1887–1929

VINTAGE RADIO

GREENWOOD’S
Classic Pictorial Album
Revised, Edited and Expanded
by
MORGAN E. McMAHON
VINTAGE RADIO
A Pictorial History of Wireless and Radio, 1887 — 1929.

This is the story of one of mankind’s great achievements; the ability to talk across the miles to one person or to millions of people. Wireless, radio, and later television have had the greatest impact on mass media since the invention of printing hundreds of years ago.

You can enjoy Vintage Radio in several ways;

• Recapture the feel of pioneer days of wireless and radio.

• Browse through old-time ads, pictures and trivia.

• Read about the rough-and-tumble days of a new industry.

• Own the authoritative collector’s and historian’s handbook, with photos and information on over 1,000 items.

• Discover a new hobby. Drag that old radio out of the attic and make it a conversation piece. Poke around the local collectibles barn and week-end swap meets.

This book is the ideal addition to your library, and is an excellent gift. It is also available in a handbook edition for the convenience of roving collectors.

Morgan McMahon has spent most of his life living in the future. He became a radio amateur back in the days when the local “ham” was considered the neighborhood nut. In World War II he worked with advanced electronic systems. He went into solid-state research after earning his master’s degree at the University of California. He taught the first transistor course given in the west, at UCLA.

Mr. McMahon’s career in industry has revolved around new business ventures and advanced technology. He helped start one semiconductor company. He then set up diode, transistor and integrated circuit operations for a major electronic manufacturer. He was the Chief Scientist for the largest U.S. manufacturer of electronic parts. He is now a consultant.

Some years ago Mr. McMahon became interested in the history of electronics. To his surprise, the early days of this field were not at all well recorded. Harold Greenwood’s book, the only available history of wireless and radio, had gone out of print. Mr. McMahon enlisted the willing help of historians, collectors, historical societies, technical publishers and old-line manufacturers to assemble Vintage Radio. His aim is to help preserve this piece of our heritage in an enjoyable way, in a series of readable books.
A Pictorial History of Wireless and Radio

SECOND EDITION
When Uncle Sam Wants to Talk to All The People.
VINTAGE RADIO

Harold Greenwood's Historical Album Expanded With More Old Ads, Illustrations and Many Photos of Wireless and Radio Equipment

by Morgan E. McMahon

Published by Vintage Radio

SECOND EDITION
HEARING HIS FIRST OPERA
ACKNOWLEDGEMENTS

This book is dedicated to the pioneering spirit of the late Harold S. Greenwood, who authored the original historical Album of Wireless and Radio, and to Mrs. Greenwood for her help.

This book is enriched by the contributions of many people, who have by now become too numerous to list individually.


Thorne Mayes has made particularly valuable contributions of historical material. Fred Shunaman helped greatly in pointing out opportunities for improvement over the first printing of this book. Erv Rasmussen gave valuable consultation of information sources.

Several manufacturers and publishers graciously consented to the reproduction of illustrations. We also received great help from various organizations, particularly the Antique Wireless Association (especially Bruce Kelley), the American Radio Relay League and the Smithsonian Institution.

My heartfelt thanks to all who helped with the book, particularly to my wife Gladie and the kids.

SPECIAL NOTE

Dates and prices shown in photo captions are the year of introduction and the retail price at that time.

I have great admiration and high regard for Marconi the pioneer inventor of Wireless Telegraphic Communication

[Signature]
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CHAPTER I
BIRD’S EYE VIEW

The story of early radio has its roots way back in 1887, and runs up to 1927 when A-C “plug-in” radios made the new miracle a part of everyday life. First there was “wireless” with the transmission of dots and dashes from spark machines across the miles to primitive receivers. Then came “radio,” with the transmission of voices and music for the entertainment, education, and communication of all the world. There was a mixture of pioneering, excitement, success, failure and even fraud. Interestingly, some promoters of early wireless wound up in jail because their pioneering spirit was matched only by their financial audacity. These rough beginnings changed the course of mankind.

THE STORY

A man looks up from his scribbled notes in wonder. He has just produced a theory that says electrical waves can travel through space. The man is James Clerk Maxwell, and the year is 1865.

Another man makes an electric spark with a spark coil. Across the room, a tiny spark appears in a loop of wire. Heinrich Hertz has demonstrated the truth of Maxwell’s theory. The year is 1887, and the wireless age has begun.

Guglielmo Marconi, a young Italian, shows that man can communicate across the miles. His miraculous wireless equipment is installed aboard ships and on shore, and commercial wireless is on its way. The year is 1899.

Wireless in still in its infancy. Communications are weak and undependable over long distances. Then Dr. Lee DeForest makes the step that revolutionizes radio; he invents the Audion vacuum tube, a device that can change small, weak signals into large, strong ones. This is the secret to real radio communications. The year is 1906.

The year is 1909. The S. S. Republic is feeling her way through wintry, miserable weather off Nantucket Island. A form looms through the gloom. There is a grinding crash. The S. S. Florida has rammed the Republic. The Republic, mortally wounded, wallows deeper and deeper in the waves. The ship is equipped with that new toy called “wireless.” Jack Binns, wireless operator, cranks up his spark transmitter and his “CQD” distress message crackles across the sea. His call is heard at sea and on shore. Rescue ships
converge on the Republic, and it goes down with the loss of only six lives. The world applauds.

The mighty Titanic is on her maiden voyage. The year is 1912, and the "unsinkable" ship plows majestically along under cold, starlit skies. There is a long, grinding shudder, hardly noticeable to the passengers. But the ship is mortally wounded. A wireless plea for help carries across the miles. Ships respond, but by the time they arrive, people have drowned or frozen in the black, cold water. Later, a haunting fact comes to light; the S. S. California was within easy range to save all the Titanic's passengers. Unfortunately, her radio operator was off-duty. The world is shocked. International regulations are written making 24 hour wireless a must on seagoing vessels.

Wireless has captured the imagination of the world. Radio pioneers float stock issues to finance ill-conceived business ventures. Also, opportunists flock in to fleece the public. Companies are made and broken overnight. Fortunes are invested and lost. The early 1900's are as wild as ever seen in any business.

The "War To End All Wars" comes. As usual, World War I has a tremendous cost in suffering, death and waste. As is also usual, however, war spurs the advancement of technology. By the time of the 1918 Armistice, radio has become a faithful workhorse.

In 1910, Lee DeForest plays music over his primitive arc transmitter. Other west coast pioneers also transmit programs, but one ingredient is missing; the audience. In 1919 the time is ripe. Dr. Frank Conrad of Pittsburgh, Pennsylvania broadcasts from his garage, and people begin to listen to this miracle of speech and music. Dr. Conrad's employer (Westinghouse) sees the opportunity and takes over. KDKA, the first commercial broadcast station is born in time for the Warren G. Harding election of 1920.

Broadcasting's first big blooper occurs in 1921 when Mayor Lew Shank of Indianapolis stands in front of a live microphone and says, "Do you mean to tell me that people can hear me over this damned dingus?"

The early 1920's are the years of squeaks and squawks in every household, of batteries and battery chargers, and of outlandish stunts like radios in automobiles and "portable" radios (weight 40 pounds). There are only two legitimate radio broadcast frequencies, and stations "sneak" this way and that in order to find clear channels. Out of this chaos comes order, by the hard work of legislative bodies, technical teams and the business community. By the mid-1920's radio broadcast is well established. The various broadcast, amateur and commercial communications are "put to bed" with assigned frequencies. Squeaks and squawks are eliminated by new radio circuits.

But batteries are still the bane of home radio: Acid eats holes in mother's carpet. Sonny makes periodic trips, hauling the "A" battery
to the battery man for a re-charge. Father gulps at the high price of a home battery charger. Then comes the final big breakthrough; the A-C radio that you can plug right into the same electric outlet that runs your toaster, your fan and your electric hair curling iron. Radio has become as much a family member as the horse, the Model "T" car and the wind-up phonograph. The year is 1927.

A new world of news, adventure, music, comedy, drama and talk has been opened to every home. By 1929 everyone knows names like Eddie Cantor, H. V. Kaltenborn, Graham McNamee, Will Rogers, Rudy Vallee, Major Bowes, Joseph Duninger, Amos 'n Andy and the Gold Dust Twins.

The wireless-to-radio revolution has taken from 1887 to 1927, a remarkably short forty years. In the year 1927, people still don't realize that they've started a communications revolution that will change the habits and future of all mankind.
TECHNICAL MILESTONES

1865  JAMES CLERK MAXWELL develops a theory showing that electromagnetic waves can travel in space.

1883  THOMAS EDISON finds that current will flow from a heated filament in a vacuum. This "Edison effect" is the basis for vacuum tubes.

1884  PAUL NIPKOW invents the scanning disc giving first television images.

1887  HEINRICH HERTZ proves Maxwell's theories by sending and receiving radio waves across a room.

1895  GUGLIELMO MARCONI sends and receives messages by wireless.

1899  MARCONI's wireless is adopted for commercial ship-to-shore use.

1901  MARCONI receives first trans-Atlantic radio signal.

1904  J. AMBROSE FLEMING develops the vacuum tube diode.

1906  LEE DeFOREST invents the triode vacuum tube amplifier, most important discovery in radio.

1912, 1913  DeFOREST and EDWIN H. ARMSTRONG independently discover regeneration.

1915  First practical radiotelephone communications, by Bell Telephone Labs.

1918  ARMSTRONG invents the superheterodyne circuit.

1919  DR. FRANK CONRAD's radio broadcasts "catch on" and radio broadcasting is born. Picked up and commercialized by Westinghouse as station KDKA in 1920.

1922  ARMSTRONG invents super-regeneration.

1926  JOHN LOGIE BAIRD demonstrates first practical television.

1927  A-C "plug-in" radios are introduced, making radio a true household convenience.
JUST A FEW OF THE EARLY PIONEERS

DR. LEE DeFOREST
THREE ELEMENT AUDION
1906

GUGLIELMO MARCONI
SENT FIRST WIRELESS MESSAGE
1895

HEINRICH HERTZ
ELECTROMAGNETIC WAVES
1887

MAJOR ARMSTRONG
REGENERATION, SUPERHETERODYNE,
SUPER-REGENERATION, FREQUENCY MODULATION

SIR OLIVER LODGE
METHODS OF TUNING

DR. J. A. FLEMING
FLEMING VALVE 1905

HUGO GERNSBACK
PIONEER PUBLISHER

R. A. FESSENDEN
ELECTROLYTIC DET. 1903

EDOUARD BRANLY
COHERER DET. 1890
People knew radio as “wireless telegraph” in its early days. In fact, the word “radio” was not used for some years. Scientists, engineers, amateurs, experimenters and businessmen were the pioneers that gave us this great new tool. Communications without wires were especially important to ships at sea, people separated by great distances, and to armies on the move. Wireless began with spark transmitters and coherer receivers, progressing to quenched-gap transmitters and crystal receivers, and finally to continuous-wave “C-W” transmitters and vacuum-tube receivers. Wireless paved the way for radio broadcasting, the greatest thing in mass media since the invention of movable type in the 1400’s.

The wireless days saw a raw, rough industry being born, with all the adventure and intrigue typical of other new technical giants. The following paragraphs recount the early days of the wireless and radio industry as described by Thorn Mayes, an eminent historian:

In 1899 Guglielmo Marconi formed the Wireless Telegraph and Signal Company in England for the purpose of building and installing wireless on lighthouses and light ships along the English coast as he had demonstrated he could communicate over a distance of 15 miles by wireless which was sufficient for this application. This company later became the Marconi Wireless Telegraph Company which today is the most important radio company in England.

