montreal, Toronto, Winnipeg.

OPERATING AND TROUBLE SHOOTING

(Continued from page 11)
ments without causing the whistling tones. Their production is always accom-

will need to be connected to an antenna system consisting of ground connection, which may be made to water pipe, and an



overhead wire. The most effective overhead wire will be one elevated from 30 to 60 feet above the earth, and having an over-all length of about 150 feet. Good results may be obtained by running 30 to 40 feet of wire around the picture moulding within a room, or from the top of the house to the lower floor.

Batteries

Supply batteries for the vacuum tubes as connected as shown in the illustration. The type of battery and its potential will be determined by the type of vacuum tube used. Detailed necessary instructions accompany each vacuum tube. The rheostat plug pins provided for controlling current flow to each vacuum tube will require to be set as indicated upon the card fixed behind each rheostat.

Vacuum Tubes

Vacuum tubes of types WD-11, WD-12, UV-199, UV-201A, C-11, C-12, C-299, C-301A and 216A, when used as detectors (left-hand socket) will require the insertion of a licensed 4-megohm grid leak in the grid leak clips on the grid condenser underneath the instrument baseboard. Removal of screws at sides and top of panel, and the two screws from instrument board inside the case, permits removal of the entire unit.

(ANOTHER SET NEXT WEEK.)

In guying the supporting towers, pipes or poles, use guy wires at least as large as the aerial wire, and preferably larger.

Wire-Table

B.&S. Gauge	Turns per Inch of Copper Wire with Various Insulations					
	Enm	Cot	Single	Dbl	Single	Dbl
18	23	21	19	23	22	20
19	26	24	21	26	24	23
20	29	26	23	29	27	25
21	32	29	25	32	30	27
22	37	33	29	36	33	31
23	41	37	32	40	37	34
24	46	40	34	44	41	38
25	51	44	37	49	45	42
26	57	48	41	54	50	46
27	64	54	44	60	60	57
28	74	59	47	67	65	63
29	80	64	50	74	74	69
30	90	70	54	82	81	76
31	101	75	57	90	87	84
32	112	82	60	99	93	92
33	127	88	64	108	99	101
34	141	95	67	119	107	110
35	158	101	71	129	114	120
36	178	108	74	140	121	131

Day and Night Reception

The night range of sending and receiving stations is much greater than the daylight range. Do not expect to hear stations a great distance away in the daytime.

panied by a radiation of energy from the receiving antenna. The receiver is thus a miniature transmitter and transmissions from the receiver may interfere with the reception of signals from the same station by others in the neighborhood.

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A Three-Tube Reflex Neutrodyne Receiver

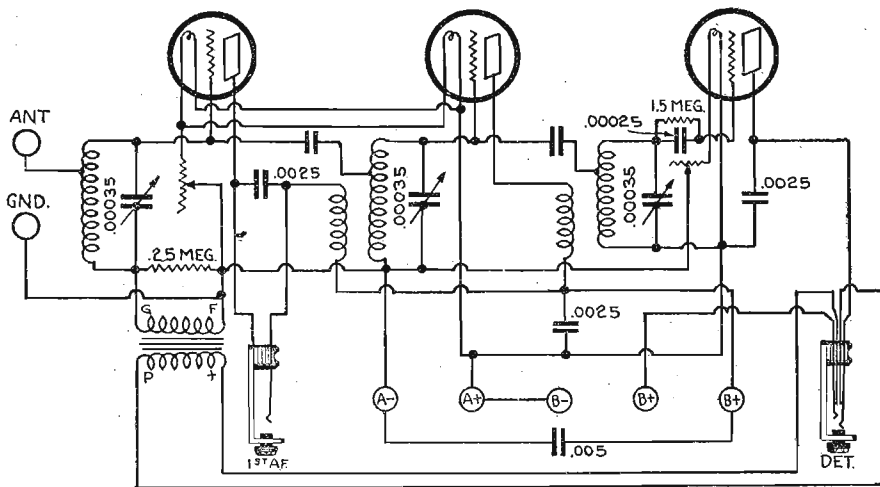
An Economical and Efficient Hook-Up

By H. J. Marx

A FAN who had just made up his mind to build the five-tube neutrodyne set recently described, when he noticed that a Reflex neutrodyne circuit was promised which was to be the ultimate in combining these features, requests advice whether he should wait for this article or he could change his set to a Reflex if he so desires. Then he goes on to request a frank opinion relative to the apparatus sold by various dealers and mail-order houses advertised in this and other publications. The subjects mentioned are of such prime interest to many fans that it might be well to devote this one article to a little explanation of a number of features that must be considered by the fan, by the manufacturer and by writers who present circuits through this publication.

Requirements of Circuits

First, the circuit that is presented must possess something definite, something new or of special interest to the fans. Yet it need not follow that the fan is compelled to discard his present circuit and complete a new one. It is simply a question of his own judgment as to his requirements, his ability, his interest and the limitations of his pocketbook. It might be well just to cover the reasons for presenting all the new and various forms of circuits. It is not, as sometimes supposed, just a question of giving the fan something else to worry about. Regardless of how many circuits are published, the number of letters coming in requesting hook-ups with other variations never diminish or cease. If a three-tube neutrodyne is shown, they want a two tube or four tube or even five tube. If a seven-tube super-heterodyne is



shown, then the letters start pouring in asking for five tube, six tube, eight tube, ten tube and even twelve tube circuits.

The first requirement, then, is to present hook-ups so the fan can select for himself the number of stages of amplification.

Neutrodyne circuits have been presented before. In order to get sufficient distance and volume five tubes are required. Then the fan asks for a three tube. After this is published, the letters request the same volume as the original five tube, but using only four or two tubes. The natural re-

sult is development of the Reflex Neutrodyne. The main point to be emphasized in the presentation of such a circuit is that you have not increased the efficiency of the circuit as a whole, but by reflexing some stages, you have accomplished economy in tubes and current consumption. Now, it is obvious that the moment the neutrodyne circuit is reflexed at least three or four methods with variations can be used.

Three-Tube Reflex Neutrodyne

The circuit illustrated was laid out and

tested by assembling instruments on the original baseboard. No attempt was made to panel mount the set. This was found very efficient and led to the decision of presenting a full construction article. This construction article will follow shortly and the only change to be made in the circuit is the addition of another stage of separate audio frequency amplification.

A few features of minor importance will be found a little unusual or different from circuits previously presented, but general standard practice is followed. The only caution suggested is that the audio frequency transformer should not be so placed that it lies in the magnetic field of any of the neutroformers, since this immediately creates distortion, howling and noisy reception. Care must also be taken that the grid leads, especially on the reflexed stage, be kept as short as possible and avoid parallel runs to other leads. The panel size required need not be larger than 9 by 14 inches. Two good Radio frequency amplifiers are required and a soft tube is recommended for the detector stage.

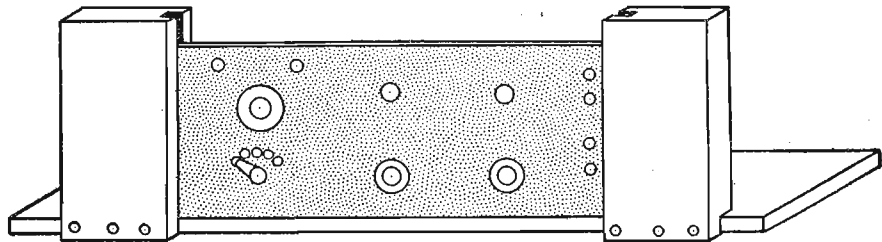
Apparatus

Selection of apparatus is important, but at the same time difficult as to recommendation of specific makes. For example, there are available on the market loud speakers ranging in price from \$10 to \$50 or more. The \$10 article simply presents the best that manufacturers can offer for the price. In the \$25 article the manufacturer is allowed more leeway and can therefore improve his article, and so on. This holds true of any piece of apparatus that any dealer or mail order house may carry.

Apparatus may be divided into cheap, good and best, and the only recommendation that can be made is that the fan buy the best he can afford. It is obvious that there is slight possibility for the manufacturer to give the best in design at the lowest price. The same problem exists everywhere, and no one can give better advice than to state that the fan is best off when his judgment is based on the limitations of his finances and the recognition of the public in general of standard merchandise that is well known by all.

Holding Large Panels While Working on Them

In working on large panels it is convenient to mount them between two matched boards, screwed to the baseboard,



with the grooves toward the center of each other. This allows the panel to be removed for inverting or reversing it.—Leonard H. Searing, Auburn, N. Y.

About Lead-In Wires

Lead-in wires should be of copper, approved copper-clad steel or other metal which will not corrode excessively, and in no case should they be smaller than number 14 gauge. Antenna and counterpoise conductors and wires leading therefrom to

ground switch, where attached to buildings, must be firmly mounted 5 inches clear of the surface of the building on non-absorbent insulating supports, such as treated wood pins or brackets equipped with insulators having not less than 5-inch creepage and airgap distance to inflammable or conducting material. Where desired,

approved suspension type insulators may be used.

In passing the antenna or counterpoise lead-in into the building, a tube or bushing of nonabsorbent insulating material should be installed so as to have a creepage and airgap distance of at least 5 inches to any extraneous body. If porcelain or other fragile material is used, it should be installed so as to be protected from mechanical injury.

A drilled window pane may be used in

place of bushing, provided 5-inch creepage and airgap distance is maintained.

Control Over Regeneration

Often, to conserve space, an inductance coil may be placed around a variable condenser.

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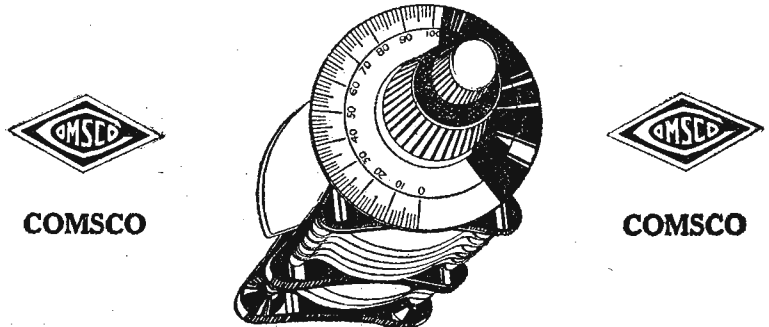
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COOLIDGE BROADCASTS FEBRUARY 12

Tuesday, February 12

CKAC, Montreal, Canada (Eastern, 425), 4:45 p. m., Musical tea; 7:00, Kiddies' stories in French and English; 7:30, Rex Battle and His Mt. Royal Hotel Concert Orchestra; 8:30, Vocal numbers, Joseph Saucier, director; 10:30, Joseph C. Smith and His Mt. Royal Hotel Dance Orchestra.

KDKA, E. Pittsburgh, Pa. (Eastern, 326), 12:10 p. m., Organ recital, Howard R. Webb; 6:15, Dinner concert, Grand Symphony Orchestra; 7:30, Industry and our Educational Institutions; Dr. William M. Davidson; 7:45, Children's period; 8:15, Special "Lincoln" program, Alexander Dunbar; 8:30, "Abraham Lincoln, the Great American," L. H. Gardner; "Abraham Lincoln and Unity," I. Charles Palmer; "Abraham Lincoln and Public Service," M. Z. Ralph; Concert, Students of the Amanda Vierheller Studio; KDKA Little Symphony Orchestra; 11:30, Special concert, Queen City Orchestra.

KFI, Los Angeles, Calif. (Pacific, 469), 6:45-7:30 p. m., Concert features presented by Emma M. Bartlett; 10:00-11:00, Movie-land program presented under guidance of Meany and Nehls.

KFKX, Hastings, Neb. (Central, 341), Rebroadcasts program of KDKA.

KGO, Oakland, Calif. (Pacific, 312), 8:00-10:00 p. m., Concert program including vocal and instrumental numbers.

KHJ, Los Angeles, Calif. (Pacific, 395), 12:30-1:15 p. m., Program presenting Mattie Taylor Nice, reader, Ray Furth, saxophonist and banjoist; Harold Southwick, pianist; Jack Lewton, tenor; 2:30-3:30, Matinee Musical, Americanization Program; 6:45-7:30, Children's program presented by the Pasadena (Calif.) Flfo and Drum Corps; The weekly visit of "The Sandman" and Queen Titania; Bedtime story, "Uncle John"; J. E. Storm, singer; Edith Lingerfelt, soprano, age 16 years; Mildred Lingerfelt, violinist, 12 years old; 8:00-10:00, Lincoln Day Program, presenting 160th Infantry Band, Calif. Nat. Guard, R. Burns, director; Mrs. Floryane Thompson, mezzo-soprano, "Forges Win." Dr. Thomas Lutman; 9:00-12:00, Art Hickman's Orchestra.

J. San Francisco, Calif. (Pacific, 423), 8:00-10:00 p. m., Mr. Theodore J. Erwin and Mr. John O. Engard; 10:00-11:00, E. Max Bradford's versatile band playing in the Rose Room Bowl of the Palace Hotel.

Headliners of the Week

PRESIDENT Calvin Coolidge will be heard again over the microphone. This time on Lincoln's Birthday, from WJZ. The Orpheus Male Chorus which won first prize last summer at Bisteddfof, Wales, in a world-wide contest will sing Tuesday from WJAX. Their prize-winning song, "Come Live With Me," will be one of the numbers. Tuesday afternoon, boys and girls may hear Marjorie Borrowers read "The Crazy Story of Dizzy Lizzy." She promises this will even tickle the ether waves. While you are still wondering where to tune in Tuesday look at WLW's Special Odd Fellow Program. With it is this little poem:

*"If you are an Odd Fellow you will hear it.
If you are not an Odd Fellow you should hear it.
And if you don't hear it you will be a very Odd Fellow indeed!"*
A Masked Singer and his Masked

Pianist are creating an air of mystery around WTAM, Wednesday night. Although they were well known once in concert circles and have appeared over many footlights, they will approach the microphone incognito, and even our Cleveland correspondent can't find out their names.

Amherst graduates may hear the musical clubs of their Alma Mater Friday night from WJZ. Thanks to Radio thousands instead of hundreds will enjoy the program this year. WDAR will give a theatrical concert on the same evening. Through arrangements with the producers this station has many of Broadway's biggest musical comedy stars "do their stuff" for an unseen audience.

A real oriental program will be broadcast Monday from WHAZ when the Rensselaer Polytechnic Institute students from China, Japan, Siam, India, and the Philippines will give a special Far East program.

Wednesday, February 13

CKAC, Montreal, Can. (Eastern, 425), 1:45 p. m., Rex Battle and his Mt. Royal Concert Orchestra; 4:45, Musical tea.

KDKA, E. Pittsburgh, Pa. (Eastern, 326), 12:10 p. m., Daugherty's Orchestra; 6:30, Dinner concert, Pittsburgh Athletic Association Orchestra; 7:30, "What Constitutes Vision," Representative of the Sanitation Committee; 7:45, Children's period; 8:15, "Why You Should Visit Europe This Summer," Charles Latus of the Pittsburgh Post; 8:30, Concert.

KFAE, Pullman, Wash. (Pacific, 330), 7:30-8:30 p. m., "Mining Investments," Dean L. O. Howard, school of mines; Cougar Washingtonians, Robert C. Christopher, director; Group songs, Sigma Chi Fraternity Men; "Animal Husbandry talk," Prof. George Severance.

KFI, Los Angeles, Calif. (Pacific, 469), 8:45-7:30 p. m., Concert program and Detective Stories presented by Detective Nick Harris; 10:00-11:00, Instrumental concert presented by the Hollywood Community Orchestra.

KFKX, Hastings, Neb. (Central, 341), Rebroadcasts program of KDKA.

KHJ, Los Angeles, Calif. (Pacific, 395), 12:30-1:15 p. m., Program presenting Norman Samuel, ukelele; Leontine Redon, mezzo-soprano; 2:30-3:30, Matinee Musical; 6:45-7:30, Children's program presenting Vitarion Melone, musicale reader; Frederick M. Brown, baritone; Bedtime story, "Uncle John"; 8:00-10:00, Program presented by Orpheus Four, composed of Samuel B. Glasse, first tenor; Paul Adams, second tenor; Verner A. Campbell, baritone; H. H. Dudley, bass; Dr. Mars F. Baumgardt, lecturer; 10:00-12:00, Art Hickman's Orchestra.

KPO, San Francisco, Calif. (Pacific, 423) 2:30-3:30 p. m., Concert by Louisiana Five Synopsators; 4:30-5:30, Rudy Seiger's Fairmont Hotel Orchestra by wireless telephony; 5:30-6:00, Children's half-hour; stories for children by "Big Brother" of KPO; 8:00-11:00, A short talk will be given about the Boy Scouts; E. Max Bradford's versatile band playing in the Rose Room Bowl of the Palace Hotel.

KYW, Chicago, Ill. (Central, 536), 11:35 a. m., Table talk, Mrs. Anna J. Peterson; 6:50 p. m., Children's bedtime story; 7:00-7:30, Dinner concert, Congress Hotel; Joska Debabary and his orchestra; Clyde Doerr and his orchestra; 8:01-8:30, American Farm Bureau Federation; "It's What the Farmer Sees," H. W. Moorhouse; 8:30-9:30, Musical program, Chicago Musical College, D. Paul Breitwiser, director.