The first wireless company to be formed in the United States was the American Marconi Wireless Telegraph Company. It was incorporated under the laws of New Jersey, November 1899, with authorized stock of 2 million shares of $5 par value, to exploit the Marconi patents in the U.S.A. Their first installations were made on the Nantucket light ship and at Siasconset on the east coast of Nantucket Island. First exchange of messages over the 40 mile distance was in August, 1901.

The development of American-based wireless followed a different pattern. From 1900 thru 1915, many companies were formed for the purpose of issuing and selling wireless stock. This movement was given considerable impetus by Marconi’s reception of signals across the Atlantic in December of 1901. Of these many companies, only one lasted until the WW-I period. Only the major operating companies will be covered in this review.

In 1901 the American Wireless Telephone & Telegraph Company was formed by Dr. Gehring to exploit the patents of Dolbear and Harry Shoemaker. Within a year, there were 9 subsidiary companies with a total capital stock of $50 million. Robert Marriott, who became one of the outstanding early wireless engineers, a founder
of the Institute of Radio Engineers May 1912, was engineer of the Pacific Wireless Telegraph Company, a western subsidiary. He designed and installed the first commercial wireless stations in the United States which started operations in July, 1902, between Avalon, Catalina Island and San Pedro, California. These two stations continued under several managements until 1920 when the Pacific Tel. & Tel. Company put in a wireless telephone link.

By 1902, most of the American wireless companies were broke and were reorganized into the Consolidated Wireless Tel. Company with capital stock of $7.5 million. The name was changed in 1903 to The International Wireless Tel. Company and in 1904 the remains of this company were taken over by the American DeForest Wireless Tel. Company.

This next group was formed by Dr. Lee DeForest who organized the Wireless Telegraph Company of America in 1901 with a capital stock of $3,000. After meeting and joining an eastern promoter by the name of Abraham Schwartz, the company was changed in late 1901 to the DeForest Wireless Tel. Company with a capital stock of $1 million. In February 1902, a new DeForest Wireless Tel. Company was formed under the laws of Maine with stock of $3 million with Abraham Schwartz, President, and Dr. Lee DeForest Vice President and Scientific Director. November 1902 the capital stock was upped to $5 million and in 1903, the name changed to American DeForest Wireless Tel. Company with capital stock of $10 million.

By 1906, the American DeForest Company was by far the largest operating company in the United States with 27 land stations. Typical sets consisted of a 1 or 2 K.W. high voltage transformer, bank of Leyden jars for the condenser and a helix completing the transmitter. Shipboard receivers used the DeForest responder or electrolytic detector with his syntonizer, which was a tuner made up of two slide tuning coils connected to work with the looped antenna. Land stations used the same detector with the more selective 3 coil tuner.

The Courts in 1906 judged the DeForest responder an infringement of Fessenden’s electrolytic detector patent of 1900 so American DeForest Company had to immediately change all stations to use silicon detectors which had been patented in 1906 by General H. H. Dunwoody who was now an officer in the American DeForest Company. Because of this incident, DeForest resigned from the company in November 1906.

Abraham Schwartz, who had now changed his name to White, still President of American DeForest Company, formed the United Wireless Telegraph Company late in 1906 with capital stock of $20 million. United took over the American DeForest Company operations in February 1907. Early in that year, Colonel C. C. Wilson was successful in ousting White and became the President of United Wireless.

Even though a major objective of United’s top management was
Early "Portable" Wireless Sets
selling stock, the operating people were doing their best to improve company performance. Harry Shoemaker, as Chief Engineer, set up a capable engineering group to design better equipment. United started with the American DeForest 2 & 3 coil syntonizers which they called their type A and B tuners. They developed three improved receivers, the type C in 1907 for tugs and small coastal ships. Early in 1908, the type D was introduced which became the standard receiver for ship and shore stations. It was produced in quantities and was in use on some ships thru World War I. The type E, the first commercial receiver to use a loose coupler, came out in 1911, but few were built for by this time United was in receivership. In May 1911, three United Wireless officers were convicted of fraudulent stock selling practices and were given sentences of up to three years in Federal prison.

American Marconi had filed suits against United for patent infringement. Modern Electrics of April 1912 reports that United lost the suit, and that the assets of the company were purchased by the British Marconi Company for $700,000. These were sold to the American Marconi Company who immediately took over operation of United's 70 land stations and 500 ship installations.

By 1906, when David Sarnoff was hired as office boy, American Marconi was operating 4 shore stations and had their gear on a total of four ships. In 1912, when they took over United, their shipboard installations had increased to 40.

Best known receivers developed by American Marconi, were the 101 of 1912, the 103 of 1913 and the 106 that came out in 1915. They also developed the panel type transmitters in this country. Their P-8 2KW 500 cycle quenched and synchronous rotary gap transmitters with various models of the 106 receiver were standard shipboard sets up to the end of the spark era.

American Marconi had a large well equipped factory at Aldene (Roselle Park) New Jersey that turned out much of the wireless equipment used by the U.S. in WW-I but it was still a British controlled company with the majority of its stock held in England.

By the start of WW-I, the 50 KW arc transmitters had proved their superiority to the 300 KW Marconi timed spark sets. Dr. Alexanderson of the General Electric Company had for several years been working on the design of a high frequency alternator (A-C generator) which showed much promise as a continuous wave transmitter. During the war, the Navy installed a 200 KW alternator in the New Brunswick, New Jersey station which soon outperformed 500 KW arc sets indicating this to be the high power transmitter of the future.

Because of the importance of radio communication by the end of WW-I, the Navy and our Congress were convinced that our communication system should be American owned and operated.
RADIO
TELEGRAPH and TELEPHONE
EQUIPMENT

DESIGNED FOR
COMMERCIAL SHIP AND SHORE STATIONS
MILITARY INSTALLATIONS
PLEASURE YACHTS AND CRUISER AUXILIARIES
SCHOOLS AND COLLEGES
PRIVATELY-OWNED RESEARCH AND
EXPERIMENTAL STATIONS

United Fruit Company's Steamer Paitoree

WIRELESS SPECIALTY APPARATUS COMPANY
ENGINEERS, DESIGNERS, AND MANUFACTURERS
BOSTON, MASS., U.S.A.

October, 1919
Before the radio stations were returned by the Navy to commercial ownership at the end of WW-I, the General Electric Company had purchased from Marconi Wireless Telegraph Company of England, their stock in the American Marconi Company. General Electric Company, Western Electric and later Westinghouse, pooled their radio patents and formed the Radio Corporation of America which through a stock transfer acquired the organization and assets of the American Marconi Company in November 1919.

G. E. Company took the tools and dies from the Aldene plant so they could continue to manufacture for R.C.A. the P-8 transmitters and 106 receivers as long as spark sets were used. In 1922, they modified the 106 receiver to use the Western Electric VT-1 detector tube, and it became the 106D model.

In March 1920, the Navy returned to their original owners the high power land stations in the United States. R.C.A. immediately installed a second Alexanderson alternator in their New Brunswick, New Jersey station, two in the Chatham, Massachusetts station for trans-Atlantic service and two in the Bolinas, California and Kahuku, Hawaii stations for trans-Pacific operation.

With the start of the broadcasting era, R.C.A. having no manufacturing facilities of its own, sold receivers made by both General Electric and Westinghouse and tube transmitters made by G.E. Company. Later they set up their own plants to build these equipments. This part of their business soon exceeded the volume of RCA’s communications operation.

It is interesting to trace the business history of Dr. Lee DeForest, widely-known technologist of wireless and radio. When Dr. DeForest left the American DeForest Wireless Telegraph Company in 1906, the only patents he retained were on his audion detector which at that time were thought to be worthless.

Early in 1907, he formed the DeForest Radio Telephone Company for the purpose of developing a radiophone set using an arc as the generator of the high frequency oscillations for the carrier. He made a number of installations but his complaint expenses were high so the man went broke in 1911. DeForest then went to work for the Federal Telegraph Company in Palo Alto, California. He left Federal in the spring of 1913 to go east and that summer sold to A.T.&T. Company the patent on his audion for telephone repeater service for $50,000.

With this money, in 1914 he revived the DeForest Radio Tel. Company, changing its name to the DeForest Radio Tel. & Tel. Company which built radio equipment for the military during WW-I. After the war, the company continued to build commercial and amateur gear and developed several lines of receivers for broadcast reception. Around 1925, the company went out of business but by this time Dr. DeForest was spending full time on the development of talking motion picture equipment.
General scheme of the radio link as used between the mainland and the island of Santa Catalina, connecting the mainland telegraph system with that of the Santa Catalina Island and making them a single system. The radio link in this installation is a duplex arrangement, so that two messages can be handled at one time, or one in each direction.
LISTENING to the foremost citizens of the nation; keeping in touch with the affairs of the world; enjoying the classical and popular music of yesterday and of the very hour; spanning hundreds and even thousands of miles without physical conductors between the talker and the listener; handling current by the kilowatt and by the thousandth of a watt; starting with the simple receiver and culminating with a powerful transmitter, even one capable of spanning the Atlantic, as shown in this painting—all these features and many others make radio the fascinating subject which it is to layman and professional alike.
Amateur radio has always been a source of technical advancement, of emergency radio services and of trained people. The thrill of communicating directly with someone far away is immense. This CW station, IBCG, pioneered trans-Atlantic amateur communications in 1921.
The one man most responsible for advancement in radio circuitry was Major Edwin H. Armstrong. He invented feedback, key to tube receivers and transmitters, in 1912. While in the Army in 1918, he invented the superheterodyne receiver, now the basic circuit of most radios. This was followed in 1922 by the super-regenerative receiver, the most sensitive single-tube circuit known. In 1933 Major Armstrong capped his career by inventing frequency modulation (FM). He participated in many other pioneer efforts, such as the earliest Trans-Atlantic amateur communications by 1BCG. Illustrated below are the original receivers built by Armstrong and his associate, Harry Houck.
WHERE YOU COULD BUY IT

By 1906 wireless apparatus was on sale to the amateur and exper­i­m­enter. The Electro Importing Co. of New York was formed by Hugo Gernsback and soon began making parts and sets for the amateur. J. J. Duck, and later his brother Wm. Duck at Toledo, Ohio, put out a mail order radio parts catalog. Another mail order house was Manhattan Elect. Supply Co. F. D. Pitts of Boston put out a radio parts catalog containing testimonials. John First of New York sold the famous “Firse” line by mail.

In 1914 Merker-Flocker Electric Co. of Pittsburgh offered wireless gear for sale. Pacific Laboratories of San Francisco sold the Audiotron and Moorhead tubes in 1916. National Radio Supply Co. of Washington, D.C. sold both amateur and commercial apparatus by mail order. An amusing advertisement of the period was that of the Electrical Supply Co., which read, “Be a detective and hear through the walls with our Skinderviken Button.”

The DeForest Radio Tel. & Tel. Co. of New York issued catalogs after the war, selling their famous “unit parts” for the amateur.

Publishing pioneers, particularly Gernsback, Doubleday and Scientific American were important to the growth of wireless and radio. Organizations such as the American Radio Relay League were also powerful forces in advancing this new technology.
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| No.  290 | ¼ in. coil | $2.00 |
| No.  291a | ⅛ in. | 3.00 |
| No.  291b | ⅛ in. | 3.10 |
| No.  291c | ¼ in. | 3.65 |
| No.  292 | ½ in. | 5.00 |
| No.  293 | ¾ in. | 5.85 |
| No.  294 | 1 in. | 7.50 |
| No.  296 | 1¼ in. | 10.00 |
| No.  297 | 1½ in. | 15.30 |
| No.  298 | 2 in. | 25.00 |
| No.  299 | 2½ in. | 50.00 |
| No.  300 | 3 in. | 75.00 |

For the Beginner

No. 797—$2.50 Value  $1.75

Receives up to 500 Miles

This consists of a combination universal detector; 7½ ohm nickel plated case; exceptionally sensitive receiver and telephone cord; tuner ¾ x 2 inches large type, wound with bare copper wire; 1-inch Wollaston wire; 2 insulators; 60 feet aluminum serial wire.  Price............................ $1.75

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ON THE MARKET 
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with 
and 
position. 

**The Livest Catalog in America**

![Image](image.png)

**1/2 inch THICK** = **WEIGHT 1/2 lb.** = **658 ILLUSTR.**

What Catalog No. 16 Contains

It contains the largest assortment of Wireless and electrical experimental apparatus shown in any catalog published. In addition are shown Commercial Wireless Sending and Receiving Outfits, Electric Meters, Dynamometers, Flashlights, Medical Batteries, High Frequency apparatus, Playing Outfits, Toys, Testing Means, Tools, Sporting Goods and the LARGEST Scientific Book section published. This book will give you as much information as many books that cost you $1.00 or more. It contains 658 Illustrations, 2000 articles, complete Code Charts of Morse, Continental and Navy Codes, electro-typing "TREATISE ON WIRELESS TELEGRAPHY," list of Call Letters of U. S. Government and Commercial Ships and Eber Wireless Stations, besides a great many useful tables and formulas. This valuable book is 7 x 11 inches in size and 3/4 inch thick, and well bound. It is sent free for 6.00 to cover postage only.

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MESCO Short Wave Regenerative Receiver

Recommended for relay work on wave lengths of 150 to 450 meters. It is possible to receive wave lengths up to 1,000 meters with reduced amplification.

The circuit is the Armstrong regenerative with constants accurately calculated for the wave lengths when employed in conjunction with audion detectors.

Will receive undamped and damped waves.

Send 10c. for New Wireless Manual A 9
The most complete book of its kind published. You cannot possibly afford not to have one. Contains 180 pages. Send for one NOW.

YOU WILL GET YOUR 10 CENTS BACK ON AN ORDER FOR $1.00

Our Pocket Electrical Catalogue W28, 248 pages, mailed on request. This catalogue contains practically everything in general use in the electrical line and is in fact a small pocket encyclopedia of electrical goods information.
NOTE: Early circuits did not show grid leak resistors, probably because grid condenser leakage sufficed. Also, battery symbol polarity was not standardized; tube plates should be positive in polarity.
LOOSE COUPLER CIRCUIT

TWO-SLIDE TUNER CIRCUIT

SPARK COIL TRANSMITTER

SPARK TRANSMITTER WITH ROTARY GAP

TUBE TRANSMITTER, HEISING MODULATION
CHAPTER III
TRANSMITTERS

Spark transmitters began with the Ruhmkorff spark induction coil. They were rated by the number of inches of spark they produced. The one inch coil would send eight miles and the four inch 32 miles. Spark transmitters up to 12 inch size were in use; the small ones ran on batteries and the large ones by generators. The spark transmitter consisted of a spark coil or transformer, a spark gap, Leyden jar, a helix and a keyswitch. Initially using a simple two-electrode spark gap, later models had a rotary motor-driven gap, and later still some used a quenched gap. The original Leyden jar condenser gave way to glass plates with tin foil between them, immersed in oil. Then came the mica condenser. Spark gap transmitting stations needed a hot wire ammeter to tune the antenna, a send-receive switch, and a ground switch to earth the antenna.

Keys on small rigs were simple telegraph keys, but on KW transmitters ½ inch contacts were used as the key was in the primary circuit of the transformer. Some keys were enclosed to make them flame proof. Eventually the helix was made illegal and an oscillation transformer was used.

Antennas were usually a four-wire flat top or a five-wire cage for 200 meter; usually about 100 ft. long with a 35 foot rat tail and lead in. Commercial stations ran 100 KWs of power and operated to 31,000 meters. The radio act of 1912 put the amateur on 200 meters with a maximum of one kilowatt.
Immediately following W.W.I. amateur operators continued to use spark transmitters, but in 1921 G.E. made the Radiotron and Cunningham transmitting tubes, making Continuous Wave transmitters with tubes fairly common. RCA sold parts made by G.E. and also by Wireless Specialty Co. to build a complete C.W. or radiotelephone station. The Acme Apparatus Co. also made C.W. parts and transformers.

The early radiotelephone stations used Heising and grid modulation, and also modulated their antenna. Transmitters were self-excited oscillators of tubes in parallel. The tank coil used was a large tapped coil, tuning being accomplished by changing taps. It was soon found that using tubes the station could be tuned down to 175 meters with good output.

The M.O.P.A. transmitter followed, using a master oscillator with a power amplifier following; these were better than the parallel tube oscillator and the self-rectifying circuits.

Parts and tubes at this time were very expensive. The UV-204 250 watt tube cost $110.00. A 10 watt radiotelephone kit cost $150.00; a 100 watt kit cost $250.00 Thus many amateurs of the time wound their own transformers and coils. But the tube transmitters were clearly best, eliminating the interference of the spark transmitter, and giving about three times the range with the same antenna power while having much greater selectivity. By 1922 there were about 25,000 amateur radio transmitters in use, and about eight times that many receivers.
Gentlemen:— Although I have had your $\frac{1}{2}$ K. W. set in operation but a few days, I have already worked over 150 miles in the day time.

(Signed) A. E. Gerhard, Omaha, Neb.

The "W-M" $\frac{1}{2}$ K.W. Complete Set Boxed for Shipment $40.00$

The "W-M" 1 K.W. Complete Set Boxed for Shipment $60.00$

Send 2c. postage for our complete catalog "E" listing high power apparatus exclusively.

WORTS-McKISSON MANUFACTURING CO.
DEPT. M, TOLEDO, OHIO
TRANSMITTERS

MARCONI I
FIELD ARTILLERY
COMMAND SET
1914  50 WATTS

TRANSMITTER-RECEIVER USING CARBON DETECTOR
1917

EARLY TRANSMITTER

CONNECTICUT T & E
U.S. ARMY SCR-65
FIRST TYPE USED IN
AIRPLANES  1918
Low Power D. C. Transmitting Equipment

OWNERS of radio stations having no available supply of alternating current have heretofore been unable to obtain efficient and reliable transmitting equipment to operate with the power generated by batteries. With the advent of the Amrad Induction Coil and the special Amrad Quenched Gap the old handicap has been swept aside. These two instruments make the transmission of radio messages over distances of 25 miles and upwards an easily accomplished fact under ordinary conditions. Both instruments are of a design suitable for use with standard Oscillation Transformers and Condensers as illustrated above. The power supply may be obtained from either a 6 volt storage battery of the automobile type or from standard 32 volt farm lighting circuits.
An Alexander 200-kilowatt high-frequency alternator as employed at the Radio Central wireless station and in other American long-distance stations. This machine generates high-frequency current and therefore takes the place of the usual spark oscillator.
A Wireless Telephone Now Possible for Every Radio Amateur!

TRANSMIT your messages in words instead of dots and dashes! Install a DeForest Oscillion Radiophone Transmitter as part of your set and you can do it. Nothing complicated or impractical. The Type "O" Transmitter shown below plugs into lamp socket. Just plug in, connect antenna and ground, push a button and talk! Voice quality superior to that over a wire; clear, distinct and continuous. Once adjusted it requires no further attention. No special apparatus needed to receive Radiophone messages over limited distances. Same transmitter equally effective for both telephone and telegraph. Throw a switch and telegraph; throw it back and talk! Not an experiment or an impractical instrument. Absolutely perfect in performance and guaranteed to operate as claimed when instructions are followed.

Add the DeForest Oscillion Radiophone Transmitter to your set and you can send messages by telegraph or telephone. Its cost is not prohibitive and it is the coming development in Radio Service. Find out all about it—

Send for the DeForest Catalogue
A 56-page book full of vital Radio information for the Amateur, including wiring diagrams and other data. Sent postpaid for 10 cents in stamps. Send for yours today.

DEFOREST RADIO TELEPHONE & TELEGRAPH COMPANY

Inventors and Manufacturers of High Grade Radio Apparatus.

1399 Sedgwick Avenue New York City.
DE FOREST OT-10 RADIOTELEPHONE.
FIRST TRANSMITTER USED IN COMMERCIAL BROADCASTING, 1920. INTRODUCED 1919

WESTINGHOUSE TF AMATEUR TRANSMITTER.
10 W PHONE, 20 W CW, COMPANION TO RADA RECEIVER. 1921

PARAGON 2-5-U TRANSMITTER
10 WATT PHONE/CW 1921

KFI’S FIRST BROADCAST TRANSMITTER.
50 W 1922
Panel type damped wave transmitter, such as is employed on board steamers. This transmitter makes use of a quenched gap, which is mounted on the front of the panel.
Panel type damped wave transmitter, the front view of which appears on page 40. Simple as the front view may seem, it will be noted that the transmitter is quite complicated with most of its mechanism mounted at the rear of the panel.
Another type of damped wave transmitter, such as is used on board ship. In this instance there are two methods of obtaining the oscillations or waves. There is the quenched gap mounted on the front of the panel, and the synchronous rotary gap mounted at the right.
Mechanism of a commercial CW telegraph transmitter, using several 50-watt tubes and a chopper for producing modulated continuous waves.
BREADBOARD
UV-202 TUBE
1923 W6BJI

BENWOOD "CW"
PHONE/CW/ICW/BUZZER
1922 (QST) 5350.00

1 KW PHONE/CW/ICW
HEISING MODULATION
1922 (QST) 480

20/40M BRITISH
250W CW XTAL
1929 (QST) G5BY

5 METERS
1928 (QST) 8CMP

200W 20-60M CW/ICW
XTAL CONTROL
210-PP210'S
1926 (QST)

5 METERS
1928 (QST) 8CMP

RADIO ENGINEERING LABS
250W CW M.O.P.A.
1928 (QST)