WBAP, Fort Worth, Texas (Central, 476), 7:30-8:30 p. m., Concert, Old Time Band of Midlothian Texas; 9:30-10:45, Concert, Floydada Chamber of Commerce.

WBZ, Springfield, Mass. (Eastern, 337), 7:30 p. m., Bedtime story for the Kiddies; "The Art of Investment," Donald McClench; 8:00, Edna Doris Winn, pianist; Mrs. Follis P. Gould, soprano; Pearl Leahy, accompanist; 9:00, Bedtime story for grown-ups, Orison S. Marden.

WCAE, Pittsburgh, Pa. (Eastern, 426), 4:30 p. m., The Sunshine Girl; 6:30, Dinner concert, William Penn Hotel; 7:30, "Uncle Kaybee"; 8:15, Address, Arthur Deerin Call; 8:30, Program, Universal Serenaders.

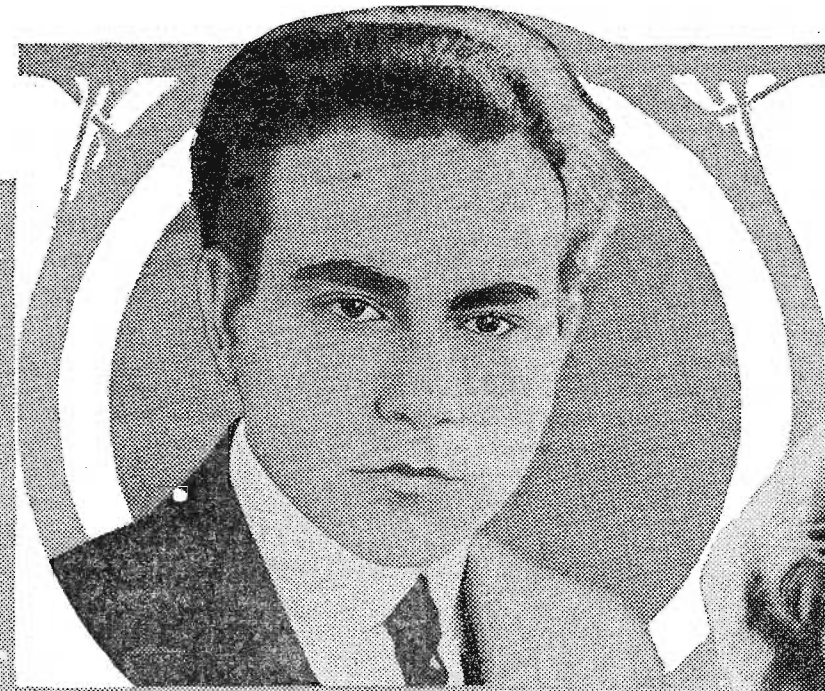
WGAL, Northfield, Minn. (Central, 360), 10:00 p. m., Second Annual Radio Program, Northfield Post, No. 84 American Legion; Speakers; Arthur O. Lee, Frank Clark, Victor E. Carlson; J. Oliver Sletten, bugler; Marc Harkins, tenor; Mrs. Lester T. Banks, accompanist; Northfield Post Drum and Bugle Corps; American Legion Quartet; War Historians; Osmond Felland, Marc Harkins, Oliver Macheack, Talford McGuire.

WCAP, Washington D. C. (Eastern, 469), 7:30-10:00. Joint program with WEAF.

WDAP, Chicago, Ill. (Central), 7:00-8:00 p. m., Concert given by the Drake Concert Ensemble (under the direction of Henry Sellinger) and the Blackstone String Quintette (under the direction of Irving Margraff); 8:00-8:30 p. m., Classical Music program on the Barton Organ by Ralph Emerson; 10:00, Studio Artists; Rosemary Hughes, Soprano; Frederick W. Acard and Bob Cough; Jessie and Nuber; Jack Chapman's Orchestra. ALSO—Ralph Emerson will play every evening during our 10:00 p. m. program on the Barton Organ at 10:10 p. m.

WDAR, Philadelphia (Eastern, 395), 11:45 p. m., Daily Almanac; 12:02, Stanley Theater organ recital; Arcadia Cafe Concert Orchestra; piano solos, Edna Elmhurst; 2:00-3:00, Arcadia Cafe Concert Orchestra; 7:30, Dream Daddy's bedtime stories; 7:50, Dramatic review, Arnold Abbott.

WEAF, New York, N. Y. (Eastern, 492), 11:00-11:30 a. m., B. R. Baumgardt on "The Einstein Theory of Relativity"; 11:50-12, U. S. Dept. of Agriculture; 3:30-4:00 p. m., Alumni Service Columbia University; Chapel; 4:00-5:00, Dave Harman's Orchestra; 7:30-7:40, Thornton Fisher; 7:40-8:10, Bomar Crauser, pianist; 8:10-8:20, American Surety Co.; 8:30-8:50, Brooklyn Daily Eagle News Review; 8:50-9:15, Edgar White Burrill; 9:15-9:30, Frances Kilburn, soprano; 9:30-11:00, National Republican Club Banquet—speakers, Senators Elsborg and Wadsworth and President Calvin Coolidge.



Here are three favorites of the Sunday evening performers, whose program is broadcast from WEAF, the American Telephone and Telegraph Company's Capitol Theater station, New York City: Left, Betsy Ayres, better known, perhaps, as the "Texas Nightingale; right, Gladys Rice, soprano, one of "Roxie's Gang," and above, David Mendoza, conductor of the theater's Capital Grand Orchestra, said to be the largest organization of its kind in the world. WCAP, Washington, D. C., connected by direct wire to WEAF, rebroadcasts the same program. On February 17 fans will have an opportunity to hear them by tuning in either station.



KYW, Chicago, Ill. (Central, 536), 11:35 a. m., Table talk, Mrs. Anna J. Peterson; 2:35-3:30 p. m., Studio program; 6:50, Children's bedtime story; 7:00-7:30, Dinner concert, Congress Hotel; Joska Debabary and his orchestra; Clyde Doerr and his orchestra; 8:01-8:30, American Farm Bureau Federation; "It's What the Farmer Sees," H. W. Moorhouse; 8:30-9:30, Musical program, Chicago Musical College, D. Paul Breitwiser, director.

WBAP, Fort Worth, Texas (Central, 476), 7:30-8:30 p. m., Concert, Old Time Band of Midlothian Texas; 9:30-10:45, Concert, Floydada Chamber of Commerce.

WBZ, Springfield, Mass. (Eastern, 337), 7:30 p. m., Bedtime story for the Kiddies; "The Art of Investment," Donald McClench; 8:00, Edna Doris Winn, pianist; Mrs. Follis P. Gould, soprano; Pearl Leahy, accompanist; 9:00, Bedtime story for grown-ups, Orison S. Marden.

WCAE, Pittsburgh, Pa. (Eastern, 426), 4:30 p. m., The Sunshine Girl; 6:30, Dinner concert, William Penn Hotel; 7:30, "Uncle Kaybee"; 8:15, Address, Arthur Deerin Call; 8:30, Program, Universal Serenaders.

WGAL, Northfield, Minn. (Central, 360), 10:00 p. m., Second Annual Radio Program, Northfield Post, No. 84 American Legion; Speakers; Arthur O. Lee, Frank Clark, Victor E. Carlson; J. Oliver Sletten, bugler; Marc Harkins, tenor; Mrs. Lester T. Banks, accompanist; Northfield Post Drum and Bugle Corps; American Legion Quartet; War Historians; Osmond Felland, Marc Harkins, Oliver Macheack, Talford McGuire.

WCAP, Washington D. C. (Eastern, 469), 7:30-10:00. Joint program with WEAF.

WDAP, Chicago, Ill. (Central), 7:00-8:00 p. m., Concert given by the Drake Concert Ensemble (under the direction of Henry Sellinger) and the Blackstone String Quintette (under the direction of Irving Margraff); 8:00-8:30 p. m., Classical Music program on the Barton Organ by Ralph Emerson; 10:00, Studio Artists; Rosemary Hughes, Soprano; Frederick W. Acard and Bob Cough; Jessie and Nuber; Jack Chapman's Orchestra. ALSO—Ralph Emerson will play every evening during our 10:00 p. m. program on the Barton Organ at 10:10 p. m.

WDAR, Philadelphia (Eastern, 395), 11:45 p. m., Daily Almanac; 12:02, Stanley Theater organ recital; Arcadia Cafe Concert Orchestra; piano solos, Edna Elmhurst; 2:00-3:00, Arcadia Cafe Concert Orchestra; 7:30, Dream Daddy's bedtime stories; 7:50, Dramatic review, Arnold Abbott.

WEAF, New York, N. Y. (Eastern, 492), 11:00-11:30 a. m., B. R. Baumgardt on "The Einstein Theory of Relativity"; 11:50-12, U. S. Dept. of Agriculture; 3:30-4:00 p. m., Alumni Service Columbia University; Chapel; 4:00-5:00, Dave Harman's Orchestra; 7:30-7:40, Thornton Fisher; 7:40-8:10, Bomar Crauser, pianist; 8:10-8:20, American Surety Co.; 8:30-8:50, Brooklyn Daily Eagle News Review; 8:50-9:15, Edgar White Burrill; 9:15-9:30, Frances Kilburn, soprano; 9:30-11:00, National Republican Club Banquet—speakers, Senators Elsborg and Wadsworth and President Calvin Coolidge.

WFAA, Dallas, Texas (Central, 476), 12:30-1:00 p. m., Address, DeWitt McMurray; 8:30-9:30, Musical recital, artists at the Scottish Rite Cathedral, H. B. Criswell, chairman; 11:00-12:00, McFall's Merrymakers in popular dance music.

WFI, Philadelphia (Eastern, 395), 12:30 p. m., Meyer Davis, Bellevue Stratford Orchestra; 3:00, Piano solos, Caroline Hoffman; 6:00, Bedtime stories; 6:30, Meyer Davis Bellevue Stratford Orchestra.

WGI, Medford Hillside, Mass. (Eastern, 360), 12:00 p. m., Selections on the Ampico; Amrad Round Table; Selections on the Brunswick Console; 2:00 p. m., Amrad Women's Club Program; 3:45, "Tuesday Tea Talk," David McGregor Cheney; 6:30, Meeting of Big Brother Amrad Club; 7:00, Evening Program; "Africa from Cape Town to the Congo," A. S. Flint; Special Holiday Program, Lincoln's Birthday.

WGR, Buffalo, N. Y. (Eastern, 319), 12:30-1:00 p. m., George Albert Bouchard, organist; 4:00, Tea time music, Martha Gompf, harpist; Katherine Staug, violinist; 7:30-7:30, Vincent Lopez Hotel Stetler orchestra; 7:30, Digest of the day's news.

WGY, Schenectady, N. Y. (Eastern, 380), 2:00 p. m., Music and household hints, U. S. Dept. of Agri.; 7:45, Turner Male Chorus, Frank Kimun, director; Wilhelmina Schneider, pianist; Mrs. Gertrude Wemyle Craig, reader; "Regenerative Radio Receivers," R. H. Langley.

WHAS, Louisville, Ky. (Central, 400), 4:00-5:00 p. m., Strand Theater Orchestra; Walnut Theater Orchestra; Selections, Alamo Theater organ; 7:30-9:00, Concert, Al Gorman's Novelty Orchestra; Reading: An Interesting Historical Episode.

WHB, Kansas City, Mo. (Central, 411), 12:35 p. m., Popular music, Sweeney Radio Orchestra; 2:00-3:00, Ladies' Hour Program, Classical and Popular music, Sweeney Radio Orchestra; 7:00-7:30, Educational program, "Fetter Homes and Buildings," George Parrish, pianist; Weekly W. C. T. U. talks, Mrs. F. L. Taylor on "Lincoln"; 8:00-10:00, Regular Tuesday evening musical; "Lincoln," E. J. Sweeney; Theresa Petrow, soprano.

WHN, New York, N. Y. (Eastern, 360), 3:45-4:30 p. m., Bob Schafer & His Entertainers; 9:30-9:45, Geo. M. Sage of Natl. Security League in talk on "Abraham Lincoln"; 10:00-10:15, Mircconi Bros. accordion solos; 10:15-10:30, Hon. Milton W. Sutton in talk; 10:30-11:00, Shapiro Bernstein Entertainers; 11:15-11:30, Edith Herlick, soprano.

WIP, Philadelphia (Eastern, 509), 1:00 p. m., Organ recital, Karl Bonawitz; 6:05, Dick Music, Dick Regan and his WIP Little Symphony Orchestra; 7:00, Uncle Wip's bedtime stories; 8:00, Dramatic review, Elliot Lester; 10:15, Ted Weems and his Cafe L'Aiglon Orchestra; Charlie Kerr and his Hotel St. James Orchestra.

WJAX, Cleveland, Ohio (Eastern, 390), Program furnished by the Cleveland News-Leader; 7:30 p. m., Bedtime story by E. G. Johnson; 7:45, Concert by the Orpheus Male Chorus, Mr. C. D. Dawe, director. "The Crusaders," by The Chorus. "The Song of Steel," by G. H. McCullough, basso. "The Blue Danube," by the Chorus. "For You Alone," by E.

Bryn Evans, tenor. "All Praise to God in Light Arrayed," by the Chorus. "The Banelero," Alvin E. Hart, baritone. "Deep River," by a double quartette. "Bedouin Love Song," Fred VanLuit, baritone. "Come Live With Me," Chorus. "In Native Worth," Frederick B. Fleming, tenor. "The Nun of Nideros," by the Chorus. "Aera," C. C. Chapel, tenor. "As Torrents in Summer," by a quartette. "The Trumpeter," James Blair, basso. "The Lost Chord," by the Chorus. "Until," T. Herbert Davis, tenor. "Lullaby" and "If I But Knew," by the Chorus. "There Is No Death," W. Giffin, baritone. "Tenor and Baritone," duet, Messrs. Evans and Blair. "Soldier's Chorus from Faust," by the Chorus; Contralto solos, selected; Mrs. Alice Shaw Duggan; Piano solos, selected; Mr. Ben Burt.

WJAZ, Chicago, Ill. (Central, 448), 10:00 p. m., Mrs. George Ehrmann, soprano; Merle Bailey, tenor; Maryan A. Rozyski, Oriole Orchestra.

WJY, New York, N. Y. (Eastern, 405), 7:30 p. m., Etiquette talk, Doubleday Page Co.; 7:40, Lincoln program, auspices of the Abraham Lincoln picture; 8:40, Carlyle Straub, poet; 9:15, China Society Dinner, Speeches, Prof. Henry Fairfield Osborn, Chairman of the American Museum of Natural History; Roy Chapman Andrews.

WJZ, New York, N. Y. (Eastern, 455), 2:15 p. m., Luncheon, auspices of the Women's National Republican Club, Speeches, Hon. Walter F. Brown, Hon. H. Ed. Marshall, Senator Frank B. Willis; 3:30, Recital, Julitta Comin, soprano; C. Allen, accompanist; 3:45, Bernard Frank, harmonica player; 4:00, Harper's Bazaar Fashions; 4:15, Julitta Comin; 4:30, Richard Douglas, songs with ukelele; 5:00, Joseph Serman, harmonica player; 5:15, Shirley Hess, reader; 7:00, "Abraham Lincoln," William E. Martin; 7:15, Supper music, Paul Specht and his Alamo Hotel Orchestra; 8:15, American Orchestra Concert; 9:00, Proceedings, Annual Lincoln Dinner of the National Republican Club, Speech, President Calvin Coolidge, Senator Wadsworth.

WLW, Cincinnati, Ohio (Central, 309), 4:00 p. m., Topics for Women, Times-Star News; 10:00, Special Odd Fellow Program.

WMAQ, Chicago, Ill. (Central, 447.5), 2:30 p. m., Lincoln Memorial program; 4:20, Items of interest to women; 4:30, Pupils from Glenn Dillard Gunn School of Music; 5:00, "Busy Lizzie," for children, Marjorie Barrow, Assistant Editor of Child Life; 7:00, "America, My Country," E. E. Miller, baritone; 8:30, "Lincoln," Mrs. Eleanor Gridley; The Gettysburg address, Col. Julius Kline; 9:15, LaSalle Hotel Dance Orchestra.

WMC, Memphis, Tenn. (Central, 500), 8:30 p. m., "The Puritan in Two Continents," Dr. S. Parkes Cadman; 1:00, Frolic; Yancy and Bookers' Orchestra.

WOC, Davenport, Iowa (Central, 484), 12:00 p. m., Chimes; 3:30 p. m., Lecture, "Mumps," A. G. Kierichs; 5:15, Chimes.

WOO, Philadelphia (Eastern, 509), 11:00 a. m., Organ recital, Mary E. Vogt; 12:00 m., Wanamaker Crystal Tea Room Orchestra; 4:45 p. m., Organ recital, Mary E. Vogt.

Health Bureau; 10:00-2:00 a. m., Midnight revue; Clyde Doerr's orchestra; J. Remington Welch, organist.

WBAP, Fort Worth, Texas (Central, 476), 7:30-8:30 p. m., Concert, E. U. Taylor, Jr., baritone; 9:30-10:45, Concert, George Freeman's Sooner Serenaders.