"SINGLE CONTROL"
TNT CIRCUIT
1929 UX-210

LEEDS
74W 201A OR 30W UX-210
1929 (QST) 857.50

2305D'S AND 211D
1930 W2BGN

6LG-6L6-PP 809'S
1938 W1PGQ
ROTARY SPARK

CLAPP-EASTHAM ROTARY QUENCHED 1920

BENWOOD ROTARY SEMI QUENCHED 1919

MURDOCK ROTARY GAP 1913 $20.00

B. F. CHAMBERS ROTARY GAP 1915 $15.00

BENWOOD SPARK WHEEL 1919
MARCONI WIRELESS TELEGRAPH CO.
OF AMERICA TYPE 10-A
10 INCH SPARK INDUCTION COIL
1910

E. I. CO.
1" SPARK COIL
1914 $4.00

RUHMKORFF SPARK
INDUCTION COIL
ABOUT 1915

E. I. CO.
1/2 KW SPARK TRANS.
1912 $6.00
SOLD BY DUCK

AMRAD TYPE C
SPARK INDUCTION COIL
MADE FOR U.S. ARMY IN 1918.
HELIX AND OSCILLATION TRANSFORMERS

HELIX
1 KW ABOUT
1914

AMCO OSC. TRANS.
1 KW MADE FROM KIT
ABOUT 1914

MURDOCK #424
OSC. TRANS.
1914

½ KW TRANSMITTING
TUNING COIL
ABOUT 1914
WIRELESS APPARATUS

GENERAL RADIO AUDIBILITY METER 1920

EATON OSCILLATOR 1919 $15.00

MURDOCK KICK BACK PROTECTOR 1914

CLARK TONE TESTER 1919

MESCO AERIAL SWITCH 1916

TRUMBULL GROUND SWITCH 100 AMP. 1915
SPARK TRANSFORMERS

THORDARSON

1/4 KW 1919
$15.00

THORDARSON FLEXIBLE

1 KW 1915
$25.00

THORDARSON TYPE R

1 KW 1919
$25.00

FISHER 1/2 KW WITH LINE REACTOR
WIRELESS APPARATUS

E. I. CO.
VAR. TRANS. COND.
LEYDEN JARS
1908   $2.50

MARCONI
.003 VAR. COND. NENSOR
1906

E. I. CO.
FIXED VAR. COND.
#1000
1912   $1.25

THORDARSON
OIL TRANS. COND.
1 KW.  1919   $32.50
WIRELESS APPARATUS

FISHER
1 KW. SPARK GAP,
AIR COOLED, 1919

MURDOCK F.440
SPARK GAP
1919 90 CENTS

KNAPP
GENERATOR
1916

MESCO
SPARK GAP
1915

ENCLOSED SPARK GAP
1919

ELECTROSE INSULATORS
1912 TO 1920
WIRELESS APPARATUS

GENERAL RADIO
FLAME PROOF KEY
1918

WIRELESS SPEC. APPARATUS
50 AMP KEY
ABOUT 1917

OMNIGRAPH
CODE MACHINE
PAT. 1904 $20.00

RCA
MAGNETIC MODULATOR
USED IN ANT. CIRCUIT
1922

WESTON
GALVANOMETER

SIDE WINDER KEY

STD. WIRELESS KEY
1916

VIBR OPLEX
"BUG" KEY
MICROPHONES

Telephones were used as microphones in the early days, but the single button carbon unit was not good enough for music and singing. The simple carbon mike operated by variations of pressure on the carbon granules, varying the current. A double-button carbon mike was designed that still gave a carbon “hiss” and had to be mounted on springs to prevent vibration, but this did produce a somewhat better response.

The condenser microphone was then developed, operating on the principle that varying the space in a small condenser altered the voltage with pressure. Condenser mikes used gold plated backs with Dural diaphragms; nitrogen gas was sealed in the unit. These had a low output and were subject to heat and cold; they required a preamplifier. There were many circuit problems, but frequency response was excellent, 40 to 10,000 CPS. They were made by Western Electric, Remler, American and others.

Velocity or ribbon microphones were developed, and proved to be unaffected by temperature changes and hum from R.F. fields. They required a preamplifier and an output transformer to match the amplifier input, but had good frequency response. They were bad for close-up talking. They operated on the principle that a moving conductor in a magnetic field induces a current in the conductor.

Crystal mikes appeared in two types; the grille and the diaphragm. They work by the piezoelectric properties of Rochelle Salts; when a piezoelectric crystal is bent it generates a voltage. Crystal mikes have excellent response. They do not need a preamplifier, and up to 100 feet of mike cable can be used. The only drawback is that high temperature destroys the crystal.
MICROPHONES USED IN THE 1920s

- **Western Electric Single Button with Stand**
- **American Condenser Mike with Pre-Amp.** $100.00
- **Magnavox Loud Speaking Transmitter**
- **Western Electric Double Button with Case**
- **American Double Button**
- **Universal Baby Mike**
- **Western Electric Hand Microphone**

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TRANSMITTING TUBES

Western Electric's 5 watt VT-2 "Baseball" was the first volume-produced transmitting tube, introduced in 1918. Western's type 211, brought out in 1919, had a 50 watt capability and the 212 handled 250 watts. DeForest and G. E. were other major transmitting tube manufacturers, with G. E. tubes being sold under the Radiotron and Cunningham names. G. E. UV-202, UV-203 and UV-204 types introduced in 1921 were particularly popular in the early days.
TRANSMITTING TUBES

KENOTRON RECTIFIER
UV-216  1921

RADIOTRON UV-203
50 WATT TRANSMITTER
1921  $30.00

RADIOTRON UV-202
5-WATT TRANSMITTER
1921  $8.00

RADIOTRON UV-204A
250-WATT

KENOTRON RECTIFIER
UV-217  1921
TRANSMITTING TUBES

WESTERN ELECTRIC
211E
50 WATT TRANS.

WESTERN ELECTRIC
276A
50 WATT

WESTERN ELECTRIC
211D
50 WATT TRANS.

RADIOTRON
UV 872
HALF WAVE RECT.

DE FOREST
552
100 WATT TRANS.

DE FOREST
503A
50 WATT TRANS.
A corner of the experimental laboratory at WGY, 50KW was employed. The station was heard in England and on the Continent.

Broadcasting the results of a boxing contest round by round. The radio-telephone is at its best in work of this kind, and special efforts are being made to report all athletic events of surpassing interest in this manner. This photograph was made at the time of the Dempsey-Carpentier fight.
Still another radio-phone broadcasting station, showing the announcer and the receiving operators. This is KDKA of East Pittsburgh, Pa., the forerunner of all other radio-phone broadcasting stations in the United States.

The "announcer" of a radio-phone broadcasting station, and the receiving operator. The announcer speaks into the microphone transmitter which he holds in his hand. Alongside of his is the radio-phone transmitting apparatus, with the vacuum tubes for generating and modulating the radio waves. This is WJZ, the Newark radiophone.
CHAPTER IV
RECEIVERS

Early wireless receivers were beautifully hand-crafted, but were technically primitive. Their masters cursed them, yet gave them tender loving care. The earliest receivers used “coherers”, detectors which would be a fine tribute to Rube Goldberg: Radio signals (A) causes filings (B) to stick together causing current (C) to close relay (D) causing telegraph clicker (E) to click and also causing hammer (F) to strike glass tube (G) holding filings (B) knocking them loose to be ready for the next signal. Coherers were not very sensitive and not very reliable, but they allowed wireless communication to come into being.

In the early 1900's, a new family of metal-chemical “electrolytic” detectors made wireless more practical. Other detectors using moving magnetic wire were used on board ships because of the motion and vibration. Crystal detectors were invented in 1906, leading to much more elegant and useful commercial receivers, and letting every youngster enjoy the wonders of radio with his own crystal set.

Dr. Lee De Forest’s triode vacuum tube really launched large-scale radio communications and made practical home receivers possible. The time was right when Dr. Frank Conrad started broadcasting from his garage in 1919, and the broadcasting era exploded. Thousands of small shops started making radios. This vast number soon shook down to a few manufacturers whose names became household words; Atwater Kent, Crosley, De Forest, Federal, Freed Eisemann, Freshman, Gilfillan, Grebe, Fada, Kennedy, Magnavox, Paragon, RCA (first as a sales agent for General Electric and Westinghouse radios), Tuska, Stewart-Warner and Zenith. The Philadelphia Battery Company introduced the first Philco radio in 1928.

Early commercial and home receivers used a wide variety of circuits. Regenerative “bloopers” circuits were soon replaced by tuned—radio—frequency “TRF” sets, including Hazeltine—licensed “Neutrodyne” hook-ups. The “superheterodyne” circuit was broadly accepted by 1930 and has been the standard receiver circuit ever since. These early receivers were very well made, and survive today as collectors’ items. Loudspeakers were beautifully styled, and are also treasured by collectors.

The painful part of home radio in the 1920’s was the inconvenience and expense of batteries. Attempts were made to ease the pain by selling home battery chargers and by building “battery eliminators”. Then, in 1927, development of the A-C radio tube made true plug-in radios available at reasonable prices. The golden days of radio broadcasting were here.
WIRELESS RECEIVERS
WIRELESS SPECIALTY APPARATUS CO.
IP-76
FIRST RECEIVER USING
CRYSTAL DETECTOR AND
LOOSE COUPLER. MADE FOR U.S. NAVY.
1907

MARCONI CA 294
250 TO 3100 M.
1917

MARCONI 106
1915
MODIFIED TO 106D BY
GEN. ELEC. FOR RCA. 1922

MARCONI TYPE D TUNER
AMERICAN MARCONI CO. 1912-1918
MADE BY UNITED WIRELESS.
DESIGNED 1907 BY H. SHOEMAKER OF
UNITED WIRELESS CO.

PACIFIC WIRELESS
SPECIALTY CO.
AUDION RECEIVER
1910-14
MASSIE TUNER
USED IN MASSIE WIRELESS SYSTEM 1916

WESTERN ELECTRIC SCR-59
RECEIVER WITH COMPANION
CONNECTICUT T & E SCR-65A
TRANSMITTER WWI

TELEFUNKEN
RECEIVER
1914

MARCONI OF AMERICA
MODIFIED FLEMING VALVE
RECEIVER 1914

NATIONAL ELECTRIC
SUPPLY CO. NAVY
CN-112 SUBMARINE
RECEIVER WWI

WIRELESS EGERT ENG., INC.
TYPE 303 COMMERCIAL
RECEIVER
MARCONI SHORT WAVE RECEIVER, MADE FOR NAVY DEPT. BUREAU OF STEAM ENGINEERING. 1917

1-P-500 (SE-143)
CRYSTAL DET. RECEIVER
1918 $425.00
150 TO 6,800 M

NATIONAL ELECTRICAL SUPPLY CO.
CN 239
CRYSTAL DET. RECEIVER
1917 $425.00

I-P-501 (SE-1420)
250 TP 8,000 M.
CRYSTAL DET. & AUDION
I-P-503 LONG WAVE
LOADING UNIT TYPE B AMP.
1918 $600.00

I-P-501A
250 TP 8,000 M.
CRYSTAL DET. & AUDION
TWO STEP AMPLIFIER
1920 $550.00
LONG WAVE RECEIVERS

MURDOCK
LONG WAVE RECEIVER
LOADING INDUCTANCE
SILICON DETECTOR
1913 S.P. 550.00

CLAPP—EASTHAM
LONG WAVE RECEIVER
1914 FERRON DETECTOR

THREE SLIDE COIL
RADIOSON ELECTROLYTIC
DETECTOR, WITH
PLUNGER BATTERY.

LONG WAVE RECEIVER NAVY COUPLER,
CONNECTICUT TEL. & TEL. VAR. COND.
RADIOSON DET. GRAPHITE POTentiOMETER.
PHONE CONDENSOR. MURDOCK 55 PHONES.

THREE CIRCUIT LOOSE COUPLER
RECEIVER FOR CRYSTAL DETECTOR OR AUDION. 1919
CRYSTAL SETS

Before the radio tube came into use there were several detectors available. In 1907 Pickard invented the mineral or crystal detector. In 1921 with many broadcast stations coming on the air and the Quaker Oats box already in use everyone could then have a radio. Nearly every man and boy living near a broadcast station made a crystal set, or bought one ready made. Factory made crystal sets cost from $10.00 to $35.00 complete.

The two circuit sets with spiderweb coils, or other low loss coils, and a good galena detector received stations up to 1500 miles away. A Quaker Oats box set would do fine if you had a neighbor near by with a good regenerative receiver that radiated the station he was listening to. As more broadcast stations came on the air more selectivity was needed, and was often secured by separating the primary and secondary circuits by about five inches; this cut down the volume and good headphones were then needed.