WBZ, Springfield, Mass. (Eastern, 337), 6:00 p. m., Dinner concert, WBZ Quintette; 7:30, Bedtime story for the Kiddies; Humorous program; Story for Grown-ups, Orison S. Marden; 11:00, Chamber music, WBZ Quintette, Kathleen E. Delehanty, pianist.

WCAE, Pittsburgh, Pa. (Eastern, 426), 3:00 p. m., Fred Rosenfeld, pianist; 4:30, Sunshine Girl; 6:30, Dinner concert, William Penn Hotel; 7:30, Popular songs; 8:30, Musical program, Black & White Melody Boys.

WDAP, Chicago, Ill. (Central), 7:00-8:30 p. m., Concert by Drake Concert Ensemble and Blackstone String Quintette; 10:00, Studio program furnished thru courtesy of Lake Forest School of Music; Jack Chapman's Orchestra; 10:10-10:25, Program on the Barton Organ by Ralph Emerson.

WDAR, Philadelphia (Eastern, 395), 11:45 a. m., Daily Almanac; 12:02 p. m., Stanley Theater organ recital; Arcadia Cafe Concert Orchestra; 2:00-3:00, Arcadia Cafe Concert Orchestra; 7:30, Dream Daddy's bedtime stories; 7:41, Features from Stanley Theater; 8:00, Stanley Theater Orchestra, Josef Pasternack.

WEAF, New York, N. Y. (Eastern, 492), 11:00-11:15 a. m., Columbia University; 11:15-11:30, N. Y. Tuberculosis Society; 11:45-12:00, U. S. Dept. of Agriculture; 12:00-12:15 p. m., Noon Chapel Services at Columbia Univ.; 4:00-4:15, Michael Harapi, Hawaiian Guitar; 4:15-4:30, Morton Sherdahl, baritone; 4:30-5:00, Marguerite Gilbert, soprano; 5:00-5:30, Children's Hour Stories; 7:00-7:30, United Synagogue of America; 7:30-7:40, Thornton Fisher; 7:50-8:10, American Agriculturist; 8:10-8:20, Reid Ice Cream Co.; 8:30-8:45, National Surety Co.; 8:45-9:15, Fanny Wilson Palmer, pianist; 9:15-9:45, Joseph Kulumayer, violinist; 9:45-10:45, Harold Land and group of artists.

WFAA, Dallas, Texas (Central, 476), 12:30-1:00 p. m., Philadelphia Program, Rod Head Girl.

WFI, Philadelphia (Eastern, 395), 12:30 p. m., Meyer Davis, Bellevue Stratford Orchestra; 6:00, Bedtime stories; 6:30, Meyer Davis Bellevue Stratford Orchestra.

(Continued on page 16)

How to Drill Glass for Making Cabinet Panels

Simple and Inexpensive Tools Required for the Work

By Lyman M. Forbes

AT RADIO expositions to be held in various cities, manufacturers will exhibit sets in plate glass, which may cause fans to say, "How can I own one like that." After pricing such sets the obvious answer to most will be, "Build it yourself"; in which case, be prepared for discouragement. Perhaps your family will suggest your head should be examined, your friends may call you crazy, and perfect strangers may tell you that it can't be done successfully, but remember that when your set is finished, those who talked the loudest will be the first to pat you on the back.

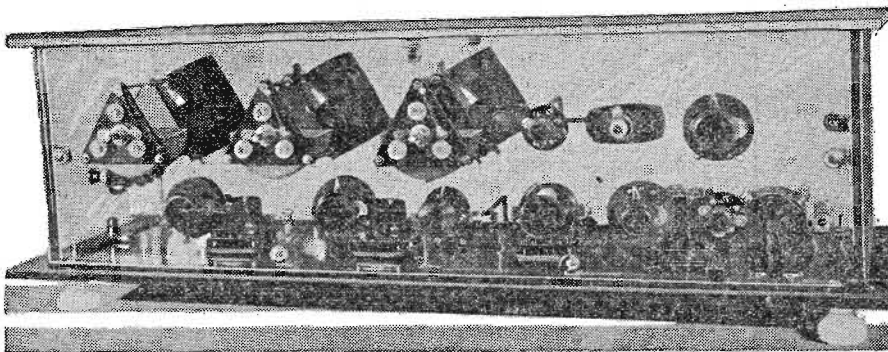
Anyone who can build a Radio set can make a plate-glass panel or cabinet with five or six dollars' worth of simple tools, some of which are already to be found in most homes. Glass is strong and when handled properly offers little danger of breakage. It is a better dielectric than common insulating materials now in use and is considerably cheaper. The average Radiophan can lay out, drill and fit glass just as he would any other material, for it is entirely a matter of knowing how.

Panel Built for Neutrodyne Set

The information given in this article is partly the result of building the Radio Digest five-tube Neutrodyne, (see issues of August 25, September 1, 8 and 15, 1923) in glass. For those who might be interested in the dimensions and materials, they are given as follows; but the main purpose of the article will be to show the Radiophan how to adapt glass to his own requirements. On the set illustrated herewith, the cabinet was made as follows:

- Base, 3/8-inch black glass, 30 1/2 inches by 10 1/2 inches, polished edges.
- Top, 1/4-inch plate, 29 1/2 inches by 9 1/2 inches, polished edges.
- Front and Back, 1/4-inch plate, 28 inches by 8 inches, ground edges.
- Ends, 1/4-inch plate, 3 inches by 8 inches, ground edges.
- 6 yards 3/8-inch felt.
- 14 3/8-inch nickelplated brass show-case brackets.
- 28 round-head fitted nickel screws, with rubber washers.
- 36 3/8-inch rubber washers.
- 4 white glass legs.

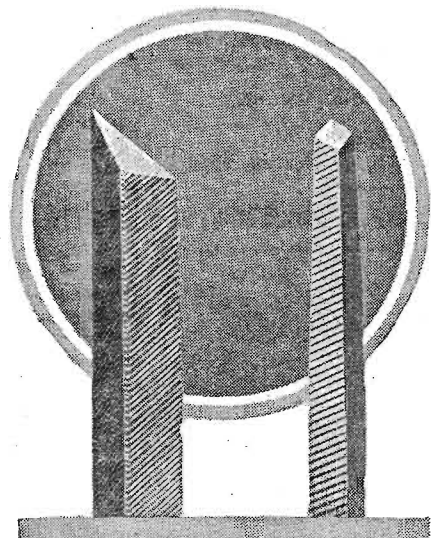
The glass was purchased retail, cut ground and polished, and cost \$11.50, while fittings and incidentals totaled about \$5 more. The legs used are white glass knobs such as those on kitchen or medicine cabinets, costing 25 to 50 cents each according to size. Double binding posts were used, with a metal head inside the set and a rubber post outside, so that



all battery connections could be made without raising the top.

The few tools needed for drilling glass are the following: one medium sized three-cornered file; one small square file; one rattail file; one carpenter's brace; one small rotary grinder and one oilcan and some turpentine.

The files, which are used as drills, are prepared by grinding, as follows: Take the three-cornered file, lay a flat face



against the stone, then, holding the file at a suitable angle, grind until you have a triangular, slanting face on the end. (See illustration.) Then lay the flat faces of the square file on the stone and grind off the cuttings for about 2 inches from the end. This gives you a smooth, four-sided tool. Now put a diamond-shaped, slanting face on the end and you have an

instrument which can be used for drilling and for enlarging small holes. (See illustration.) When grinding the files do not run the stone so fast that you overheat the point of your drill, or it will become brittle.

When buying the glass ask the dealer or glazier for some small broken pieces to practice on. Prepare your worktable by

fastening your grinder in a convenient place, then lay some large, thick magazines on the table. When drilling the glass always keep it upon a cushion of magazines or upon a soft bed of fresh putty; never on the hard table top.

Try on Pieces First

Experiment by mounting any spare parts you happen to have upon the small pieces you intend to practice on. Assuming that you have a rheostat, requiring a 3/8-inch hole for the center shank and two small countersunk holes for the screws, lay the glass on a magazine and measure off the point you wish to drill, marking the spot with the sharp end of a tooth pick, dipped in India ink, or with a drill point. If using the latter method, hold the file firmly in your hand with the point on the glass. Bear down and twist the drill several times until you hear a grating or scratching noise.

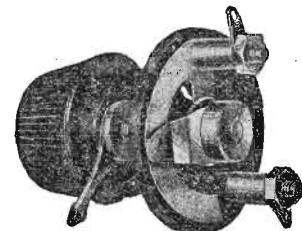
Now fasten the triangular file in the brace, just as you would grip a bit or drill. Take the brace by the round knob and hold it erect over the glass, guiding the drill to the prick point. Take your

(Continued on page 28)

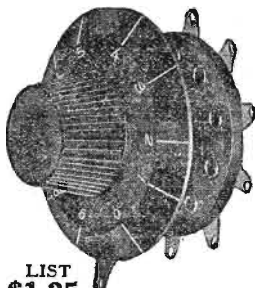
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2-LO, LONDON, ENGLAND ON ONE TUBE

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 overland 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

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Cannot Monopolize Everything

The Air Is Just as Free Today as Ever

THOSE who have been diligently working to monopolize everything within sight in the Radio business seem to run up against a snag wherever they turn. Nowadays the Government does not allow anybody to drive some necessary article into the corner, then make the public pay for it at his own prices, or in other words, make the individual beg for what he wants, and when he does get it, pay an enormous price for it.

No, the Government accuses eight corporations of combining and conspiring to monopolize the supply of Radio apparatus. While this conspiring element has been diligently working, time has traveled on also and the basic patents are about run out so that anybody can manufacture the apparatus. The main danger would be the monopolizing of the ether by the big telephone companies, but there need be no fear of that at present.

Nothing Omitted

Listener Can Tune in to Any Kind of Program

EVERY conceivable form of education and entertainment can be enjoyed from listening in on a Radio receiving set. A review of programs planned by some of the larger broadcasting stations confirms this. A great variety of subjects are covered each week, such as travel, lectures, talks by well-known persons, quartet, duet and solo music; business talks, children's stories, readings, joint recitals, farm, market and stock reports; sport events, fashion talks, time signals, and weather forecasts; humor, current events, book reviews, dance music and church services and bible classes every Sunday.

That is not all. Every now and then a station announces the broadcasting of an entire play by its actors. Everything but the action goes over, and even that is explained sufficiently to make the production a success.

Now efforts are being made further to develop Radio, even to broadcasting movies. And a few years more may see the broadcasting of action itself, so that listeners may not only hear, but see the entire production while sitting at their Radio sets at home.

Making a Good Set

Haphazard Construction Cannot Produce Results

THERE is usually very little doubt in the minds of most Radiophans as to what constitutes a good receiver. The characteristics which a Radio receiver must have in order to mark it as a set worthy of praise are so well known that any Radiophan can call them off on his fingers.

When a man who knows how to get his money's worth plans to make a receiver, he knows that if he is to get the utmost satisfaction in its operation, the set must have certain well-defined qualities and characteristics. But while it is always well to set one's objective far ahead, it is not advisable to try to cover the gap that separates the novice from the expert in one leap.

A finished education cannot be acquired in a single year, and a Radio expert is not made in a few hours' study of Radio literature. If you begin in a small way by constructing one of the simpler single circuit type sets, you will get more enjoyment and a better knowledge of Radio than by trying to make a super-heterodyne or neutrodyne set.

Most people seem to have the idea that the building of an efficient Radio receiver consists merely in assembling a number of parts and connecting them in accordance with a wiring diagram. Nothing, however, could be farther from the actual facts.

After the experienced fan has soldered the last connection, he can connect up the aerial, ground and batteries, insert the tubes in their sockets, plug in his phones or loud speaker, turn on the juice and in a few minutes' manipulation of the dials tune in stations from one coast to the other loud and clear.

The fact is that the experienced person has figured out his set and will know, when it is finished, that he will get results and the set will produce the desired signals.

RADIO INDI-GEST

Broadcasting

I shot my voice into the air
Winged with ether, lightning fast,
It fell to earth, I knew not where.

Alone, in curtained room of gray
I gave my secrets to a microphone,
But find it tattled all I had to say.

My heart hurried through the velvet night
To high Cepheus, Perseus and Andromeda,
Beyond the last star-lantern's twinkling light.

I traveled faster than a giant's shout
To homes and humans scattered o'er the
sphere

And not a key was turned to keep me out.

I shot my voice into the air,
Now it is coming back to me
From unseen listeners everywhere.

From patient sufferers on their beds,
Shut-in, alone and weak of limb,
With 'phones clasped to their aching heads.

From aged mothers crowned with gray,
Who, cornered, hear the outside world
When curtain-shadows hide the joyous day.

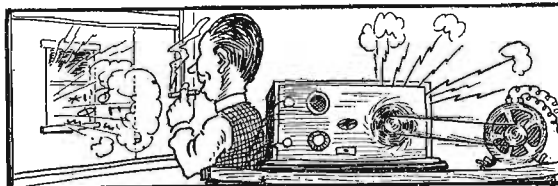
From mechanic-lads and experimental-men
Who litter tools and parts upon a bench,
But NOT from muted maids and wives who
humor men.

From thousands tuning sermon, song or show,
From tired, honest toiler, sweat-begrimed,
Come thanks for secrets spoken by the Radio.

This learned I when I spoke into the air,
That men and maids
Are mighty human everywhere.

HARRY ELMORE HURD.

Humph! Lots of People Do This



Office of the Lava Dept.,
7734 Brimstone Ave.,
The HOT Place.

Dear Indi: The following kink is very valuable if you find yourself getting behind in distance records. It is guaranteed to stop all distance records within three blocks.

First secure the noisiest set obtainable and set the tubes oscillating freely. Then get a small electric motor such as is used on sewing machines and the like. Using a piece of strong cord as a belt, harness the motor to the condenser dial of the set, turn on the current and listen to the language issuing from your neighbors' windows.

Note: If there is a Radio compass in the vicinity be sure that its owner is not a prize-fighter or I may have to get ready to receive some new members to our family, and my asbestos suit is already very much scorched. Your warmest friend,
E. SA. P.

Our Own A. & Q. Dept.

Dere indi: wen i rede yur paper tha first time i sez theres a reel paper. i sez to mi ma ime gona rite an ask sum kwetshuns so hear goas.

1. wi do i get a kweer trikuling nois wen i reseev frum cuba? i sez itz becaws tha grids leakin into tha groun. pa sez no sech thing, itz tha operatur takin a bracer. uv corse pa otta no.

2. wen lissening ta buffalow neer niagry falls i here nois like fallin watur. i sez itz becaws uv mi cateract amplifkashun. pa sez no such thing itz tha buze pourin ovur into the U. S. wich is it?

Hoapin to get mi kwetshuns ansurred, I hav,
BEN LISNING.
Answer.—Always respect your elders. Your father is right both times. INDI.

Locating the Set

Little Jack Horner sat in a corner,
Taking dad's new set to bits,
But now he's grieving, for after "receiving"
He's cautious wherever he sits.

CRANSTON (R. I.) NEWS.

There's Some Catch in Your Trap

Dear Indi: I got you. Beautiful-Loving-and-Handsome. Now I feel better acquainted and will tell you of a discovery to CUT OUT INTERFERENCE. A Guaranteed Wave Trap comes all ready to use for only 10c, if you will accept my check for \$1.00 on the 11th National Bank of Condensers, I will ship you this information to control all "strays" and waves.
INS U. LATON.

NOTICE

Readers of Indi-Gest will undoubtedly miss the weekly symposium symposed weekly by "The Mystery Man" and will probably wonder what has happened. Well, one way to explain it is that the Queen, alias Maggie, crowned the King in a little two-hit domestic bout. Maggie hit the King and the King hit the floor. Another way to explain the King's absence is that we, Indi, ourselves are negotiating with Mr. Miloplex to have him run his stuff lengthwise down our column. Which is right? Let us have your vote!
Indi.

THE SUPER AUDIBLE MICROPHONE

INSECTUS
THEY ARE TALKING ABOUT THE WEATHER, NOW THE SMALL ONE SAYS PAPAAN!



LADIES AND GENTLEMEN I WILL NOW BROADCAST HOW I GET INTO THE SOUP.



Condensed

By DIELECTRIC

Some time ago we were informed of the possible application of Radio to disease diagnosis, being told that special Radio receivers would convey to the trained ears of a physician accurate tidings of a patient's condition. Whatever becomes of that theory, enough is already established as fact to prove the value to medical science of Radiography. Operations have been performed where the anesthetic consisted of dance music coming from a loud speaker. A physician said recently that the best medicine possible to give his tubercular patients was frequent doses of Radio programs. The medical profession will shortly be apprised of the extent to which the public has benefited from their ability to tune in addresses on hygiene and health in general. Women have many opportunities to listen to experts whose knowledge of dietetics has fitted them for suggesting menus best suited to our needs. Radio: health.

You read of code fans making remarkable records for picking up amateurs—distance records—and perhaps sense an appeal in such a thing, yet have you begun to master the meaning of the dit-dahs? So many listeners to broadcasting programs have informed me of their intention to learn code so as to get all that there is in Radio transmission. There was that young American Radio operator in Tokio, Japan, whose code message to his mother in Cambridge, Ill., was picked up by an amateur in Tacoma, giving to him the credit of making the first two-way short-wave communication across the Pacific Ocean in Radio history. American amateurs have an organization, the American Radio Relay League, and it was through them that the message reached its destination. Get in the game. You may at least hear some very interesting things.