The crystal set required a good outside aerial and a good ground connection. The two most common crystals used were galena and silicon. Galena was most sensitive but took longer to find a good sensitive spot with the "cats' whisker." The silicon was louder and it was easy to find a good spot. Crystal detectors were priced from 50c to $4.00 for a good one. They were sold in fancy boxes, marked with guarantees as to volume, distance and clarity. Fixed detectors were available, and while they required no adjustments they were not as sensitive as the cat's whisker type. Crystal detectors are still being made and sold today.

Baby Grand, one of the smallest Crystal sets made; 2 in. x 4 in.
CRYSTAL RECEIVING SETS

AIRPHONE GOLD GRAIN DETECTOR RECEIVER
$6.00

REMLER CRYSTAL SET
1921 $5.00

COMMERCE RADIOPHONE
1919

G. E. ER-753
1921

VICTOR CRYSTAL SET

TWO CIRCUIT CRYSTAL SET
CRYSTAL RECEIVING SETS

NATIONAL RADIOPHONE CRYSTAL DET. RECEIVER 1922

MEEPON CRYSTAL SET 1923

STANFORD ELECTRIC CO. MINIATURE 3" DIAMETER

AEREX CRYSTAL SET KING OF THE AIR 1922

LEE ELECTRIC MFG. CO. - LEMCO CRYSTAL SETS 1923
CRYSTAL RECEIVING SETS

PANDORA CRYSTAL SET
1922 $2.50

BROWNIE CRYSTAL SET
BROWNIE CO. SAN FRANCISCO

AMPLIFIER FOR CRYSTAL SET
CARBON MIKE DIRECT COUPLED
TO A RECEIVER. OPERATES A
LOUDSPEAKER WITHOUT TUBES.

ECLIPSE CRYSTAL SET
ECLIPSE MFG. LOS ANGELES

RAD-SCO CRYSTAL RECEIVING SET
RADIO SUPPLY CO.

C. D. T. CRYSTAL SET
TANNER CO. LOS ANGELES
CRYSTAL RECEIVING SETS

MONTE BLUE CRYSTAL SET

AERIOLA X NOT MADE BY WESTINGHOUSE 1924

MULTIPHONE CRYSTAL SET 1924

BETTA-TONE CRYSTAL SET 1924

RADIO SERVICE CO.

INDIA IVORY CO.
CRYSTAL RECEIVING SETS

PHILMORE CRYSTAL SET

MIRACLE CRYSTAL SET
UNCLE AL'S RADIO SHOP
OAKLAND, CALIF.

WORLD CRYSTAL SET

BABY GRAND CRYSTAL SET
ONE OF SMALLEST MADE

A. C. GILBERT
CRYSTAL SET
1922  $10.00

GREG-SOR CRYSTAL RADIO
STERLING MFG.
BERKELEY, CALIF.
RECEIVING SETS

UNCLE AL’S CRYSTAL SET
ONE STAGE OF AUDIO

STANDARDYNE THREE TUBE SET
USING MULTIVALVE TUBE
THREE TUBES IN ONE  1925

DUAL-WAVE CRYSTAL DETECTOR RECEIVER
1924

EISEMANN VARIO-COUPLER
SWITCH POINTS INSIDE

HOWE CRYSTAL RECEIVER
1925

CRYSTAL DETECTOR RECEIVER
ATWATER KENT

Atwater Kent started as an electrical manufacturer. He introduced a line of high quality do-it-yourself "breadboard" radio components starting in 1921. He presented his famous Model 5 about the end of 1921, but concentrated on components until late 1923. Atwater Kent manufactured top quality products until 1936, when he decided to quit the business due to rising costs and cheap competition.

Atwater Kent Model 5

ATWATER KENT
RADIO RECEIVING SET

The two instruments shown above comprise an excellent and complete receiving set. The Coupled Circuit Tuner and Detector Amplifier on the mahogany board present a beautiful appearance. Complete outfit as above, unwired, $32.00

ATWATER KENT MANUFACTURING COMPANY
4947 STENTON AVE.  Radio Dept.  PHILADELPHIA, PA.
Connections shown above are for five ¼ ampere tubes with 45 volts on the plate circuit of the detector tube. When a one ampere 5 volt tube is used as a detector, decrease its plate voltage to 22½ volts by reset disconnecting wire A from point Y and connecting it to point X.

If Battery Charger is used, a switch is recommended and should be connected, as shown in diagram.
ATWATER KENT RECEIVERS

ATWATER KENT
MODEL 9
1924  $70.00

ATWATER KENT
MODEL 9C
1924  $65.00

ATWATER KENT
TUNED R.F. REGEN. DET.
1922  $70.00
(KIT)

ATWATER KENT
MODEL 10C
1924  $85.00

ATWATER KENT
MODEL 10
1923  $100.00

ATWATER KENT
MODEL 12
1924  $105.00
ATWATER KENT RECEIVERS

ATWATER KENT
MODEL 19
4 TUBE T.R.F.
1924 $60.00

ATWATER KENT
MODEL 20 C COMPACT
5 TUBE TRF
1925 $80.00
("BIG BOX" MODEL 20 WAS ANNOUNCED IN 1924)

ATWATER KENT
MODEL 30
6 TUBE T.R.F.
1926 $85.00

ATWATER KENT
MODEL 32
6 TUBE T.R.F.
1926 $95.00

ATWATER KENT
INSIDE VIEW
MODEL 20 C

ATWATER KENT
MODEL 33
6 TUBE T.R.F.
1927 $95.00
ATWATER KENT RECEIVERS

ATWATER KENT
MODEL 50
7 TUBE T.R.F.
1928 $125.00

ATWATER KENT
MODEL 35
1926 $75.00

ATWATER KENT
MODEL 48
6 TUBE T.R.F.
1928 $80.00

ATWATER KENT
MODEL 36
EXTERNAL POWER SUPPLY
1927 $77.00 7 TUBES
A-C

ATWATER KENT
MODEL 40
FIRST SELF-CONTAINED
A-C MODEL A.K.
1928 $77.00

ATWATER KENT
MODEL 55
1929 $88.00 7 TUBES
A-C

ATWATER KENT
MODEL 44
1928 $106.00 7 TUBES
A-C

77
CROSLEY

Powel Crosley Jr. pioneered the manufacture of inexpensive broadcast receivers, calling them the "Model T" of radio. He sold millions of sets, giving good results at low prices. Crosley was one of the first with good regenerative receivers, using spider-web coils for low loss. He used his famous "book" tuning condensers (invented by Hugo Gernsback) for low cost. Crosley acquired Amrad in 1929. Powel Crosley's original ham call was 8CR, and he later owned radio station WLW in Cincinnati, most powerful in the world at that time.

Crosley VI one stage R.F. Regenerative Detector.

Crosley Receiver Model X

The most complete receiving set on the market. A 4 tube set consisting of one stage of tuned radio frequency, detector, and two stages of audio frequency amplification. It was on this instrument that Sebring, Fla. heard Honolulu. Price, without batteries, tubes and phones $55.00.

Socket Adapter with bushings and screws 75c. Without, 65c.

Makes it possible to use 1½ volt tubes in Crosley Sets.

V-T Socket 40c

Crosley Condenser—Model C

CROSLEY MANUFACTURING CO.

ALFRED STREET  MARCH 1922  CINCINNATI, OHIO
CROSLEY RECEIVERS

CROSLEY PUP
1925 $10.00

CROSLEY MODEL 50
1924 $14.50

CROSLEY MODEL 51
51A 2 STAGE AMP.
1924 $47.50

INSIDE VIEW
CROSLEY 52

CROSLEY MODEL 51
PORTABLE
1924 $28.50
A Wonder in Sales and
A Wonder in Performance

Never has any Radio Receiving Set made such a record in the appreciation accorded it by the public.

Thousands of homes have been made happy by this little Crosley Model 51. In twenty four days from its first appearance it was selling at the rate of 1,000 per day and hundreds of letters expressing appreciation of its excellent performance assured us that it was a favorite.

One of its two tubes is the noted Armstrong regenerative detector with the hook-up made popular in the Crosley Type V. Added to this is one tube of Audio Frequency Amplification giving loud speaker volume on local stations at all times and on distant stations under fair receiving conditions. Otherwise headphones should be used for distant reception.

This Crosley two tube marvel has been a surprise to the Radio World and has proven the biggest seller on the market today.

There is a Crosley priced for every home.

CROSLEY MODEL V—our notable one tube receiver famous for distant reception ........................................... $16.00
CROSLEY MODEL VI—two tube receiver incorporating radio frequency amplification ............................... 24.00
CROSLEY TYPE 3-B—a three tube regenerative set noted for excellent performance .......................... 32.00
CROSLEY MODEL X-J—a four tube receiver with radio and audio frequency amplification ............... 55.00
CROSLEY MODEL X-L—a consolette, with loud speaker, built like a piece of furniture ....................... 120.00

Between these are priced the Super V1, the Super X-J, the 3-C Consolette and others.

Before you buy see the Crosley line.

THE CROSLEY RADIO CORPORATION
Powel Crosley, Jr., President
Formerly The Precision Equipment Company and Crosley Manufacturing Company
618 ALFRED STREET
CINCINNATI, OHIO

Crosley owns and operates Broadcasting Station WLW
CROSLEY RECEIVERS

CROSLEY MODEL 52
THREE TUBE REGEN.
1924 $30.00

CROSLEY MODEL X
FOUR TUBE REGEN.
1922 $60.00

CROSLEY MODEL XJ
FOUR TUBE RECEIVER
1923 $55.00

CROSLEY TRIRDYN
NEUPORT 1924
$100.00

CROSLEY SUPER
TRIRDYN SPECIAL
3 TUBE REFLEX
1924 $75.00

CROSLEY MODEL 5-38
1926 $38.00

CROSLEY 608 GEMBOX
6 TUBES
FIRST SELF-CONTAINED
A–C CROSLEY 1928
$65.00
Dr. DeForest, early in 1903, tried out an electrolytic detector which Reginald Aubrey Fessenden had patented. He found it superior to the chemical detector he had been using in the Responder. Fessenden's detector used a Wollaston wire (invented by the man of the same name) which was a platinum wire sealed in a glass rod and dipped into a dilute acid solution. DeForest had Clifford Babcock make what he called a "Spade Electrode", a piece of platinum leaf sealed into glass. In 1905 the courts ruled that this was in infringement on Fessenden's patent and prevented DeForest from using it. However, by this time, DeForest had a carborundum detector and was developing the audion detector. With the spade electrode this pioneer was employing a three-slide and a five-slide tuner. He called these the two-coil and three-coil "Syntonizers" and they made up the receiving equipment for the DeForest system.
DE FOREST

FIFTEEN PANEL UNIT SET
1919  $160.00

P-300 AUDION-ULTRAUDION
1919  $88.50

INTERPANEL SET
1921  $125.00

T-200 MULTIWAVE TUNER
1920  $87.50

RADIOCRAFT D6 REGENERATIVE
1923  3 TUBES

SCR 64A 80X RECEIVING SET
1919
DEFOREST RADIO TEL. & TEL. CO.

DEFOREST F-5
RADIO PHONE
5 TUBE T.R.F.
1924 $75.00

RADIOPHONE TYPE D-10
PORTABLE REFLEX 4 TUBE
1923 $150.00

THE EVERYMAN CRYSTAL SET
1923 $31.50

DEFOREST
RADIOHOME
DECEMBER, 1919

Federal's
(There's Much in a Name)

Telephone & Telegraph Co.
MANUFACTURERS
TELEPHONE, TELEGRAPH AND RADIO APPARATUS AND ACCESSORIES

FACTORY AND HOME OFFICE
Buffalo, New York, U. S. A.

RADIO TELEGRAPH AND TELEPHONE APPARATUS

Home of Federal Radio Apparatus

BRANCH SALES OFFICES:

NEW YORK CITY          SAN FRANCISCO          CHICAGO          BOSTON
2150 Woolworth Bldg.   603 Mission St.      504 Plymouth Bldg.  89 Bedford St.

BRIDGE & BURG,          PHILADELPHIA
ONTARIO                1008 Drexel Bldg.

85
FEDERAL TELEPHONE & WIRELESS CO.

FEDERAL JR. CRYSTAL RECEIVING SET
1921 S.P. $25.00

FEDERAL 57 RECEIVER
SINGLE TUNED RECEIVER
1 STAGE R.F. DET. 2 STAGE AUDIO 1922 S.P. $98.00

FEDERAL 58 DX RECEIVER
DOUBLE TUNED RECEIVER
1 STAGE R.F. DET 2 STAGE AUDIO 1922 S.P. $116.00

FEDERAL 59 RECEIVER
DOUBLE TUNED RECEIVER
2 STAGE R.F. DET. 2 STAGE AUDIO 1923 S.P. $177.00

FEDERAL 61 RECEIVER
3 STAGE R.F. DET. 2 STAGE AUDIO 1923 $223.00
Here are questions asked you every day:

Is the Neutrodyne the best receiver?
—is the Freed-Eisemann the best neutrodyne?—are dry cell tubes as good as storage battery tubes?—is the loop as efficient as the regulation aerial?

Most times—to most questioners—you shrug your shoulders and say it's a matter of individual preference.

But it isn't. It's a matter of knowledge. Each of these questions and many more are answered in our booklet "Buying a Radio" written for the layman, with a personal word for the expert. Your copy comes free for the asking. Write us.

Four-tube and five-tube models. Prices $100 up. Slightly higher in Canada and west of the Rockies.
FREED-EISEMANN RADIO BROADCAST RECEIVERS

FREED-EISEMANN
FE-15 5 TUBE T.R.F.
1924 $90.00

FREED-EISEMANN
NR-7 6 TUBE NEUTRODYNE
1924 $150.00

FREED-EISEMANN
NR-5 5 TUBE NEUTRODYNE
1923 $150.00

INSIDE VIEW
NR-7
FRESHMAN MASTERPIECE RECEIVERS

FRESHMAN MASTERPIECE
5 TUBE T. R. F.
1924 $60.00

FRESHMAN MASTERPIECE
5 TUBE T. R. F.
1925 $60.00

FRESHMAN MASTERPIECE
5 TUBE T. R. F.
1925 $60.00
The Christmas Radio Gift

Select your Christmas Radio gift for Performance and appearance. The GILFILLAN NEUTRODYNE has wonderful clarity, ample volume and exceptional selective power. Programs come in from far and near—Equally clear—and without interference, howls or squalls.

Parts for GILFILLAN NEUTRODYNE sets are made, assembled and finally inspected in Gilfillan Factories. That is why every Gilfillan Neutrodyne set gives uniformly fine results in reproduction.

The cabinet is made of selected American walnut beautifully finished in two tones. It will look handsome in the modest or richly furnished home.

A GILFILLAN NEUTRODYNE makes a most practical and enjoyable Christmas present. Send for literature to nearest office.

Jobbers and dealers write for special sales proposition.

GILFILLAN BROS. INC.
KANSAS CITY 1815 W. 16th St., Los Angeles, Cal. NEW YORK CITY 225 W. 57th Stree
GILFILLAN RECEIVERS

GILFILLAN GN–3
NEUTRODYNE
1925 $75.00

GILFILLAN GN–2
5 TUBE NEUTRODYNE
1924 $135.00

GILFILLAN MODEL 10
5 TUBE NEUTRODYNE
1925 $125.00

GILFILLAN GN–5
NEUTRODYNE
5 TUBES
1926

SIX TUBE PORTABLE
1925 $65.00
SHORT-WAVE REGENERATIVE RECEIVER AND TWO-STAGE AMPLIFIER TYPE CR-6

Wave-length range: 170 to 680 meters

FOR the radio amateur and experimenter who is satisfied only when he knows that he possesses the very last word in radio receiving apparatus, there is but one answer: the short-wave regenerative receiver and two-stage amplifier, known as Type CR-6. This is one of the most popular receiving sets now in use, because of its remarkable completeness, efficiency, and ease of operation.

The electrical design of the CR-6 embodies the most suitable arrangement for high efficiency and smoothness of operating control, for the wavelengths covered. The antenna circuit consists of an adjustable inductance in series with a variable capacity, giving a very wide range of settings.
A. H. GREBE CO. RECEIVERS

GREBE CR-3
150 TO 680 M.
1920  $60.00

GREBE CR-6
THREE TUBE REGEN.
170 TO 680 M.
1919  $180.00

GREBE CR-5
ONE TUBE REGEN.
150 TO 3,000 M.
1921  $80.00

GREBE CR-9
THREE TUBE REGEN.
150 TO 3,000 M.
1921  $110.00

GREBE CR-8
ONE TUBE REGEN.
150 TO 1,000 M.
1921  $80.00
A. H. GREBE CO. RECEIVERS

GREBE CR-18
10 TO 200 METERS
ONE OF THE FIRST
10 METER RECEIVERS
1926 $100.00

GREBE SYNCHROPHASE
5 TUBE T. R. F.
1925 $125.00

GREBE RORK
2-STEP AMP.
$55.00

GREBE A-C SIX
7 TUBES A-C
1928

GREBE RORB
DET. 2 STEP AMP.
$75.00
The 200 meter wave to which the amateur is limited by government regulations, does not permit of high efficiency at the transmitting end. It is possible to more than offset this, however, by the use of super sensitive receiving apparatus—a fact that is well demonstrated by the way amateurs consistently communicate over greater distances than do commercial stations although obviously the latter work under more favorable conditions.
COLIN B. KENNEDY RECEIVERS

KENNEDY 110 UNIVERSAL
175-25,000 METERS
1922 S.P. $325.00

KENNEDY 220 INTERMEDIATE
175 to 3100 METERS
1921 S.P. $210.00

KENNEDY 281 & 521 AMP.
175 to 620 METERS
1921 S.P. $200.00

KENNEDY MODEL V
1923 S.P. $86.50

KENNEDY PORTABLE
1923 S.P. $75.00
The most satisfying receiver you can buy

Selectivity
Model XV is so superselective that you can cut right through powerful local broadcasting and receive distant stations clearly. Not merely faint, fuzzy whispers, but firm, distinct reception without a trace of interference. In cities like Chicago, where conflicting stations make a broad tuning receiver useless, Model XV separates them completely so any local program can be chosen or all locals can be cut out and long range reception enjoyed. Users tell us they have logged over 150 stations from coast to coast and even across the seas.

Purity of Tone
Kennedy receivers have always been noted for their fine tone quality. No other receiver of any type approaches the Kennedy in its brilliant reproduction of every shading of music and inflection of the voice.

Simplicity of Tuning
Each station is always found at its own dial setting. There are only two tuning dials—one for each hand and none left over. Only one figure need be jotted down as the setting for any station. Both dial settings are practically alike. You can set the dials and name the station!

Volume on Distant Programs
Stations hundreds of miles away come in so perfectly, with loudspeaker volume, that your friends believe they must be local stations—until they hear the station call letters.

You must hear this receiver to appreciate its wonderful superiority.

Write for the address of a dealer who will demonstrate

THE COLIN B. KENNEDY COMPANY
Saint Louis
COLIN B. KENNEDY RECEIVERS

KENNEDY XI
1924 $185.00

KENNEDY XV
TYPE 430
1924 $142.50

KENNEDY XXX
TYPE 435
1925
MAGNAVOX Radio

Receiving Set TRF-5 with
Reproducer M4 - $125.00

Experienced radio users have stated that this Magnavox equipment (illustrated below) represents the highest standard of real value and usefulness ever offered in the radio field.

The Magnavox 5-tube circuit is a special development of tuned radio frequency in which a splendid balance of selectivity, range and volume have been attained. The one dial Station Selector eliminates all tuning adjustments; while the Magnavox Reproducer insures sonorous, pleasing tone for all programs.

Magnavox Radio Receiving Sets, Tubes and Reproducers are carried by reliable dealers. Illustrated booklet on request.

THE MAGNAVOX COMPANY
OAKLAND, CALIFORNIA

New York: 350 West 31st St.
Chicago: 162 N. State Street
San Francisco: 274 Brannan St.

Canadian Distributors: Perkins Electric Limited, Toronto, Montreal, Winnipeg
TRF-50
(as illustrated)
A 5-tube tuned radio frequency receiver with built-in Magnavox Reproducer unit which consumes no battery. Cabinet measures: height, 14¾ in.; length, 20¾ in.; depth, 18¾ in.
Without tubes or batteries . . $150.00

TRF-5
This is identical with the above but encased in smaller cabinet without built-in Reproducer. Cabinet measures: height, 9¾ in.; length, 20½ in.; depth, 14¾ in.
Without tubes, batteries or reproducer $125.00

MAGNAVOX
New Broadcast Receivers combining supreme efficiency, convenience and beauty

HERE at last is the perfected instrument permitting you to enjoy simultaneously the most desirable elements of broadcast reception.

Three decisive advantages go with the Magnavox: unequalled simplicity of control, reproduction of exceptional clearness—handsomely carved period cabinets.

Magnavox Radio Receivers, Vacuum Tubes, Reproducers, Power Amplifiers, and Combination Sets are sold by reliable dealers everywhere

THE MAGNAVOX CO., OAKLAND, CALIF.
New York: 350 W. 31st Street  San Francisco: 274 Brannan Street
Canadian Distributors: Perkins Electric Limited, Toronto, Montreal, Winnipeg
The amateur will tell you that the Paragon three-circuit receiver, because of its greatly superior selectivity and sensitivity, can pick and choose between broadcasting stations of about the same signal strength with less than one per cent differential.

This means that with a Paragon receiver you get what you want when you want it—complete messages and clear music from the station you tune in on, without interruption and jamming. Until you have listened in with a Paragon three-circuit receiver, you cannot guess the real pleasure and fascination of radio.

Long before broadcasting popularized radio with the general public, Paragon equipment was the choice of the experienced amateur. He will tell you today that if you want quality and satisfaction, Paragon Radio Products are the best and safest buy on the market.

An illustrated Catalog of Paragon Radio Products is Yours For the Asking

DEALERS — The Adams - Morgan Company has an interesting proposition to make to reputable radio dealers who believe in quality merchandise. Details on request.

ADAMS-MORGAN COMPANY
6 Alvin Ave., Upper Montclair, N. J.

You would need them all to hear what you get nowadays with a single circuit receiver.

With several hundred powerful broadcasting stations, all operating on one narrow wave band, it takes real selectivity and sensitivity to get a satisfactory radio programme.
PARAGON RECEIVERS
ADAMS-MORGAN COMPANY

PARAGON RA-10 REGENERATIVE SHORT-WAVE PRE-TUNER
1921  S.P. $75.00

PARAGON DA 2 DETECTOR 2 STAGE AMP.
1921  S.P. $65.00

INSIDE VIEW RA 10

PARAGON RA 10 DA 2

III A
3 TUBE REGEN
1923  $175.00

PARAGON RA-6
ADAMS MORGAN
FIRST RECEIVER TO USE ARMSTRONG REGENERATIVE CIRCUIT.
1916  $35.00
The Radio Corporation of America was and is one of the largest and oldest manufacturers of radio sets. After the first World War the Alexander alternator patents were offered for sale. The British Marconi Company were making arrangements to secure these, but the U.S. Government intervened in the interests of maintaining our nation’s lead in the radio field. So R.C.A. was formed on October 17, 1919 with Ed J. Nally as President, and Owen D. Young as Chairman. A month later, on November 20th, American Marconi Co. was taken over by RCA.