The President Harrison, first ship flying the American flag to engage in round-the-world freight and passenger service, will have not that honor alone but the distinction of having been started on her maiden voyage by President Coolidge. It always seemed more or less of a marvel to consider the pressing of a key close at hand sufficient to send electrical energy over thousands of miles of wire to open the locks of a canal, or perform some such mechanical feat at the far end. With no wire leading from the President's yacht to the President Harrison at San Francisco, the latter was signaled to leave her dock and steam away. Mr. Coolidge pressed a key which caused the big ship's whistle to blow, but this time it was the ether alone which carried the energy. What will some day come of the ability to make use of Radio in this way is beyond guessing. No doubt practical applications will abound in time.

We, in this country, were thought to have gone Radio-crazy about a year ago (a few still think so), for nearly every head-of-the-house was doing what he declared to be unjust up to then; carry packages home with him after a hard day at the office. These parcels contained dials, tubes, wire, etc., with which to make a "set." At present the tendency appears to be more decidedly in favor of the purchase of receiving sets already assembled. Now our English cousins have the "bug," and sets are multiplying very rapidly over there. This is due in large part to the reports of hearing our broadcasting on that side of the big pond. So great has the interest become that another powerful Radio station is under construction at Plymouth, to be used in relaying programs sent out by foreign broadcasting stations. Is this a commentary on the character of entertainment put out by the British stations, or simply in answer to the DX-hound's entreaties? They sit up all night now!

How to Make a Lighthouse Keeper's Receiving Set

Part II—Portable Set Suitable for Everyday Use

By S. R. Winters

MAKING the connections of the two spider web variometers is likely to cause trouble in the wiring of this simple form of regenerative circuit. Even this apparent difficulty may be surmounted if the diagram of the Lighthouse Service is faithfully followed in detail. A. W. Tupper, assistant engineer, who is responsible for this self-contained receiver, is extremely cautious about one point; that is, each pair of coils should be assembled so that when they are together and observed from one side, the wire in each will be turning in the same direction.

An arrow marked on each coil near the center on both sides will unmistakably indicate the direction in which the wire is turning in passing from the center, or start of the variometer, to the outside. Then, when the two variometers are assembled, arrange them so that the arrows on each pair of coils are pointing in the same direction. In the absence of arrow markings, it is difficult to ascertain in which direction the coil is wound after its completion. A margin of 8 inches of wire at the beginning and completion of the wiring is reserved for making connections with other instruments.

The coils D and E, as indicated in one of the diagrams, are both threaded around the same spider web in this fashion: Start at center, wind on 30 turns and secure end of wire by passing it twice through a small hole punched near the edge of the slot, pulling wire through taut each time and leaving a loose end 6 inches long.

A piece of thin wrapping twine which has had a coating of shellac or is covered with paraffin is wound thereon in two turns. This prevents contact between coils D and E. Then, begin winding coil D. The wire is made secure by passage through a small hole near the edge of the slot, as before. Thirty turns are wound on coil D, making sure that the windings are in the same direction as those of coil E. Also 6 inches of loose wire is left at the completion of this coil for making connections with instruments.

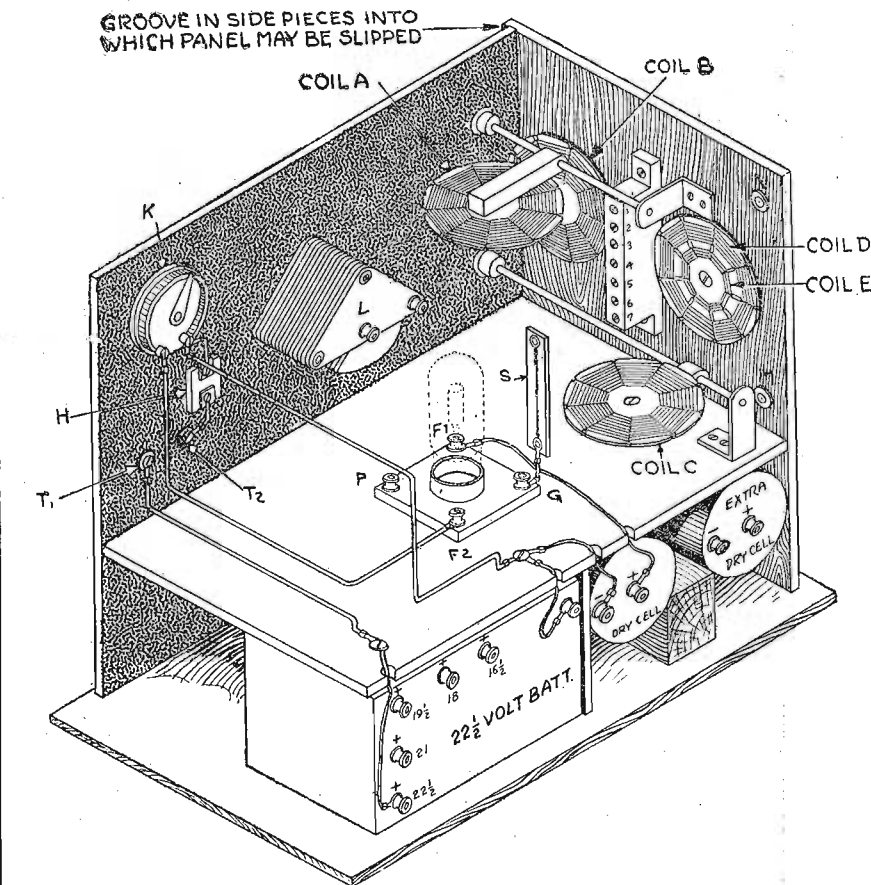
The edge of the cardboard is trimmed off to within 1/4 inch of the wire windings, and all four of the loose wires are passed through small holes near the edge of the cardboard. A little slackness in the wires that have to pass from the inside over the rest of the windings is permitted, in order that they may not rub together.

Winding of the Coils

In winding the various coils it is well to mark each of the wires with a paper tag; otherwise, their identity cannot be established once the coils are put in position. To illustrate, identify the wire coming from inside of the coil E with the letter combination I-E, the one from the outside of the coil E with the letters O-E, and so on. This system will lessen the labor.

The coils are made by cutting each slot within 1/2 inch of the center, using number 26 enameled magnet wire. Number 24 wire may be used for this purpose but the completed coils will then be considerably larger, a condition not consistent with the snugly built box or cabinet already described. That is to say, the depth of the case would have to be greater.

The coils are mounted on shafts fashioned from wood and are 1/4 inch in diam-



eter. A piece of 1/4-inch dowel stock will meet the requirements. These shafts are passed through holes in the front panel of the cabinet and are provided with knobs for turning them. The latter, with dials on them and provided with screw sets, may be purchased. But, to make the set a real homemade one, one-half of a common thread spool will suffice, the other half being inserted on the inside of the panel as a thrust collar to steady the shaft in its correct position.

The other end of the shaft is sharpened to a flat cone-shaped point to fit into a hole drilled in the spring-brass elbow, as indicated in one of the diagrams. This hole is restricted to a size of 1/8 inch or possibly a bit more, so that the shaft will not slip through. The brass elbow is so located that it will press on the end of the shaft and cause the spool thrust collar to force itself against the panel with sufficient friction to hold the coil in any position in which it may be placed by turning the knob on the receiving set.

Coil Mounting

The coil is held securely on the shaft by means of a wood strip, 1/2 inch square and 2 inches long, with a hole drilled in one end for the passage of the shaft. A pin through the strip and shaft will hold the former rigidly to the latter, provided

the shaft fits the hole snugly. The coil is fastened to the wood strip with a small flat-head wood screw; tacks or nails may be substituted, but are not recommended by the Lighthouse Service, since they will eventually work loose.

The stationary coils are fastened to the side of the cabinet by means of a flat-head wood screw passing through the center of the coil. A tiny block of wood, through which this screw passes, is stationed behind each stationary coil in order to hold it about 1/8 inch from the side of the cabinet. The stationary coils are so located that their centers will be on the same line with the centers of the movable coils when the latter are closed down against the stationary coils.

Kind of Wire Used

Mr. Tupper, considering that there would be keepers of lighthouses, rural dwellers, city dwellers, and others without any knowledge of wiring diagrams, has outlined in the minutest details the hook-up of this \$20 Radio receiving apparatus. Reasonably heavy wire is specified for the various connections so that it will retain its position once properly placed. At present regular Radio bus bar may be used. Heavy tinned copper wire may be obtained from electrical stores and other mercantile establishments handling Radio equipment. In the absence of this kind of wire, the sort used for door bells, although not so neat, will serve. The neat appearance of this wireless set may be preserved by extending the wires in straight lines, making right-angle bends when necessary to form contacts with the proper points.

Preferably, copper or brass wire terminals soldered to the ends of all connection wires should be used, if they can be obtained. Otherwise, a tiny piece of thin brass or copper is soldered to the ends of the wires, the bit of brass or cop-

(Continued on page 26)

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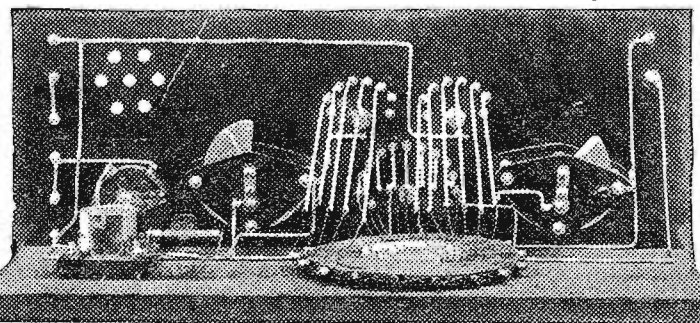
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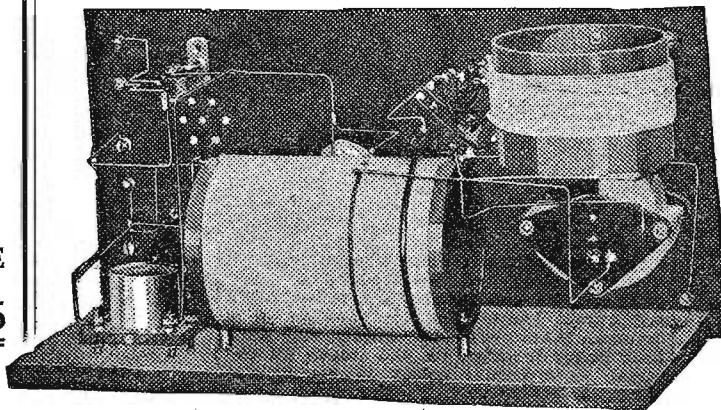
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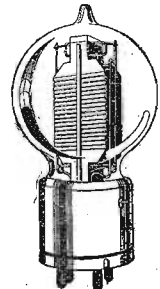
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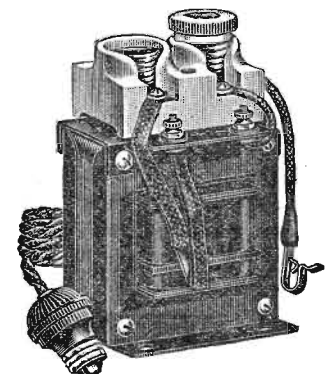
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Simple Explanation of Radio for Everybody

Chapter XI, Part I—Dry Cells and Storage Batteries

By M. W. Thompson

THE following article is the twenty-first of a series for Radio beginners, written by Marvin W. Thompson, well known in air-phone circles for his understandable style of approaching his subject. The remaining chapters will be:

- Chapter XII—Radio Frequency Amplification.
- Chapter XIII—The Neutrodyne Receiver.

WHILE the dry cells should presumably be taken up first since they are "primary" cells and sources of current, we will take up storage batteries which are really "secondary" cells, since all data regarding them are available at this time. Dynamos and primary cells are regarded as sources of energy, whereas the secondary cell is purely for storage purposes.

Electricity at Work

Electricity at work manifests itself in three ways—by its heating effect, by its magnetic effect and by its chemical effect. It is the chemical effect which is utilized in the storage cell for the storage of electrical energy. Conventionally, electricity flows through a circuit in much the same way as does a fluid, and its flow can be reversed in direction. When the direction of flow is reversed, the magnetic effect produced is also reversed as explained in the chapter on inductances; where there is a north pole produced by the flow in one direction, there will be a south pole produced when the current is reversed. A very similar effect is obtained in a storage cell. Electricity is passed through a cell in one direction to charge it and the current produces certain chemical effects on the plates of the cell. These effects are of the nature of a chemical change and of what is termed a reversible character. If the cell is then connected to a conducting circuit, the materials from which the plates are made revert to their original or uncharged state and in this process an amount of electrical energy is given out, which depends on the amount of the plate material which reverts to its original state.

Storage Battery Described

A storage battery then does not actu-

ally store electricity as we know it, since this is the function of a condenser. The three essential parts in a storage cell are the positive plates, the negative plates and the electrolyte. There must, of course, be a container of some kind, a

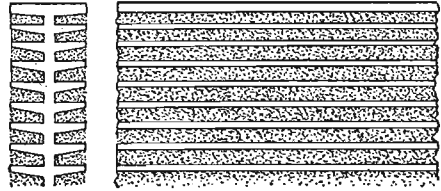


Figure 81a—Showing the grid-like structure of lead into which the paste is pressed to form a storage battery grid. This is a so-called "shelf" grid positive plate.

top which supports the plates and other small parts which are essential to mechanical construction. There are at present two types of storage cells on the market, one of which contains sulphuric acid and compounds of lead, while the other contains iron and nickel compounds and alkali solution. Since the lead-sulphuric acid type is the one in more general use, we will take it up first.

Acid Storage Battery

The positive plate of a lead cell consists of a lead support of some kind maintaining in the proper position a quantity of lead peroxide PbO₂, which is the active material. On the negative plate the active material is pure lead in a spongy and finely divided state. This spongy lead is also held in the proper position by a lead support of the ordinary, heavy, dense variety of metal. The supports—both positive and negative—may also be formed of an alloy of lead and antimony, and frequently are. It is only essential in such cases that they should not be readily attackable by the electrolyte, whether current is passing or not.

The electrolyte is dilute sulphuric acid. The conductivity of the electrolyte varies with its dilution, and a fully charged specific gravity of 1.210 or 1.215 gives about the best working results. The specific gravity at the time of complete discharge should be in the neighborhood of

1.180. By specific gravity we mean the comparative weight of a liquid in relation to the weight of water, the weight of water being taken as 1. Since mixing water with sulphuric acid results in a solution which is about one-fifth heavier than water, we say that its specific gravity is about 1.180.

Chemistry of Discharge

A cell composed of two types of plates and the electrolyte mentioned above and being fully charged, will, on connection to a conducting circuit, supply a current of electricity. In electrolysis, the current is produced by carriers of electricity called "ions." These are constituents of the electrolyte and are present as such in the solution; they are not produced by the action of the current. These ions travel in different directions—some with the current and some against it. In a solution of sulphuric acid, the ions are hydrogen and the SO₄, the former carrying a positive charge and the latter a negative one. On the discharge of a lead cell, therefore, the hydrogen ion travels to the positive plate and when there, together with the H₂SO₄ of the electrolyte, reacts with the PbO₂. The SO₄ travels to the negative plate and reacts with the

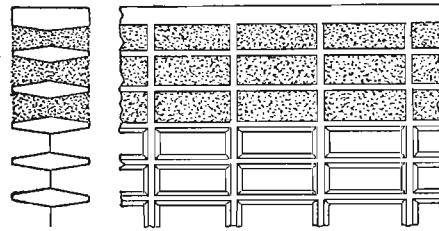


Figure 81b—"Rectangular" grid pasted positive plate.

Pb. The formula of what occurs within is as follows: At the positive plate, 2PbO₂+2H₂SO₄=2PbSO₄+2H₂O; and at the negative plate, 2Pb+2H₂SO₄+O₂=2PbSO₄+2H₂O.