They became the largest distributor of radio receiving sets in the world, selling the entire output of the General Electric Company and Westinghouse. RCA took over the Marconi Institute, founded in 1913, and renamed it the Radio Institute of America; it offered technical radio courses and commercial radio operator’s courses to thousands of students.

RCA World Wide Wireless in 1920 sold transmitting and receiving commercial sets made by G.E. and Westinghouse, and also some made by Wireless Specialty Apparatus Company. RCA sold ship-to-ship and ship-to-shore stations complete. Portable mule pack sets, military tractor sets, spark transmitters from one to 20 KW, tube transmitters and interfleet radio telephones were all distributed by RCA at this time.

RCA Communications Inc. kept two 100 K.W. alternators in daily use to handle radiograms to 43 foreign nations. Radiograms were also handled by Western Union Telegraph Company. In 1926 RCA purchased radio station WEAF in New York for one million dollars and founded the National Broadcasting Company; M.H. Aylesworth was President. There were more than five million home radio receivers in use at this date.
Completing Sets at the Westinghouse Electric and Manufacturing Company's Radio Works, Springfield, Massachusetts

Radio Corporation of America

Section of Radio Assembling Room at Immense Plant of General Electric Company, Schenectady, N. Y.
Westinghouse Regenerative-Vacuum Tube Receiver Combination No. 4

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Price</th>
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<tbody>
<tr>
<td>RC</td>
<td>Short Wave Regenerative Receiver, 170-700 meters, less tubes</td>
<td>$132.50</td>
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<tr>
<td>CB</td>
<td>Load Coil</td>
<td>$6.00</td>
</tr>
<tr>
<td>UV-200</td>
<td>One Radiotron Detector</td>
<td>$5.00</td>
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<tr>
<td>UV-201</td>
<td>Two Radiotron Amplifiers</td>
<td>$13.00</td>
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<td>6HR-9</td>
<td>Storage Battery, 6 volts, 100 A. H.</td>
<td>$24.00</td>
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<tr>
<td>UD-790</td>
<td>Brandes Telephones</td>
<td>$8.00</td>
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<tr>
<td>UD-824</td>
<td>Telephone Plug</td>
<td>$1.75</td>
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<tr>
<td>AD</td>
<td>Receiving Antenna Equipment</td>
<td>$7.50</td>
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<td>LV</td>
<td>Vocarola (Loud Speaker)</td>
<td>$30.00</td>
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<tr>
<td>285168</td>
<td>Rectigon Battery Charger, 5 amperes</td>
<td>$28.00</td>
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</table>

Total: $261.75
RADIO CORPORATION OF AMERICA

RADIOLA SIX TUBE RECEIVER WITH RE-ANT TUNER. AR-THREE STAGE R.F. AMP. RA-REGEN RECEIVER. DA-DET TWO STEP AMP. MADE BY WESTINGHOUSE 1922 S.P. $225.00

RADIOLA SENIOR TYPE RF REGEN. USES WD-11 TUBE MADE BY WESTINGHOUSE 1923 S.P. $65.00

AERIOLA JR. MODEL RE CRYSTAL SET 1922 S.P. $25.00 MADE BY WESTINGHOUSE
RADIO CORPORATION OF AMERICA

RADIOLA SPECIAL
ONE TUBE REGEN.
170 TO 500 M.
1923  $30.00
WIRELESS SPEC. CO.

RADIOLA CONCERT RECEIVER
CRYSTAL SET
170 TO 2650 M.
WIRELESS SPEC. CO.
1922  S.P.  $40.00

AERIOLA SR. RECEIVER
REGENERATIVE USES WD11
MADE BY WESTINGHOUSE
1922  S.P.  $65.00

AERIOLA AMPLIFIER
2 STEP WD 11 TUBES
MADE BY WESTINGHOUSE
What will your wheat bring?

What will your corn bring? Your livestock? Will it be top price? It will, if you keep in touch with the market—with a RADIOLA.

Practical, dependable and economical is the new RADIOLA III-A. It is achieving distance records greater than sets at far beyond its price—getting cross-country reception with its four tubes. Every word comes in clear and true—music and fun from far away sound as real as if they were in the room. It is the set for the farmer who wants to guide his day's work by the weather reports—guide his marketing by the crop reports—entertain his evenings with good music.

“There’s a Radiola for every purse”

Radio Corporation of America
Sales Offices
233 Broadway, New York City
10 So. La Salle St., Chicago, Ill.
435 California Street, San Francisco, Cal.
RADIO CORPORATION OF AMERICA

RADIOLA I
TYPE ER-753-A
MADE BY GENERAL ELEC.
1922 S.P. $25.00

RADIOLA II AR-800
2 TUBE REGENERATIVE
PORTABLE RECEIVER
USED TWO 199 TUBES
1923 S.P. $60.00
MADE BY GEN. ELEC.

RADIOLA III AR-805
WITH BALANCED AMPLIFIER
REGEN. DET. ONE STEP
AUDIO. ONE STEP PUSH
PULL AUDIO. 1923
S.P. $65.00

RADIOLA TYPE RS
MADE BY WESTINGHOUSE
1923
RADIO CORPORATION OF AMERICA

RADIOLA IIIA AR 806
REGEN. DET. ONE STEP
AUDIO. ONE STEP PUSH
PULL AUDIO. 1924
S.P. $65.00

RADIOLA IV AR-880
THREE TUBE RECEIVER
REGEN. DET. 2 STAGE
AUDIO. 1922
MADE BY GEN. ELEC.

RADIOLA V AR-885
AR-1300 CRYSTAL DET.
RECEIVER
AA-1400 TUBE DET.
TWO STEP AUDIO
1922 MADE BY GEN. ELEC.
$250.00 COMPLETE

RADIOLA VI AR-895
AA-1520 3 STAGE R.F.
AA-1400 3 STEP AUDIO
TUNES 200 TO 5000 M.
1922 MADE BY GEN. ELEC.
RADIO CORPORATION OF AMERICA

RADIOLA VIII
6 TUBE SUPER.
PORTABLE
1925  S.P.  $286.00

RADIOLA VII B & IX
2 CIRCUIT TUNER
5 TUBE DET. AMP.
AR-907
1923  S.P.  $245.00

RADIOLA X
REGENOFLEX
4 HD 11 TUBES
1925  S.P.  $245.00

RCA REGENOFLEX
1925  $191.00
RADIO CORPORATION OF AMERICA

RADIOLA 24 AR-804
6 TUBE SUPER
USING 199 TUBES
PORTABLE
1925 S.P. $160.00

RADIOLA 25 AR-919
6 TUBE SUPER
USING 199 TUBES
LOOP RECEIVER
1925 SP $165.00

RADIOLA 26
6 TUBE SUPER
PORTABLE
HOME BATTERY BOX
WITH ANT. TUNER
1925 S.P. $225.00
Why
Zenith is
Here to Stay—

If you own a Super-Zenith it is not necessary to tell you why the instrument is here to stay.

If you are contemplating the purchase of a radio and want one that will be thoroughly satisfactory years from today—this message is for you.

In the beginning we confronted a grave question—the choice of one or the other of two business policies.

One way open was to make radios "at a price" in large quantities. This plan we discarded and chose the other road—the road of business soundness—customer satisfaction and absolute permanence.

We designed and manufactured a superior instrument—the finest radio of its kind humanly possible to produce.

We chose this policy—not because we felt it would be the most profitable immediately, but because we knew it would be best in the long run.

As a result of that decision, Zenith has maintained a steady and ever-growing volume and owner endorsement. Every Super-Zenith is a perfectly balanced radio instrument—simple yet responsive and highly sensitive—giving distance with ease—yet preserving clarity, wonderfully true tones.

Literature gladly sent on request.

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

ZENITH RADIO CORPORATION, Strouse Building, Chicago

It Costs more—but it Does more
DO IT THE EASIEST WAY!

C. R. L. Regenerette

And not only that but combine ease and convenience with efficiency. With our C. R. L. Regenerette you can convert your loose coupler into a modern Regenerative Receiver with absolutely no changes in construction. Just modify your connections slightly and bring your set up to date. Full instructions supplied for connection and operation. The Price?

Only $15.00

CHICAGO RADIO LABORATORY
1316 CARMEN AVE., CHICAGO, ILL.

Z-NITH LONG DISTANCE RECEIVER
1922

ZENITH 3R LONG DISTANCE RECEIVER
1923 4 TUBES $175.00

Ralph Matthews (9ZN) and Karl Hassel set up the Chicago Radio Laboratory in 1919, making equipment for radio amateurs, developing the name Zenith from their call letters. Zenith became a major manufacturer of quality radio equipment.
ZENITH

ZENITH 4R
REGENERATIVE RECEIVER
1923 4 TUBES $100.00

ZENITH SUPER PORTABLE
FIRST MANUFACTURED
PORTABLE RADIO
WITH BUILT-IN SPEAKER
1924 6 TUBES $224.00

ZENITH SHORT WAVE RECEIVER
USED BY MACMILLAN
POLAR EXPEDITION
1925

SUPER-ZENITH VII BASIC CIRCUIT FOR ZENITH'S EARLY CONSOLE FAMILY
1924 $230.00 6 TUBES A-C VERSION 1926
RECEIVERS

CONNECTICUT TEL. & ELEC.
SODION NON-REGEN. DET.
2 STAGE AUDIO

BOSTON SCALE & MACHINE
105 TUNER WITH 100 DETECTOR
2-STAGE AMPLIFIER, 1920

FIVE TUBE RECEIVER
2 STAGE FIXED TUNED R.F.
REGEN. DET. 2 STAGE AUDIO
USING W.E. 215A's
NORTHERN ELEC. CANADA

MU-RAD MA 13
2 STAGE UNTUNED R.F.
DET. 2 STAGE AUDIO
1922 S.P. $160.00

REZODON
PAUL G. NIEHOFF CO.
FIVE TUBE REGEN.
1921

CANADIAN MARCONI
TYPE-C RECEIVER:
ST-1 TUNER, VO-1
DETECTOR, AA-1
2-STAGE AMPLIFIER
1922
Wireless Telephone and Telegraph Receiving Sets

Simple enough for any one to operate
and of almost unbelievable efficiency

Manufactured in the Clapp-Eastham Shops
in the Clapp-Eastham Way

A SATISFIED AUDIENCE

"A LITTLE BETTER THAN THE BEST"

CLAPP-EASTHAM COMPANY
139 Main Street, Cambridge, Mass.
REGENERATIVE ONE TUBE RECEIVERS
AND AMPLIFIERS

AMRAD
REGENERATIVE RECEIVER
DETECTOR & 2 STEP AMPLIFIER
1921 $57.50
AMERICAN RADIO & RESEARCH

CLAPP-EASTHAM ZRF
REGENERATIVE TUNER
2 VARI METERS 1 VARIO COUPLER
1919 $38.00

CLAPP-EASTHAM
REGENERATIVE RECEIVER
DET. 2 STEP AMP. 1921
$60.00 LESS TUBES

SLEEPER TYPE 3300
REGENERATIVE RECEIVER
1920 $35.00

WIRELESS SHOP
REGENERATIVE RECEIVER
A. J. EDGECOMB LOS ANGELES

JONES
REGENERATIVE DETECTOR
1 TUBE
Michigan hears Honolulu

"On Saturday night my Tuska and I picked up Station KGU, Honolulu Advertiser, and listened to them for an hour through my loud speaker. It was wonderful!"
RECEIVERS

INDUSTRIAL RADIO SERVICE
BABY ULTRA 400
1922  4 TUBES

REMLER RECEIVER
TYPE 400 COIL MOUNTING
TYPE 300 DET. CONTROL
PANEL 1921  $22.00

KODEL C11
ONE OF THE LITTLEST
ONE TUBE SETS MADE
1924  S.P. $10.00

C. D. TUSKA 225
THREE TUBE REGEN.
1922  $90.00

C. D. TUSKA 224
ONE TUBE REGEN.
1922  $75.00

C. D. TUSKA 228
SUPERDYNE
1924  $120.00

KELLOGG ONE TUBE REGEN.
1922

FAMOUS J. L. REINARTZ
RECEIVER
ONE OF THE BEST FOR C.W.
1921
BROADCAST RECEIVERS

GAROD TYPE RAF.
4 TUBE NEUTRODYNE
1923 S.P. $135.00

MURDOCK C. S. 32
5 TUBE NEUTRODYNE
1925 S.P. $130.00

MARCONPHONE
MADE IN ENGLAND
1923

GARCO CARTER MFG. CO.