Chemistry of Charging

A current passed into the cell in a direction opposite to that obtaining on dis-

charge causes the positive and negative plates to give the SO₄ they have absorbed back to the electrolyte and they revert to their original composition of PbO₂ and Pb, respectively. The following equations may be taken as representing the chem-

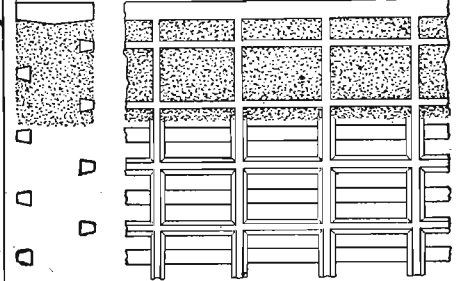
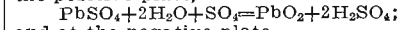
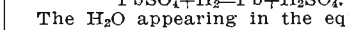


Figure 81c—"Basket" grid pasted negative plate.

ical action on charge, and it should be noted that now the SO₄ travels to the positive plate and the H₂ to the negative. In electrolytic processes hydrogen and metals always travel with the current. At the positive plate,



and at the negative plate,



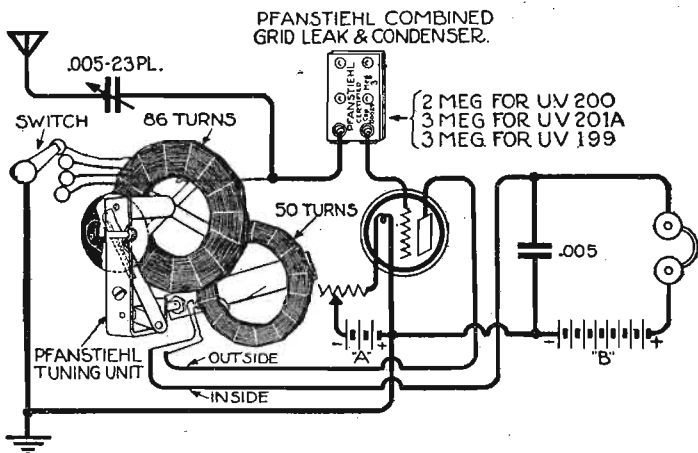
The H₂O appearing in the equation for the reaction on the positive plate is, of course, supplied from the water in the electrolyte. It will be noted in the two formulas which show what occurs on discharge, that at the end of the action both plates contain lead sulphate, PbSO₄, and water. That is the state in which they are when a battery man tells you that the plates are badly sulphated. He means that this action has gone so far, owing either to complete discharge of the battery or leaving it in a nearly discharged state for some time, that charging will not cause the plates to revert to their original chemical state.

Combination Formula

The equations which have been given for discharge and charge may be combined into one reversible equation which, read one way, represents what happens on

(Continued on page 24)

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REPLACES DETECTOR

Why Do Radio Signals Fade?

Experiment with Set between Two Stations

By Dr. M. T. Zellers

MANY attempts have been made and many theories have been advanced to explain the fading of Radio signals but without success. The United States Government conducted experiments on an extensive scale to ascertain the cause or causes of the fading but failed. The only thing discovered was the fact that there was less fading of signals transmitted by powerful stations using a long wave than of signals transmitted by weaker stations using a short wave.

This makes it appear a very complex problem. Yet I feel that my experience with fading Radio signals and the conclusions I have reached therefrom, should be published so that others may verify my findings or satisfactorily disprove my theory. Anyone who owns a receiver with which he can bring in stations from 1,500 to 2,000 miles distant can make the experiments.

Air Currents and Radio Currents

The wind blows in every direction, not at the same time but in course of time. In the morning it may be from the south, but before the sun sets it may have veered around and comes from the north. At noon, there may be a gale from the east and in less than an hour it may blow with as great velocity from the west.

These air currents may be compared to the Gulf Stream, which is a stream of water flowing through a body of water at rest. The air currents move through a body of ether at rest. These facts are all well known. Equally well established is the fact that sound can be conveyed through this ether at rest on electromagnetic currents. Now these currents also move and reverse themselves exactly as the wind or air currents move and reverse themselves, but their motion is infinitely faster than the motion of the air currents, and they reverse themselves at very much shorter intervals.

These conclusions are borne out by the fact that a person situated approximately equidistant from two stations located on opposite sides of him, may hear both stations on the same setting of his receiver, provided the wave lengths of the respective stations are the same, or nearly the same. He may hear both stations at the same time, but the signals are not very strong from either station. This condition does not continue very long. The signals from one of the stations begin to fade while those from the other station become stronger. This movement of the electromagnetic current may continue until the fading signals are lost entirely and the stronger ones increase in volume to a point where it may be necessary to reduce the voltage on the filaments in the tubes. I have had that experience a number of times.

Specific Examples

My first experience was with stations WSB, Atlanta, Ga., which is located about 900 miles east of me, and KPO, San Francisco, which is located about 1,400 miles west from me. The wave length of the former station is 429 meters, and of the latter 423 meters. Although there is a difference of 6 meters in the wave lengths of the two stations, the slight difference did not affect the volume of the signals as they came to me, now from one station, now from the other.

My next experience was with stations WDAF, Kansas City, Mo., south of me, and WLAG, Minneapolis, north of me. The wave length of the former is 411 meters, that of the latter 417 meters. Here, too, is a difference of 6 meters in the wave lengths, but as in the former case, the signals were heard distinctly and with equal loudness from both stations on the same setting of the receiver. As the signals from one station faded those from the other became louder.

Several nights later while listening to WLW, Cincinnati, 700 miles east, I was surprised to hear someone say, "This is Radio Station KGO, Oakland, Cal." I had never heard of the Oakland station before and hence was not looking for it. I had dropped into it accidentally. The to-and-fro surging of the Radio current between these stations was the same as I had experienced on previous occasions.

To make these experiments the stations must be on opposite sides of the operator. The should be approximately the same distance from the receiving station, and far enough removed from the latter to permit fading. The broadcasting stations should have approximately the same power and transmit on the same wave length. The weather conditions must be favorable for good reception.

Fading and Interference

Do not confound fading with interference. A fading signal disappears gradually while a weak signal is blotted out instantly the moment his burly neighbor steps into the arena. In course of time the faded signal creeps back. At first it is heard faintly, but gradually it becomes louder and louder until finally it comes in as loud as it was at any time before. Not so with the weak signal which was blotted out. It remains out as long as the interference continues, or until the interferer is tuned out or until the interfering station ceases to broadcast. I am now speaking of a pronounced interference. A slight interference may not entirely blot out the weak signal, but in most cases it becomes unintelligible. Stop the interference and the weak signal is back instantly, and as strong as ever.

How to Make a Grid Leak

The grid leak is of very high resistance. The ordinary grid leak is from 2 to 5 megohms in value and as the megohm is the equivalent of one million ohms, the resistance is considerable. The substances used in the manufacture of grid leaks to secure this resistance are graphite or carbon in one form or another.

A fixed grid leak is easily constructed by dipping a strip of drawing paper in India ink and allowing it to dry. The coating of carbon in the ink on the surface of the paper makes a very high resistance which is suitable for use as a grid leak. Due to the variation in the quality of the materials used, the exact size of the strip cannot be given and exact results assured.

Experiment with a strip about 1/4 inch in width and 1 inch long, coated on both sides with India ink. If the resistance is too high, which can be determined by the blocking action of the tube, the strip can be given another coating to lower the resistance.

Allow the ink to dry before trying it again, as the resistance of the leak is very low when the ink is wet. If the leak is of too low a value, the volume is greatly decreased, so cut a strip off lengthwise until the proper value is secured. Ordinary paper will not absorb enough ink, so drawing paper or blotting paper will have to be used to obtain a low enough value of resistance.

The graphite pencil mark grid leak is good and can be easily adjusted to meet the demands of the tube it is used with. It consists of a pencil mark drawn on some good insulating material, a line from the grid to the filament binding post on the socket often sufficing. The usual form is a piece of insulating material, with two screws through it placed about an inch apart, in a small groove between the two screw heads. Run a lead pencil mark between the two screw heads which form the terminals of the leak.

RADIO FOR EVERYBODY

(Continued from page 23)

discharge, and read in the other direction, what happens on charge. At Pos. Plate Electrolyte Neg. Plate
 $PbO_2 + 2H_2SO_4 + Pb = 2PbSO_4 + 2H_2O.$

Actually, there is an excess of both electrolyte and active material so that the equation does not mean that the whole of the active material is converted to lead sulphate or the whole of the electrolyte converted to water.

Positive Plates

In the manufacture of the lead-sulphuric type of storage battery, opinion is divided as to the better type of positive plate. Positive plates may be divided into two classes—Planté and "pasted." The Planté plate has been so named after one of the pioneers in storage battery work, Gaston Planté, who formed positive plates out of pure lead by a process of current reversals and without the use of masses of adherent paste. Pasted plates, as the name indicates, consist chiefly of masses of paste, which masses are supported by a suitable lead or lead-alloy frame or grid. This type of plate was originated by Camille Faure and is known sometimes as the Faure plate. The pasted type of plate consists of a lead or anti-monial-lead frame or grid, the openings in which are filled chiefly with a lead-alloy mixture. The negative plates, of similar construction, are filled with a litharge mixture. Two types of positive plate and a very good example of a negative plate are shown in Figures 81a, b, and c. The framework shown is made of lead and the paste is pressed into this framework so that it fills every corner and makes perfect contact with the frame. Plates are designed in this way to accomplish two things: to secure as large an area of paste in contact with the electrolyte as possible and also to get as much of the framework in contact with the paste as possible.

(TO BE CONTINUED.)

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wire. Wind the coil on any convenient tube; suspend it from a window and it will rival an outdoor aerial. It cannot be counted upon to give results with a crystal set, but is practical for any kind of vacuum tube receiver. It is almost always better than bedsprings, piano strings, or wires strung about the room.

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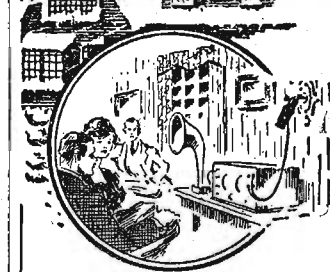
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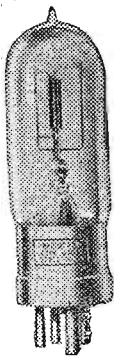


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Definition of Terms Capacity and Inductance

Discussion on Radio Instruments

By Chester N. Weems

THE following notes are answers to questions that have been raised regarding definitions of terms and expressions commonly used in describing or discussing Radio instruments.

Question. What is distributed capacity?

Answer. A condenser is composed of two parallel plates or surfaces, separated by a dielectric, which is usually air, but may be mica or any other insulating material. Such a condenser may be charged by subjecting the two plates to differences of electrical potentials; for instance, if one plate is connected to the positive terminal of an electrical circuit, the other plate to the negative terminal, the condenser will be subjected to a difference in potential that will charge the condenser. The amount of electrical charge which the condenser will take at a given difference in potential, or a close pressure between the plate, depends upon the amount of separation of the plates and the nature of the dielectric between them, and the characteristic of a condenser which enables it to take an electrical charge is known as capacity. The greater the capacity of the condenser the greater charge it will take at a given difference of potential. Two wires that are laid side by side act in themselves as a small condenser, because we have two conductors or surfaces separated by dielectric. Thus, in a Radio instrument each turn of wire in a coil has a certain amount of capacity with respect to other turns of wire in proximity. In a regular condenser the electric charges are limited to the plates of the condenser and can be considered as segregated or condensed. In an electrical coil the charges of the coil as a condenser extend along the entire length of the wire used in the winding, and for this reason is called distributed capacity.

Question. Outline accurate control of inductance of the capacity independently.

Answer. The fundamental Radio circuit consists of a closed electrical circuit containing inductance and capacity. For accuracy in tuning, it is essential that the inductance and the capacity be segregated at separate points in the circuit, and that one or both be arranged for independent adjustment. The wave length range to which the electrical circuit will respond depends upon the limited amount of inductance and capacity, and in order that

the instrument may receive messages of different wave lengths, it is essential that the operator have absolute control of the inductance and capacity independently. Where there is considerable distributing capacity in the variocoupler or variometer, which is primarily an inductance instrument, it is impossible to change the amount of inductance by adjusting the instrument, without changing the amount of capacity.

Question. How does dielectric material affect the variocouplers?

Answer. In a condenser, if the dielectric between the plates is mica, hard rubber or other material, the capacity of the condenser will be greater than if the dielectric is air. If the variocoupler has the windings on some solid insulating material like hard rubber, the presence of this material will increase the distributing capacity of the instrument in the nearest turns of the winding, and high distributed capacity in an inductance instrument is not desirable.

Question. What is the difference between the adjacent layers of wire and adjacent turns of wire?

Answer. A coil is composed of concentric layers of wire. Each additional layer of wire is adjacent to the preceding layer and to the layer that follows it in the process of winding. In a winding any turn of wire around the coil must be placed in proximity to some other turn of wire. A turn of wire is a convolution of wire around the coil, and such a turn of wire is adjacent to those nearest to it, but is not necessarily adjacent to the turns made immediately preceding to or immediately following the process of winding the coil.

Question. What are variations of inductance?

Answer. A variocoupler is a device for varying or changing the amount of inductance in a Radio circuit. Inductance is a measurable quantity in electricity like voltage or current or capacity, etc. Variocouplers or variometers are mounted in Radio sets in conjunction with an adjusting dial. When the dial reads "zero," the inductance is usually at its lowest value. As the dial is turned to higher readings the amount of inductance is correspondingly increased. Such increases or

similar changes are the variations in inductance, and such variations should correspond to equal, or like, changes in the adjustment of the dial.

Question. What is meant by the main flux through the coil?

Answer. When current is passed through an electrical coil a magnetic field is set up, which has its highest point of concentration on the inside of the coil and approximately the central point. This field is known as the field of magnetic flux. It passes through the inside of the coil along its axis, hence around the outside of the coil re-entering the coil at the opposite end. Thus, the main path of the magnetic flux of a coil passes through the coil parallel with the axis of the coil. At the outside limits of such a path there is naturally some loss in magnetic flux, because each line of flux has a tendency to repulse the other lines of flux.

Question. What is the field of the rotating coil?

Answer. From the answer to the next previous question, it will be noticed that an electrical coil has a field of magnetic flux, which may be divided into two parts. That part which is condensed and limited in its path passing through the center of the coil, and second a very extended field which passes outside of the coil. In practical Radio work we speak of the field of the coil, usually meaning that part of the magnetic flux which is passing through the inside or center of the coil and slightly beyond the limits of the coil. From this point of view, the field of the rotating coil would be cylindrical in shape and refers to the magnetic flux that is passing through the coil parallel with its axis.

Question. What is the electrical efficiency of the apparatus?

Answer. The electrical efficiency of any apparatus is usually measured by the ratio of the amount of output to the amount of input, considering two transformers. If a certain power is applied to the primary in each case, but the secondary of the first transformer gives greater power in proportion than the secondary of the second transformer, the efficiency of the first is the greater. Broadly speaking, however, the efficiency of the appar-

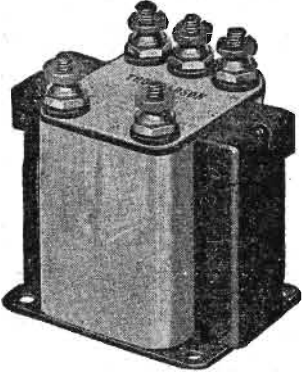
atus as applied to a Radio instrument refers to the amount of the electrical losses which occur, the instrument having the smaller electric losses being the most efficient instrument. Electrical losses in Radio instruments may exhibit themselves as heating of the windings, losses in current due to leakage or capacity effects, distortions of the magnetic fields of flux, etc. The word efficiency is often used to indicate the perfection of performance of an instrument, regardless of the question of power or electrical losses. For instance, an instrument that will tune sharply is considered more efficient than one of poor qualities in this regard.

Question. What are hysteresis losses?

Answer. The magnetic field of flux passing through and generated by any coil of a Radio instrument is the result of electrical current passing through the winding. In Radio work such currents are alternating in character. Where the alternating magnetic fields pass through any substance which is a conductor to electricity the field in turn will regenerate electrical current. By way of explanation, the signaling current, that is, one received through a coupler connected to an aerial, is generated by the magnetic field waves coming from some broadcasting stations and being intercepted by the aerial. Where the magnetic field of a coil passes through any substance conducting electricity, currents will be set up. These currents do a certain amount of work, which usually manifests itself by heating the substance in which the current is generated. Such currents neutralize a certain percentage of the magnetic field, as far as useful work is concerned in connection with the Radio circuit, and these losses are known as hysteresis and eddy

(Continued on page 28)

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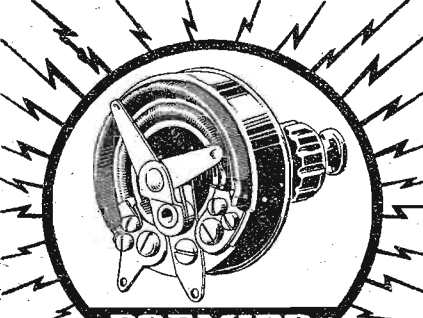
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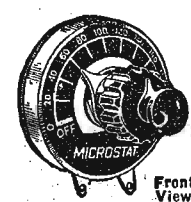
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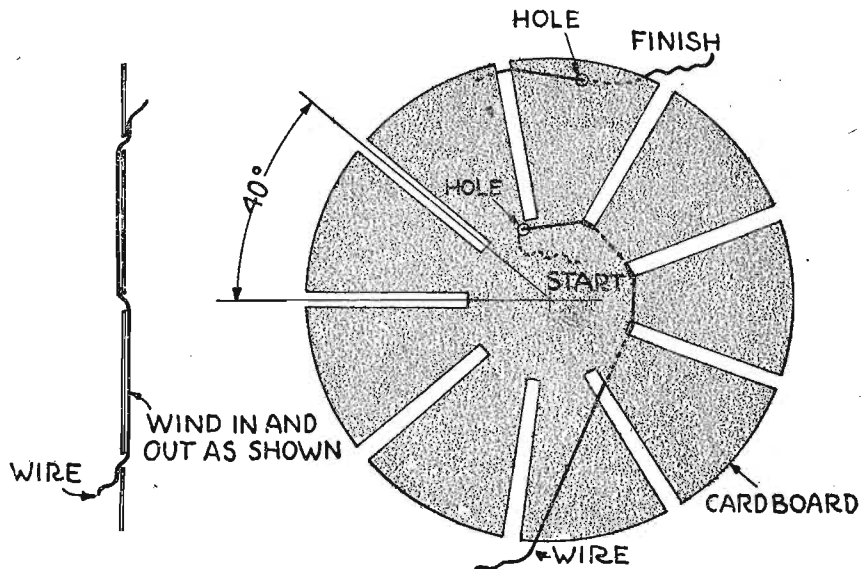
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LIGHTHOUSE RECEIVER

(Continued from page 21)

per being provided with a slot to fit the shank of the screw or binding post where the connection is to be made. The ends

denser L, which connects to the fixed plates of the condenser, and from this last point run a wire to connection F on the electron tube socket. Apparently this is a long wire, but in reality it is quite short. Next bring the outside wire of



of all wires leading from the four coils have a common meeting point at a wood block, provided with seven small round-head brass screws, under which the terminals or ends of the wires are secured. The wiring connections, as outlined by Mr. Tupper, are as follows: Starting at the antenna binding post N, extend a wire to connection 1 on the connection block. Then connect the inside wire of the movable coil A to the same connection. Give the wires from the movable coils a couple of turns around the wooden shafts before bringing them to the connection block. Now, connect the outer wire of coil A and the inner wire of coil B to connection 2. Then bring the outer wire of coil B and the outer wire of coil E to connection 3. Be sure to get the outer wire of coil E. If the wires leading from the coils have been marked as previously suggested, there will be no difficulty in leading the wires to their proper places. Next, bring the inside wire of coil E to connection 4, and make a heavy wire connection from 4 to the binding post on the variable con-

coil C and the inside wire of coil D to connection 6; the outside wire of coil D to connection 5, and the inside wire of coil C to connection 7. **Connecting Telephone Condenser** The next step in the wiring is to connect the telephone condenser H (which is .00025 mfd.) by short pieces of stiff wire and some small bolts and nuts between the telephone binding post T₂ and the right connection on the rheostat K, according to the indications in diagram. From the same telephone binding post is extended a stiff wire along the inside of the front panel and over to connection 5 on the connection block. Then, put in a heavy wire from the central binding post connected to the movable plates of the condenser L to the ground connecting binding post M. Next lead a heavy wire from telephone binding post T straight back, and fasten it to the shelf by a screw through a terminal on the end of the wire near the left-hand notch in the edge of the shelf. Under this same screw connect a strip of flexible lamp cord, on a

piece of brass picture wire having a terminal soldered to the opposite end and sufficiently long to reach any of the positive terminals on the B battery. Then, connect the P, or plate, terminal of the vacuum tube socket to connection 7 on the connection block.

Connections for Rheostat

Now give attention to the rheostat, and from the left terminal, as shown in the diagram, extend a heavy wire down, then straight back, then across to the F₂ terminal of the socket of the electron tube. From the other terminal of the rheostat (to which one side of the telephone condenser has already been connected) run a wire straight back, then straight down to the shelf about 1 inch from back edge, then across to a point about halfway between the negative connection on the B battery and the dry cell battery. The end of this wire is secured to the shelf, and soldered to it near the end are two flexible wires with terminals on the ends. These wires pass through the notches in the edge of the shelf, one to the negative terminal of the B battery and the other to the negative, or outside, terminal of the dry cell or A battery. The following step is to connect the F₁ terminal of the electron tube socket by a

flexible wire, with terminals soldered to each end, to the central or positive binding post of the dry-cell battery.

Then, on the final lap of wiring, connect one side of the grid condenser S to the L terminal of the electron tube socket with a short strip of wire bent at a right angle, making the grid condenser S stand vertical, after which connect the top of the grid condenser by a stiff wire to the antenna binding post N. The wires are secured to the grid condenser by tiny screws with nuts through eyes bent in the end of the wires or through terminals soldered to their ends.

(TO BE CONTINUED.)

Powdered crystals mounted in a tube of glass about 1/4 inch in diameter and 1 inch long will, when a connection is made to each end of the grains, make a sensitive and stable detector.

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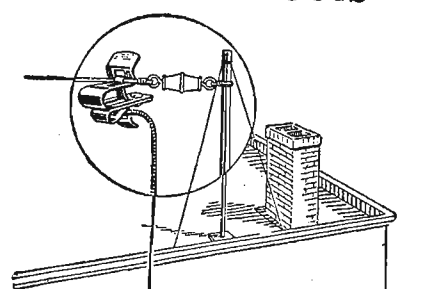
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Where an Old Phone Line Hears Foreign Plants

A True Account of a Radio Phenomenon at Brandamore, Pa.

By Myron P. Green

EDGAR D. BOYER, telegraph operator at the little railroad station at Brandamore, Pa., a very small town about seventy miles from Philadelphia, is daily experiencing Radio sensations stranger than the strangest yarns in any boys' Radio fiction story. In his little office in this isolated station, he daily receives broadcasts from stations that make the feats of the most expensive and intricate sets pale into insignificance. Imagine receiving Madrid, Spain, one night, Manchester, England, the next, and climax this with reception from Alaska! And all on the receiver of a small telephone system used only for communication along the railroad line.

When interviewed concerning this freak reception, Mr. Boyer says he is at a loss to explain the phenomenon. He has been a telegraph operator for many years at this station, which is on the Wilmington-Reading section of the Reading Railroad. He further declares he has never heard anything unusual over the telephone line, until Radio came in, as it is used today, and then, he says, he was dumfounded to hear reports coming from the Eiffel Tower in Paris.

Freak Reception

It cannot be expected of Boyer to solve the mystery of the telephone receiver at Brandamore, when well-known engineers freely state they are stumped as to the cause of the reception, although they admit that the reception comes over the line with amazing clearness and loudness.

On Christmas night Boyer, who is now a full-fledged Radio enthusiast, thought he would like to listen in on the telephone receiver in the hope of picking up a DX station. He was not disappointed, for in a short time along came signals from Madrid, Spain, testing on 20,000 meters. Mr. Boyer said he could not catch the call letters, but most of the other stuff was exceptionally clear. On the night of December 26th, he picked up Alaska. When interviewed on the subject, he was extremely calm about his freak accomplishments, and almost took it as a matter of

course that he should receive such DX on the old antiquated telephone system.

Radio Men Listen In

When he first heard the strange signals over the wire, he immediately got in touch with several Radiophans, among them Horace Beale, who operates a broadcasting station at Parkesburg, Pa. Mr. Beale forwarded Boyer's letter to Mr. Thomas Appleby, a Philadelphia Radio engineer, so that he could look into the matter. Mr. Appleby says he was naturally skeptical, but decided to take a trip to the station to ascertain exactly what was taking place and why. After a visit to the station and listening in on the telephone line, he confirmed Boyer's report of DX reception. He offers a theoretical explanation.

"It is a weird and uncanny experience for a Radio engineer to listen in on this receiver. The reception of one station at a time, or rather the automatic non-interfering properties of the system, has been unknown heretofore, and seems to involve phenomena of which Radio engineers and scientists are ignorant. The most remarkable thing about this receiver is the elimination of all but the longest wave station transmitting at any particular time.

Voice Only Heard

"When I listened in I was amazed to hear the voices of announcers and male and female singers, from many well-known stations, coming in loud enough to be heard over the entire office. Not one note of the accompanying music could be heard. The filtering medium acting upon these circuits is without parallel in Radio. I know of no means by which music accompanying a singer whose vocal tones contain the same number of vibrations could be so effectively separated as to permit only the reception of the voice to the exclusion of instrumental tones of the same frequency.

"This fact increases the mystery. Even with the volume coming in as loud as through the ordinary loud speaker, you can not hear the music that accompanies the singer. When the instrumental selections are on the air, all you can hear is the announcement. The reception is exceptionally clear, free from static and all forms of interference, and no matter how many stations may be broadcasting at the same time, the waves are automatically filtered, so that only the greatest wave length is heard.

Rectifying Action Unknown

"From observations I think the rectifying action occurs in the telegraph line, and the rectifying signals are transferred inductively to the telephone line. Both lines run parallel on the same poles for the same number of miles. A corroded connection in the telegraph line, or a high resistance electrolytic ground, such as might be formed if the branch of a tree was in contact with the telegraph line with sufficient bark worn off to expose a sap or moist surface, may be the rectifying agent in this particular instance. Whatever acts as the rectifier, however, does not interfere with the normal reception of the telegraph and telephone lines."

Mr. Boyer first heard broadcasts over the wire more than a year ago. One night while sitting at the instrument, he heard some one whistling "Listen to the Mocking Bird." He thought it was somebody walking along the road, and as it is extremely lonely in Brandamore at night,

he decided to go outside to see who was passing. When he left the office he ceased to hear the whistling, but when he entered again, he heard it. He then realized that the whistling was coming from a little horn he has on the telegraph sounder to increase the signals.

Discoverer Tells Experience

"For an instant I was scared, because I didn't know anything about Radio," he explains, "and for the want of something else to do, I reached over and took down the telephone instrument. On the telegraph sounder the whistling was coarse and interrupted, but the instant I took the receiver off the hook, the whistling poured into the room as clear as anyone could want it. Then I heard someone say, 'This is Station WOO, the Wanamaker Store in Philadelphia.' Nearly every day since that time I have heard something over the telephone, and many of the stations were distant. I wrote to Leland Stanford University, one of the stations I received, telling them of my freak set, but my letter was ignored. I wrote to many newspapers, but they probably thought I was a good-natured liar, because they also left my communications unrecognized. I don't know much about foreign languages, but I have heard

(Continued on page 30)

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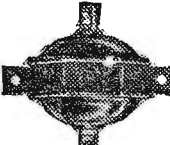
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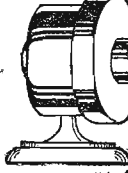
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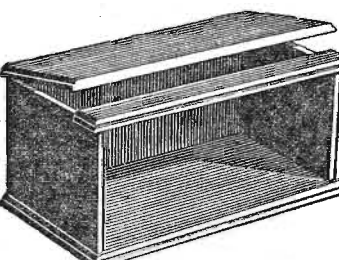
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GLASS-PANEL DRILLING

(Continued from page 19)

oilcan and place a few drops of turpentine on the glass, and you are ready.

Actual Drilling

Here comes the part which will require practice. Holding the brace by the round knob, with one hand only, tip the brace slightly, then swing it in a small, horizontal circle. This should cause the handle of the brace to whirl. When the drill is in motion, bear down on the knob, using one hand only, and you should now hear a grinding noise, which will indicate that the drill is cutting properly.

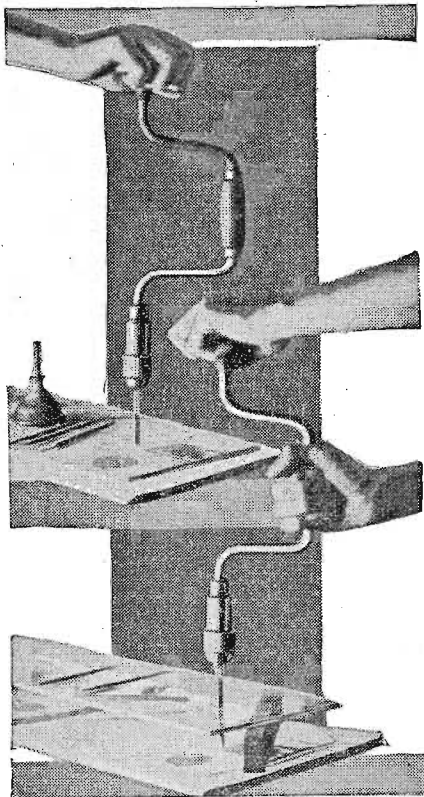
Continue until the turpentine begins to dry, or gets white from the powdered glass that has been ground away, then lift up the drill, wipe the glass and examine your work. You should now have a small cone-shaped depression. Pour on more turpentine and resume drilling, continuing until you are about three-quarters of the way through, then turn the glass over and prick the surface on the opposite side. When marking the glass in this way, get your eye directly above the hole you have started, or refraction may throw you off slightly. Drill on the other side until you meet the hole you have started, then take your small square drill and finish the hole. Here it may be necessary to raise the glass upon small blocks, which in turn should rest upon thick magazines. When enlarging holes with the square drill, hold the brace in both hands, pulling upward on the knob so that very little pressure is applied, turning the handle slowly and with a delicate touch. If the square drill does not make the hole large enough, use the three-cornered drill to finish the work.

Now push the shaft of the rheostat through the glass, put the rheostat on the shaft and mark the screw holes with a toothpick dipped in ink. Begin again with the three-cornered drill, making a depression large enough to take the screw head, drill deeper with the square drill, turn the glass and work through from the other side with the square drill. Bore the other screw hole, then test your work by mounting the part. You should have two countersunk holes which take the screws snugly, leaving the heads flush with the glass, while the shaft of the rheostat should fit loosely. If the screw holes are slightly out of line, take the rattail file, apply a little turpentine to the end and use it just as you would on metal or

rubber. It may then be necessary to correct the countersink, which can be done by twisting the three-cornered drill in the hole, holding the file in your fingers.

Keeping Drill Points Sharp

You will find that the drill points become dull very quickly. They should be



touched up on the grinder after drilling each hole. A very sharp point on your drill may snap off, but you will find that the sharp rough edges of the broken steel make a good cutting point.

Do not try to use a breast drill on glass, for with too much pressure the drill may snap off, and you will find that

when you press down too hard on the knob of your brace you cannot whirl the drill. Try changing hands, for you will find it tiresome to do all the work with the same hand and arm. It will seem clumsy at first to change off, but this can be learned with a little practice. Whirl the brace in the direction which seems easiest. Keep plenty of turpentine on the glass at all times.

Assembling the Panels

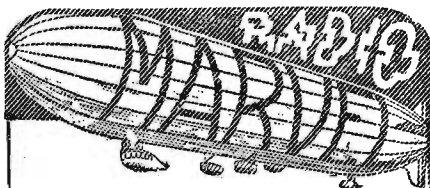
When assembling a glass cabinet do not let ground edges rest on the smooth surface of other parts. Use a piece of cloth or paper until you are ready to glue the felt edging on to the glass, which should be done after all holes are drilled and the glass has been washed. When drilling screw holes for showcase fittings make an allowance for the felt edging, so that when the cabinet is assembled all joints will be drawn tight.

When assembling a set in glass be careful about soldering. Place cloth on the base to catch any drops of hot solder which may fall, and do not overheat metal parts which are close to the glass. Use soft rubber washers on all parts to absorb the contraction and expansion of the metal. Otherwise a sudden change of temperature may crack the panel.

When drilling and assembling, remember that you are working with glass, which will serve you well if you treat it right; do not crowd it, or rush it, and when you have finished, you will have a Radio set that your family will brag about, your friends will envy, and which you yourself will think worth many times the work you have put on it.

Reasons for Radio Troubles

Never get impatient with your set. Nine times out of ten, a man familiar with Radio can find your trouble in a half minute. If you will take the trouble to familiarize yourself with the principles of Radio you can do the same. There is a reason for every Radio trouble.



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CAPACITY, INDUCTANCE.

(Continued from page 25)

current losses. It is suggested that in any advertising matter, the term hysteresis should not be used, but that the term eddy current or absorption losses be employed instead. All the ordinary insulating materials in common use, such as hard rubber, are by no means perfect insulators and at the high potentials with which we have to deal in the Radio circuit, they will introduce eddy current or absorption losses, wherever the substance is located in the path of the magnetic flux of any of the coils contained in the instrument.

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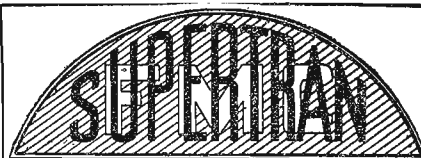
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- \$3.50 "Hedgehog" 3 to 1 & 5 to 1 Transformers 2.79

- \$25.00 Set "TADA" Neutrodyne parts...\$19.95
- \$65.00 Set "TADA" Neutrodyne parts... 51.95
- "G. E." TUNGAR 2-Amp. Charger..... 15.69
- "G. E." TUNGAR 5-Amp. Charger..... 22.95
- \$5.00 Bremer-Tully "VERNIER TUNER"..... 3.94

Workrite NEUTRODYNE Transformers (set of 3)..... 4.76

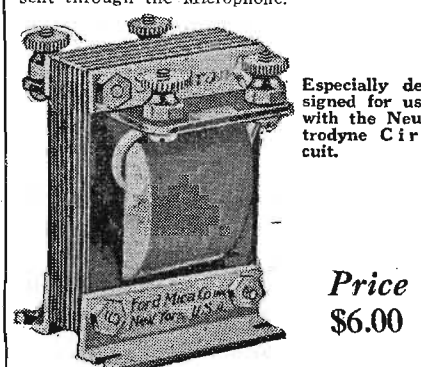
CASH OR C. O. D.—SEND FOR COMPLETE LIST
SIMPLEX RADIO SALES CO.
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Audio Frequency Transformer

GIVES REAL LONG DISTANCE

and preserves the natural tone of Broadcasting, both vocal and instrumental, exactly as sent through the Microphone.



Especially designed for use with the Neutrodyne Circuit.

Price \$6.00

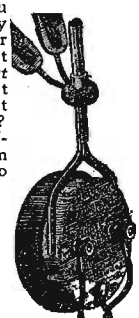
Can be used with any amplifying tube on the market with excellent results.

At your dealer—or direct by mail on receipt of purchase price.

FORD MICA CO., Inc.
33 East 8th Street, NEW YORK

Guaranteed Head-Sets

"RED-HEADS" are guaranteed radio phones. You run no risk when you buy them. Money back if, after 7 days' trial, you're not satisfied that they're the best receivers on the market at the price. Why not act right now and get a pair? It'll mean getting the maximum from broadcasting from the day you put them into use.



RED-HEAD RADIO RECEIVERS
NOW READY

The new 1924 Model F Per Pair Complete \$6.50 | The new "Red-Head" Jr. Per Pair Complete \$5.00

"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

Instruments of Excellence

- Langbein & Kaufman Variocouplers and Variometers.....\$ 7.00
- Malone-Lemmon Condensers..... 7.50
- Control-O-Meters..... 12.50
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- Curcoids—The Supreme Inductance by Means of Precision Coupling Coils. 7.50

PARTS FOR ACMEDYNE NOW IN STOCK

- Amperites.....\$1.10
- Meyers Hi-Mu Tubes..... 4.35

Radio and Mechanical Trading Corp.
23 Warren St. New York City

The NIGHTINGALE

A Remarkable Radio Set At an Unusually Low Price

The Nightingale—a non-regenerative Radio Frequency Set—combines reception merits of expensive sets with simplicity and compactness found in no other set, at a price anyone can afford.

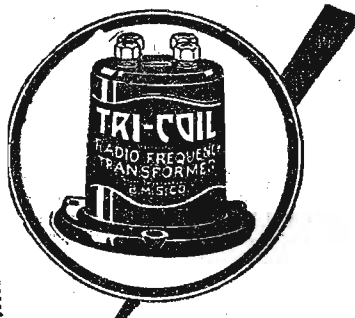
Has a four tube assembly—a detector, 1 radio frequency, 2 audio frequency with a special hook-up. Operator can use two, three or four tubes as desired. The Nightingale is remarkably simple to operate. One knob brings in station after station and keeps reception clear and distinct for any length of time. No howling or squeaking over a Nightingale.

Nightingale Only \$30

Large complete production in our own plant enables us to offer the Nightingale for \$30. Price exclusive of tubes, antenna and batteries. Here's a chance to obtain a remarkably efficient Radio Frequency set at an unusually low price. Send today for complete details on the Nightingale.

Cleveland Apparatus Company
Grafton, Ohio

want distance? use TRI-COIL



EFFICIENT!

Correctly designed, efficient—that's one of the reasons why TRI-COIL Radio Frequency Transformers can operate a loudspeaker on ONE tube. And yet the list is only..... \$2

FREE "How to Build the TRI-COIL Reflex" free at your dealer's or from us.

BROOKLYN METAL STAMPING CO.
718 Atlantic Ave. Brooklyn New York

The Stars Are Out Price \$1.25

THE STAR is a FIXT CRYSTAL DETECTOR for REFLEX OR CRYSTAL SETS.

It is a marvel of efficiency and its gold tipped filament is so secured that it may be thrown against a wall without danger of dislocation.

Try it with a horn on any good crystal set and you will have a crystal loud talker, if within five miles of any broadcasting station.

Sent on ten days' approval, postage paid, and you pay us when satisfied. All we ask that you send us the name of your dealer with your request.

PERPETUAL GUARANTEE



For Reflex and Crystal Sets
Star Crystal Company
525 Woodward Avenue, Detroit, Michigan
53 West Jackson Boulevard, Chicago, Illinois

BETTER TUNING

with BREMER-TULLY

VERNIER TUNER

Says E. E. NORTON, Akron, Ohio.

"The B-T Tuner sure gets results. With two stages of audio, I brought in KJL, Los Angeles on a loud speaker. In fact, I have brought in Pacific Coast Stations seven nights hand running from Akron. Show me anything else that will do that. (I'll buy it.)"

Says A. F. FREDLUND, 404 E. 42nd St., Chicago.

"Using the B-T Tuner and Condensers I have brought in practically every good station in the U. S., Canada and Cuba.

"Here is my record for one night: San Francisco, Portland, Calgary, Regina, Montreal, Quebec, Havana and two stations in Los Angeles. I have not bothered mentioning stations between New York and Dallas.

"Last week I built a set for a friend who reported hearing WKAQ, Porto Rico.

"Picked up Los Angeles twenty-two (22) nights in succession, mostly on the loud speaker, which goes to show that with your excellent apparatus one can pick up Long Distance Stations at will.

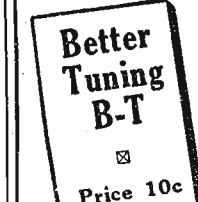
"I have hooked up all your circuits successfully and have tried out many others, but always come back to No. 2.

"These long distance stations can't be tuned in right with any other condensers I have seen except yours."

Better Tuning

Tells you why and shows you how. Sent on receipt of ten cents. Free with each tuner.

BREMER-TULLY MFG. CO.
532 South Canal Street CHICAGO



Better Tuning B-T Price 10c

More Details on Selective Tuning Coil

Results Obtained Are Satisfactory to Many

Since the appearance of the special tuner and hook-up in the January 12 issue of the Radio Digest, many letters have been received by the author of the circuit, commenting on the work it will do

WORKSHOP KINKS? EARN A DOLLAR—

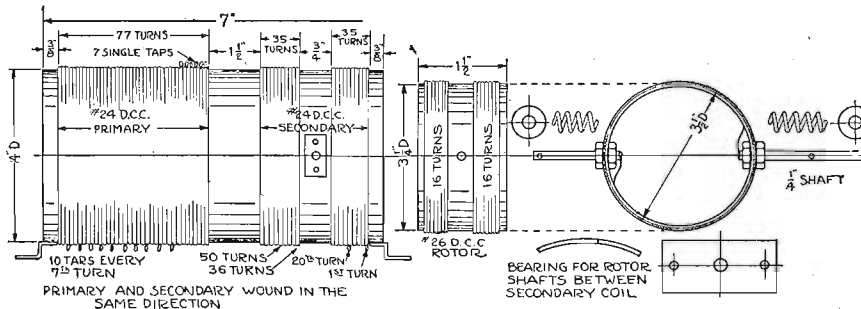
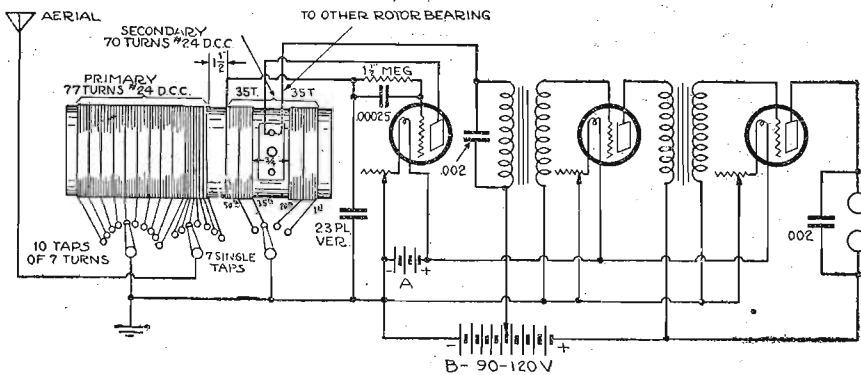
THERE are many little kinks worked out at home that would aid your fellow Radio worker if only he knew about them. There are new hook-ups, new ways of making parts and various unique ways of operating sets that are discovered every day. Radio Digest is very much interested in obtaining such material. 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,
123 W. Madison St., Chicago

and asking for further details. Many fans have built this tuner and have had unusual success with it. A letter from W. J. Gilmore, of Derby Line, says: "I have built the special tuner described in Radio Digest and it works fine and I am getting great results. What is the circuit, single or what?"

Others who have built the tuner and hooked it up with a detector tube alone want to know how to add amplification. The diagram herewith gives details of the tuner and how to place it in the circuit with two stages of audio frequency amplification. A UV-200 tube is used for the detector and UV-201A's for the amplifier. There is no question but what

HOOK-UP IN WHICH COIL IS USED



shown, it can also be used as a standard variocoupler by using the secondary windings as a primary and the rotor as a secondary, or it may be used as an inductive variometer tuner similar to the Paragon circuit. The author is using one in a super-heterodyne with regeneration, and will say that it is so selective and the tuning so sharp that stations are difficult to find.

In making the tuner, the primary and secondary windings are all wound in the same direction. A formica or bakelite tube is preferable for both stator and rotor windings. If you cannot obtain tubes of either of these materials and must use a cardboard tube, handle it very carefully so that it will not get out of shape. Coat it with collodion or paraffin before winding

on the wire. This keeps the moisture out. The windings may be coated also with the same material, but this is not necessary. Never use shellac.

The rotor tube must be as large in diameter as possible, provided it will rotate inside of the 4-inch tube. This will make the rotor windings come close to the secondary windings and is the secret of Radio frequency with this tuner. The rotor end of the tube should be

Good Rules to Observe in Building a Receiver

Cheap parts with poor electrical qualities and sloppy workmanship which add resistance and cause leaks in the circuit are responsible for virtually every failure in Radio. An amateur should exercise every effort in hooking up a set, so as to make a good job of it. Use good parts, arrange them neatly and efficiently in the cabinet, keep all wires well separated and exercise great care in soldering connections. If these rules are followed, success is almost certain.

toward the detector tube in order to have short leads. The wires for the plate of the detector tube and the first transformer, or phones, are fastened to the plates or rotor shaft bearings between the secondary windings on the outside of the 4-inch tube. The taps on the primary and secondary are taken off the top, bottom or side of the coil where it will be most convenient in the make-up of the set. Follow the diagram closely and you will be surprised at its action.

There is nothing secret or extraordinary about this tuner. It gives unusual selectivity by having both primary and secondary tapped and by placing the usual condenser across the secondary. Perfect volume control is obtained through the balanced rotor windings and close coupling of the secondary.

I would be gratified by hearing from those who try this tuner and circuit, what success they have. If you are not successful, perhaps I can help you out.—W. L. Friday, 9530 S. Robey Street, Chicago, Ill.

TEN REAL BIG REASONS WHY YOU, Yes, YOU Should TODAY ORDER and ALWAYS USE WHERE I GO BY RADIO

The New Radio Record Book Now Being Used Every Night Everywhere

1. It is Handy, Complete, Convenient.
2. Shows at a glance When, Where, How and What You Heard.
3. Every line a complete record, giving Date, Hour, Weather Conditions, Station Call Letters, Location, Kind of Program, "Tuning in" Combinations, etc.
4. How to Measure Distances and Get Best Service.
5. Accurate Official List of Broadcasting Stations corrected to November 15th.
6. Special copyrighted symbols make recording easy.
7. Enable you to keep permanent records of everything interesting you hear, such as when Lloyd George, Woodrow Wilson, President Coolidge spoke, etc.
8. Supplies at Small cost what every "Ra-Owl" has long been wanting.
9. Endorsed and used by both amateurs and professionals Everywhere.
10. New, Unique Radio Record System, with an Idea that appeals. It's the Idea and not just the number of pages, each 8x11 inches, that makes it worth while.

Now "Listen in" on This. The names and addresses of the First Person from each of the First Ten States, and the Last Person from each of the Last Ten States, received by us to February 9th, inclusive, sending \$1.00 for one Holiday, or two copies Popular Edition of Radio Record Books "Where I Go by Radio," will be published later in this Paper. This is a test of the "pulling power" of this advertisement. Why Not Be First and see YOUR name in print?

RADIO BOOK DEPT.
PROGRESS PRESS
Union, South Carolina, U. S. A.

CORRECTION FOR FRIDAY TUNER

For the benefit of fans who have tried Mr. Friday's circuit, described in your magazine of January 12th, under the heading, "Three Tube Set Does the Work of Five," I would like to point out two confusing mistakes in the printed circuit.

First, in describing his coupler, he tells that the taps are taken off on the primary next to the secondary, while in the hook-up he has them on the extreme end.

Second, the tickler leads must be reversed. If one studies the circuit that will be seen at once, for as he depicts it, the windings are directly opposed to each other.

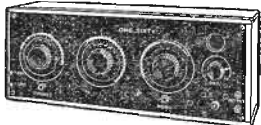
I have constructed this coupler and I know whereof I speak. I crossed over the antenna lead to the second tap switch and connected first switch and secondary switch to ground. My greatest trouble, which was my own fault, was in the tickler. I used a 180 degree rotor from another coupler and failed to reduce the windings to the number stated, but after I corrected my error I am getting wonderful results.

I live 30 miles from Pittsburgh and bring in KDKA in loud speaker volume on detector alone. I get Chicago, Omaha and New York stations on loud speaker with two stages of amplification using WD-11's throughout.—Roy N. Hill, Leechburg, Pa.

the small dry cell tubes can be used with equal success.

Radiophans building their own sets desire a more selective tuner and the one illustrated comes pretty near to being perfection in that respect. While this tuner works especially well in the circuit

The Dependable Radio Receiver



FADA "ONE SIXTY" with the NEUTRODYNE CIRCUIT

The FADA "One Sixty" is the four-tube Neutrodyne radio receiver that in selectivity, volume, distance and clarity equals the best results of any five-tube set of any type or make. Owners say, "If we don't get 'em on the loud speaker, we don't count 'em." Consistent performance on loud speaker from stations 1500 to 2000 miles away and sometimes much further.

Price \$120 at dealers Extra for tubes, batteries and 'phones
F. A. D. ANDREA, Inc.
1581 Jerome Ave., New York City

Fada
RADIO

Improved again!

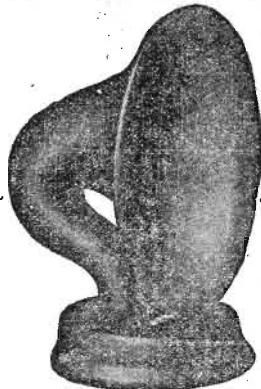


The MAGNATRON DC-201A—even better than it was before! It and the MAGNATRON DC-199 are the two outstanding performers among tubes today.

At the new list price of \$5, these tubes are also outstanding values. You can no longer afford to use inferior tubes.

Your Dealer Has Them!

CONNEWEY ELECTRIC LABORATORIES
309 Fifth Avenue NEW YORK CITY



No. 804
\$15.00

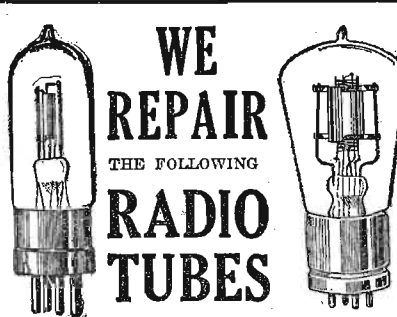
complete with Baldwin Type C Loudspeaker unit.

At Last! the true, pure voice of RADIO

The "Madera" Die-cast Wood "CLEAR SPEAKER"

made from an artificial wood, twice as dense as natural wood, with acoustic properties that will give your radio set a power and tonality you never dreamed possible. If your Dealer does not have it, write us, giving his name and address.

American Art Mache Co.
347 West Austin Avenue CHICAGO



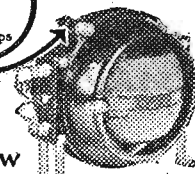
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Dealers and Agents write for Special Discount Mail Orders Solicited and Promptly Attended to

WD-11	OUR SPECIALTIES	5 WATT TRANSMITTERS	
UV-199	C-299\$3.50
UV-200	C-300 2.75
UV-201	C-301 3.00
UV-201A	C-301A 3.50
WD-11	WD-12 3.50
DV-6	DV-6A 3.50
UV-299		

H. & H. RADIO COMPANY
P. O. Box 22-A
Clinton Hill Station NEWARK, N. J.

Split Stator for All New Hookups



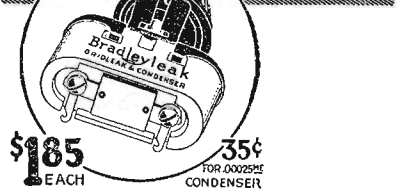
The New All-Circuit Columbia Moulded Variometer

This variometer, moulded in genuine black bakelite, represents the latest advance in construction for reason that it permits ALL of the new hook-ups of present and future. Stator is moulded in two halves with no metal bearing post in front nor in rear. Green silk wire used throughout. Silk pig-tail connections. Latest suggested hook-ups with each instrument. No. C 109 A\$5.50

COLUMBIA RADIO CORPORATION
155 N. Union St. Chicago, Ill.



A GRID LEAK THAT REALLY VARIES



A. H. Halloran, editor of "Radio," tested the Bradleyleak, and writes:

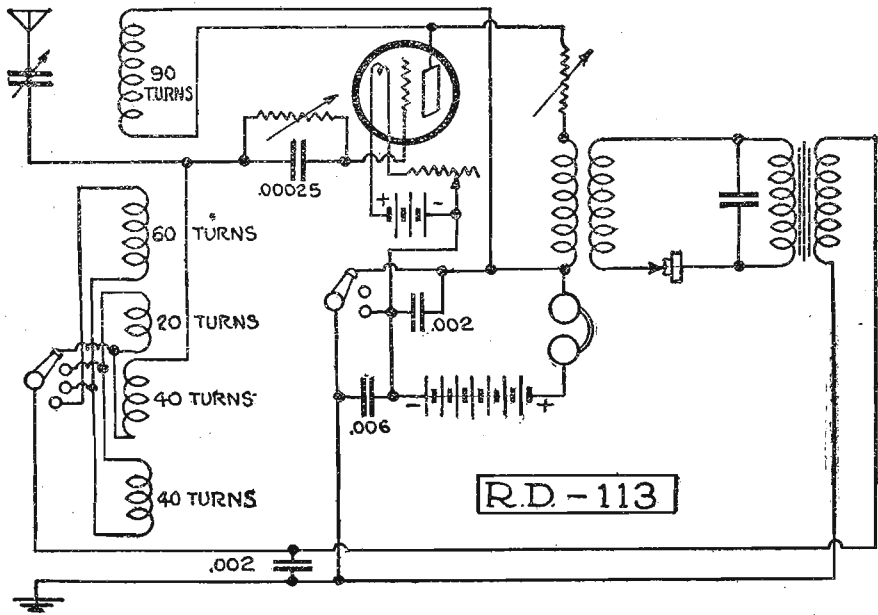
"I have made several tests on the Bradleyleak. It is the only variable grid leak I have tried that really varies."

All the leading radio authorities praise the Bradleyleak. It has solved the grid-leak problem. Try one on your radio set, tonight.

ALLEN-BRADLEY CO.
290 Greenfield Ave., Milwaukee, Wis.
Mfrs. of the Universal Bradleystat

Bradleyleak
THE PERFECT GRID LEAK

SINGLE TUBE SUPER REFLEX CIRCUIT



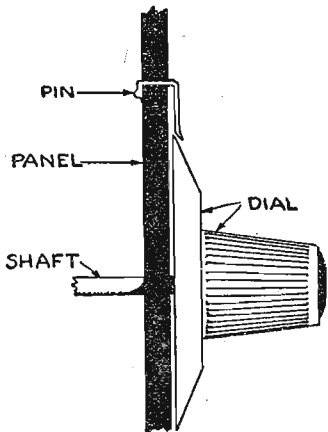
ONE of our fans, who requests us to withhold his name from publication, has submitted an unusual single-tube super-reflex, R. D.-113. We will let him tell his own story.

"The accompanying diagram shows the results of several months' experimentation with the object of producing the best single-tube circuit incorporating all the advantages of the various circuits now in common use, and giving due consideration to wave length range and compactness. The circuit is a combination of simple regenerator, super-regenerator and crystal reflex. These may be used separately or in conjunction. The grid leak is formed of a flat resilient strip of brass having one end fixed and the other end adjustably pressed against a strip of inked paper. The resistance in series with the R. F. transformer is made of a similar strip of resilient brass, except that a strip of heavy cloth, thoroughly impregnated with India ink, is used for the resistance element, so as to obtain greater conductivity. The variocoupler is basket-wound in a

cage, formed of 1/4-inch dowel pins, such as may be purchased at any hardware store, and with bakelite partitions 1/8-inch thick to hold the dowel pins properly spaced and to slightly separate the different sections of the coil. The switch points are connected so that the current flows first through the two middle sections, nearest the rotor, and then through the two outer sections. The first section, having 40 turns of number 24 dcc. wire, is always in the circuit. The additional sections, having 20, 40 and 60 turns respectively, may be thrown in if desired by turning the four-point switch. The rotor consists of two layers of number 28 dcc. wire, bank-wound on a 3-inch rotor. The shaft for this rotor passes between the two bakelite partitions at the center of the coupler, spaced 1/4 inch apart. Two wooden uprights are arranged at the front and rear sides of the variocoupler with transverse slots for holding the bakelite partitions in spaced-apart relation, and also for supporting the bearings of the rotor shaft."

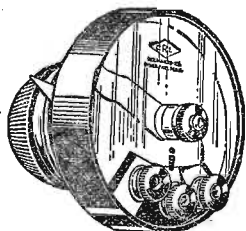
Panel Pointers for Dials

Pointers for dials may be made with an ordinary straight pin. Locate a point about 3/8 inch above the edge of the dial



and drill a 1/8-inch hole. Fasten the pin on the back of the panel with a wooden wedge, to prevent its turning, and finish as shown in the illustration.—J. Byron Jones, Turtle Creek, Pa.

"O. K.," Says National Radio Co. The National Radio Engineering Co., Atlanta, Georgia, reports as follows:—



"Your Non-Inductive Potentiometers have been selected and approved by our engineers. There are many potentiometers on the market but few of them stand up under service. Your potentiometer has passed all laboratory and standard tests. We, therefore, do not hesitate to select them as efficient for this work."

C.R.L. Potentiometers are sold by radio dealers everywhere, but if yours does not happen to have them, one will be sent you direct upon receipt of the list price plus 10c to cover postage.

- No. 110 (400 ohms) .. \$1.75
- No. 111 (2000 ohms) .. 2.00

Central Radio Laboratories

312 16th Street, Milwaukee, Wis. Non-Inductive



OLD PHONE LINE RADIO

(Continued from page 27)

signals from Spain, France, Havana, and could tell from the stuff I heard, what station it was. I have received many Canadian stations, and heard someone singing 'Barney Google' in Galveston, Tex. "It is only a short time ago that I heard Dr. G. Fleming give a talk in English on the Fleming valve from the Eiffel Tower, and this was followed by a man and woman singing in French. The announcer said in French and English that it was a high-power test on 16,000 meters from Station FL, France. It is only several nights ago that I got Aberdeen, France and Alaska."

Review of Books

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, \$2.00.

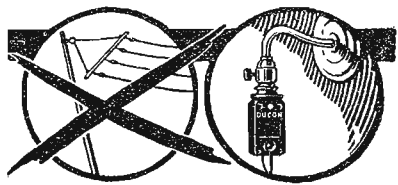
An Introduction to Radio. A real book

EVEREADY Radio Batteries
—they last longer

Conspicuous for vitality and endurance —the right batteries by test and proof for every radio use.

NATIONAL CARBON CO., INC.
Headquarters for Radio Battery Information
New York San Francisco

CANADIAN NATIONAL CARBON CO., LIMITED
Factory and Offices: Toronto, Ontario



No more antenna—just the Ducon in a lamp-socket.

Amazing results with the DUCON

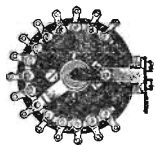
WITH just the Dubilier Ducon in a lamp-socket the three-tube neodyne set of G. W. Weston of the Kansas City Electric Club picks up Havana, and other distant stations.

"I am amazed at my results," says Mr. Weston. "I see no reason at all for an outside aerial." 400,000 satisfied users. Price \$1.50. At good dealers.

Money back if unsatisfactory after five days' trial.

Dubilier Condenser and Radio Corp.
44-50 West Fourth Street, New York

CARTER Inductance Switch



15 Points
\$2.00

Distinctive Features

- Positive Contact.
- Pigtail connection.
- Position of contact always shown.
- Solder terminal and contact one piece.
- Westinghouse "Micarta" insulation.
- Special numbered new type Knob Dial.
- Eliminates contact points.
- Only one hole to drill in panel.



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"ERLA" New Type Reflex Transformers

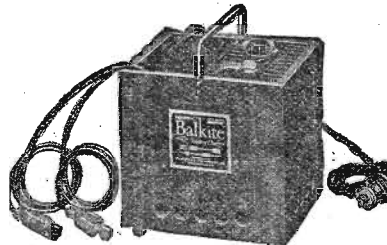
All Erla reflex parts in stock including Hilco Variocouplers and Rathbun Condensers.

Dealers send for Catalog and discounts

Note!! We are the largest exclusive Radio Jobbers in the Middle West



Mr. Dealer!!



Cash in on the FanSteel BALKITE BATTERY Charger

Here's the best charger made—no moving parts—can't get out of order. FanSteel BALKITE is a rare metal that acts as a valve—lets current flow in but not out. Price \$18.00—liberal discount to dealers.

Dealers only write for catalog A1001



for the amateur. This treatise comes in two volumes. 96 pages in each volume, fully illustrated, with flexible leather covers. Price two volumes, \$1.

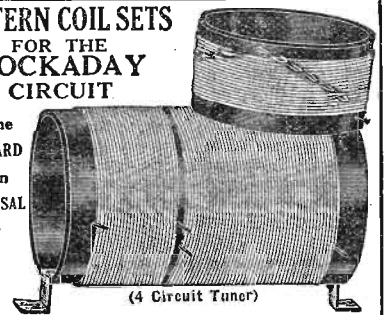
Radio for the Amateur. By A. H. Packard and R. R. Haugh. The underlying principles of Radio thoroughly explained in simple language and understandable illustrations. This book will teach you how to construct and operate a receiving set successfully. Price, \$1.50.

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, 123 W. Madison St., Chicago, Ill.

Heavily insulated wire may be used for an aerial as well as bare wire. In some cases the former decreases interference.

EASTERN COIL SETS FOR THE COCKADAY CIRCUIT

Are the STANDARD and in UNIVERSAL USE



DUE TO THEIR PROVED EFFICIENCY IN THIS WONDER CIRCUIT

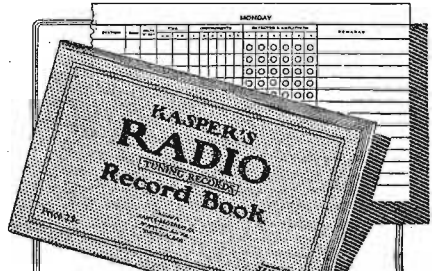
Made as per specifications of Mr. Cockaday. "D" Coil bank-wound.

Complete Assembled Set B, C and D Coils on GENUINE BAKELITE tubing, wound with No. 18 Double Silk Covered Wire \$4.25

The same on guaranteed treated tubing, wound with No. 18 Single Cotton Covered Wire \$2.75

Original and new improved hook-ups with material lists FREE with each set of coils. Either set may be used for original or new improved hook-up.

Mail Orders Filled—Dealers Communicate
EASTERN RADIO MFG. CO.
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Don't Waste Your Time

Looking for stations you already had. When you get a station simply copy the readings in a KASPER RADIO RECORD BOOK, then when you want it—IT'S THERE. This book can be used with any set and it is so arranged and printed that each day's broadcastings are kept separate; also contains full illustrations and instructions HOW TO RECORD STATIONS. 25 cents—or 6 for \$1.00, postage paid—don't send stamps.

Write Today
KASPER BROTHERS COMPANY
317 Lorain St. Bank Building
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Dealer or Agents Wanted Everywhere

Burned Out or Broken RADIO TUBES REPAIRED

All Tubes Guaranteed to Work Like New
Mail Orders Given Prompt Attention

24 HOUR SERVICE—All Tubes returned P.P. C.O.D.

RADIOTRONS	CUNNINGHAMS
WD-11 or 12.....\$3.50	C-11 or 12.....\$3.50
UV-200 2.75	C-300 2.75
UV-201 3.00	C-301 3.00
UV-202 3.50	C-302 3.50
UV-201A 3.50	C-301A 3.50
UV-199 3.50	C-299 3.50
DV-1 or 2..... 3.50	DV-6 or 6A..... 3.00

RADIO TUBE CORP.

70 Halsey St. Newark, N. J.

SEND TO NEAREST REPAIR BRANCHES
"RADIO TUBES"
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RADIO TUBE SPECIALISTS
137 Market St. PHILA., PA.

GLOBE ELECTRIC CO. 609 Cham. of Com. Bldg. PITTSBURGH, PA.
WELLSTON RADIO CO. 1479 Modiamont Ave. ST. LOUIS, MO.

Questions and Answers

Long Distance

(06143) BTW, Nacogdoches, Tex.
What is the best outdoor antenna for extreme distance work with a super-hetrodyne set designed to use outdoor antenna and ground?

What is the best way to construct an underground antenna? What is the proper length, material and best arrangement?

What is the best method of constructing a Beverage antenna? What material, length and method of construction is best?

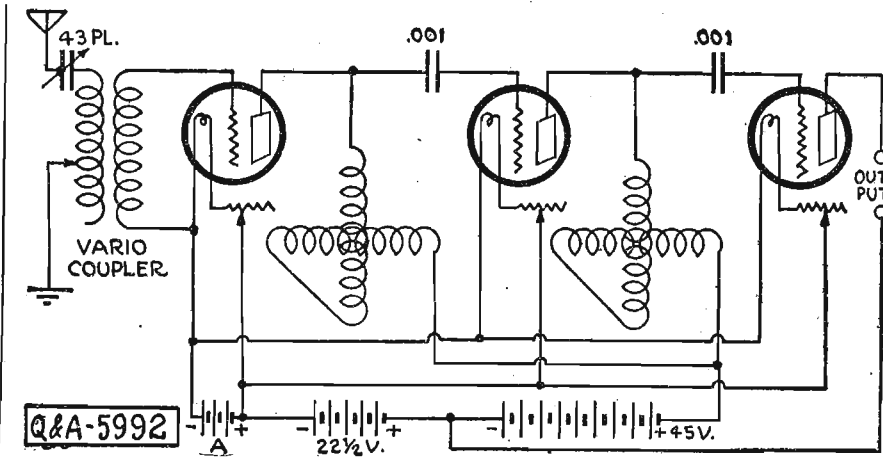
I want these data to apply to receiving antenna only for Radio broadcasting on wave lengths of 160 to 350 meters.

A.—The single wire receiving antenna is recommended. Its height is generally not important, and its length, including lead-in, should be from 100 to 150 feet. The fundamental wave length of this type is from 4 to 4.2 times its total length in meters.

An underground system consists of a single, long wire buried at a depth of from 1 to 5 feet. It operates most effectively when the soil is wet and with an insulated wire.

The Beverage system consists of a single horizontal wire of a length equal to the wave length to be received (or an integral multiple). One end is grounded through a resistance approximately equal to the surge impedance of the line (200 to 600 ohms for a line about 10 feet high, number 16 wire, at Radio frequencies), and the other end is connected through an inductance to the ground in the usual way. The receiving apparatus may be coupled to this inductance.

Its chief virtue undoubtedly lies in its directional property and immunity from static disturbances. A theoretical examination shows that as an antenna it has no special virtue, at least as compared with an overground one.



Tuned Radio Frequency

(05992) LPD, Hale, Mich.
My Radio receiving set is one of my own construction. I have heard over a hundred different broadcasting stations. My set contains three tubes; outside single wire aerial; primary, secondary and tickler coil, with detector and two amplifiers. Now, I want to build a new set adding three stages of tuned Radio frequency. I don't understand just what "tuned Radio frequency" means. I wish you would print a diagram of the set.

RADIO SETS easily built from our plans. 1000 to 2000 miles on one tube. Send 25c for blueprint plans. Winga Radio Shop, Box 93, Agawam, Mass.

A.—We have shown in the illustration herewith a method of adding tuned Radio frequency amplification to your receiver. The tuning inductance employed can be a variometer in each stage.

Neutroformers

(05966) JHW, Philadelphia, Pa.
I intend building a Neutrodyne circuit and would be pleased to have the following information:

PATENT ATTORNEYS

PATENTS. Booklet free. Highest references. Best results. WATSON E. COLEMAN, Patent Lawyer, 644 G Street, Washington, D. C.

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For a short time we are offering a Socket Free with each Tube
DUO LAMP Co. 1117 Kirk Place, Newark, N.J.

What size are the tubes used in the primary and secondary; what turns of wire on the primary and the secondary; at what turn does the tap go for the Neutrodyne, and how are the connections made, viz. the bottom of the primary and secondary and the top of primary and secondary?

A.—Replying to your inquiry, the information requested in the matter of coils for Neutrodyne circuit does not come within the scope of our service, which does not include details on manufactured apparatus.

High-grade Radio apparatus does not deteriorate so quickly as cheap instruments.

FOR SALE

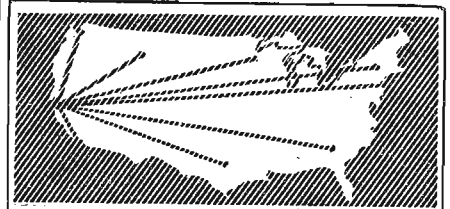
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Radio

Illustrated

Mrs. Edward H. Armstrong, of New York, wife of the man known as the "Radio millionaire daredevil," who is honeymooning at Palm Beach, Florida, cannot forsake her Radio. She is shown on the beach with a six-tube suitcase set. Major Armstrong is the patentee of the regenerative principle which revolutionized Radio.
© Fotograms



Scene from Girl Scouts' New Year week-end camp at Briarcliff Manor, N. Y. There was no snow for winter sports, so Radio was resorted to for pastime.
© U. & U.



This novel and efficient loop aerial was built by J. Harris Rodgers, of Hyattsville, Maryland, who became famous during the World War for his underground receiving system of Radio receiving. It has ten turns of wire, each turn consisting of twelve wires separated in the manner shown. This reduces the resistance and distributed capacity to a minimum and makes tuning extremely selective. K. & H. Photo



One of the few women ship's Radio operators, Miss Alameda Fowler, is seen receiving lesson in the intricacies of a ship's Radio from C. S. Rosenthal, chief operator on the George Washington.
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