NATIONAL MONODYNE
1 TUBE RECEIVER &
1 STAGE OF AUDIO
1923 S.P. $18.00
The Neutrodyne principle as applied to the FADA "One Sixty" has produced a radio receiver that is simplicity itself. Once the notations have been made of the dial settings of any stations, anyone can reset the dials in the given positions and listen to that station at will.

The pleasing design of the cabinet and its beautiful finish make it an ornament to any home. Its efficiency makes it a delight to all who listen. It is a receiver that you will be proud to own. See the FADA "One Sixty" at your dealer's. Price, exclusive of tubes, batteries and phones, $120.

F. A. D. ANDREA, INC., 1581 Jerome Ave., New York
BROADCAST RECEIVERS

TREGO
1924 5 TUBES $45.00

WARE 3 TUBE NEUTRODYNE
1924 $72.00 TYPE T

FADA 175A
5 TUBE NEUTRODYNE
1924 $160.00
F.A.D. ANDREA CO.

MUSIC MASTER TYPE 60
1925 $95.00

FADA 480B
FOLD-IN LOOP ANTENNA
R808 CHASSIS
1927 8 TUBES $300.00

KODEL PORTABLE
"THE CAMERA RADIO"
IN A CAMERA CASE
1924 S.P. $16.00

124
Perfect Mastery
of Radio

Mu-Rad
Receivers
MA-15

"I am ready
to obey thee
as thy slave,
and the slave
of those who
have that
lamp in their
hands."
—The
Arabian
Nights

MORE wonderful even than
Aladdin's Lamp is your perfect
mastery of radio's unlimited re-
sources with the Mu-Rad MA-15 Re-
ceiver. Distance beyond imagination,
sensitivity as quick as thought,
itself, all with control that obeys
your wishes easily and simply. Loud
speaker reception, using only a two
foot loop. The most highly developed
circuit—two stages of audio and
three stages of radio frequency
amplification with detector.

RECEPTION CONSERVATIVELY
GUARANTEED 1000 MILES

WRITE FOR
ILLUSTRATED LITERATURE

Establishes a New Horizon of Radio

Mu-Rad Laboratories, Inc.
801 Fifth Ave. Asbury Park, New Jersey
REGENERATIVE RECEIVERS 1924

ECHOPHONE MODEL 4
RADIO SHOP
LONG BEACH, CALIF.

ECHOPHONE MODEL A
RADIO SHOP
SUNNYVALE, CALIF.

ECHOPHONE MODEL J
SUNNYVALE, CALIF.
RADIO SHOP

ONE TUBE REGEN. RECEIVER

SIGNAL
SINGLE CIRCUIT REGEN.
ONE TUBE $25.00
BROADCAST RECEIVERS

DAVID GRIMES 5B
BABY GRAND DUPLEX
1925  5 TUBES  $59.50

CUTTING & WASHINGTON
11A 3 TUBE REGEN.
1922  $85.00

DAVID GRIMES
INVERSE DUPLEX REFLEX
TYPE 4DL  4 TUBE
SAME AS 6 TUBE SET
1924  $160.00

ERLA
5 TUBE T.R.F.
1924  $75.00

ARBORPHONE
5 TUBE T.R.F.
1925  $90.00
CONSOLIDATED RADIO CORP.

WURLITZER 5D
5 TUBE T.R.F.
1924  $85.00

127
BROADCAST RECEIVERS

DAGY-FAN
5 TUBE T.R.F.
1925 S.P. $125.00

DAGY-FAN
6 TUBE T.R.F.
WITH SPEAKER
1926 $150.00

MAGNAVOX
TRF-5
TELOS VARIO-
TRANSFORMERS
1924 $150.00

RADIODYNE WC-12
WESTERN COIL & ELEC. CO.
6 TUBE T.R.F.
1925 $150.00

MICHIGAN RADIO MRC-2
2 TUBE REGENERATIVE
1924 $32.50

RADIODYNE WC-1S JR.
WESTERN COIL & ELEC. CO.
6 TUBE T.R.F.
1926 $49.50
You’ll be Proud of This Michigan Four

"America’s Most Beautiful Set"

The art of Chippendale, the grace of Louis XIV, the sturdiness of the Jacobian period have been combined in this wonderful Michigan four cabinet. And in the radio receiving set itself, all the latest development in good construction and design have been incorporated.

One stage of radio frequency, a detector, and two stages of amplification, give you distance—selectivity and unusual volume.

A built-in loud speaker, with adjustable feature of exceptional mellow tone quality is part of the set.

Also compartment with ample room for batteries. The set operates equally as well on Standard Six Volt or Dry cell tubes.

The beautiful mahogany cabinet with inlaid drop panel gives you a set that cannot be surpassed for beauty and service.

Write for Illustrated Folder
Ask Your Dealer for Demonstration

Other models and types to meet all requirements from $32.50 up.

Licensed under U.S. Patent 1,112,449; letter pending 807,488

Michigan Radio Corporation
32 Pearl Street
Grand Rapids, Michigan
KODEL—An astonishing new receiver that will make radio history

KODEL is the name of a circuit discovered by an independent experimenter. So wonderful is the KODEL circuit that it picks up stations 1,000 miles away, using only one tube, and no antenna, when conditions are right. Add tubes and you increase distance and volume until you succeed in covering 3,000 miles on the loud speaker. All this with only a single dial to turn!

If you travel—KODEL Portable. If you cannot erect an antenna—KODEL. If you want distance and quality—KODEL. If you want simplicity—KODEL. If your pocketbook is limited—KODEL. Even if you want results regardless of cost—KODEL.

See the KODEL line at your dealer’s. If he cannot supply you, send us his name and address with check or money order and we will ship direct to you. Money returned if any KODEL set does not more than satisfy you.

ALL KODEL sets use the unique KODEL circuit and may be operated from either storage or dry batteries at will, and without an outdoor antenna if desired.

FREE. Write for instructive KODEL Catalogue, entitled “Radio for Every Purpose and Any Purse.” FREE!

DEALERS: the KODEL is a sensation wherever introduced. Write for terms.

KODEL Model C-11 Four Tube Receiver, with battery compartment and loud speaker. Price, $37.50. (Without battery cabinet, loud speaker, or accessories.) Battery cabinet can be furnished with any KODEL set at slightly additional cost.

KODEL Model C-11 One Tube Receiver—The biggest value in a one tube radio set today. Price, $18.00.

KODEL Model C-12 Two Tube Receiver—$25.00. A great distance getter; runs local stations on the horn; single dial tuning.

KODEL Model C-13 Three Tube Receiver—$35.00. Gives the tube volume with only three tubes due to reflex amplification.

KODEL—Model P-11 6-Tube Portable—the Camera of Italy. Price, $10.00 without accessories. Tube, batteries, head phone, antenna, and ground wire all self-contained. Weight 4½ lbs. complete.

Model P-11 Two Tube Portable, (Model P-11 with additional tubes added, which increases distance and volume many times) $27.50.

KODEL Model P-10 Single Tube Portable. Price, $12.50.


KODEL Model P-8 Single Tube Portable. Price, $5.00.

KODEL Model P-7 Single Tube Portable. Price, $5.00.

KODEL Model P-6 Single Tube Portable. Price, $5.00.


KODEL Model P-4 Single Tube Portable. Price, $5.00.

KODEL Model P-3 Single Tube Portable. Price, $5.00.


KODEL Model P-1 Single Tube Portable. Price, $5.00.

KODEL Model 0-10 Single Tube Portable. Price, $5.00.

KODEL Model 0-9 Single Tube Portable. Price, $5.00.

KODEL Model 0-8 Single Tube Portable. Price, $5.00.

KODEL Model 0-7 Single Tube Portable. Price, $5.00.

KODEL Model 0-6 Single Tube Portable. Price, $5.00.

KODEL Model 0-5 Single Tube Portable. Price, $5.00.

KODEL Model 0-4 Single Tube Portable. Price, $5.00.

KODEL Model 0-3 Single Tube Portable. Price, $5.00.

KODEL Model 0-2 Single Tube Portable. Price, $5.00.

KODEL Model 0-1 Single Tube Portable. Price, $5.00.

KODEL Model 0-0 Single Tube Portable. Price, $5.00.

KODEL Model 0-9 Single Tube Portable. Price, $5.00.

KODEL Model 0-8 Single Tube Portable. Price, $5.00.

KODEL Model 0-7 Single Tube Portable. Price, $5.00.

KODEL Model 0-6 Single Tube Portable. Price, $5.00.

KODEL Model 0-5 Single Tube Portable. Price, $5.00.

KODEL Model 0-4 Single Tube Portable. Price, $5.00.

KODEL Model 0-3 Single Tube Portable. Price, $5.00.

KODEL Model 0-2 Single Tube Portable. Price, $5.00.

KODEL Model 0-1 Single Tube Portable. Price, $5.00.

KODEL Model 0-0 Single Tube Portable. Price, $5.00.

KODEL Model 0-9 Single Tube Portable. Price, $5.00.

KODEL Model 0-8 Single Tube Portable. Price, $5.00.

KODEL Model 0-7 Single Tube Portable. Price, $5.00.

KODEL Model 0-6 Single Tube Portable. Price, $5.00.

KODEL Model 0-5 Single Tube Portable. Price, $5.00.

KODEL Model 0-4 Single Tube Portable. Price, $5.00.

KODEL Model 0-3 Single Tube Portable. Price, $5.00.

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KODEL Model 0-1 Single Tube Portable. Price, $5.00.

KODEL Model 0-0 Single Tube Portable. Price, $5.00.

KODEL Model 0-9 Single Tube Portable. Price, $5.00.

KODEL Model 0-8 Single Tube Portable. Price, $5.00.

KODEL Model 0-7 Single Tube Portable. Price, $5.00.

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KODEL Model 0-3 Single Tube Portable. Price, $5.00.

KODEL Model 0-2 Single Tube Portable. Price, $5.00.

KODEL Model 0-1 Single Tube Portable. Price, $5.00.

KODEL Model 0-0 Single Tube Portable. Price, $5.00.
BROADCAST RECEIVERS

BOSCH AMBOROLA
6 TUBE NEUTRODYNE
1924  $160.00
AMER. BOSCH CO.

SPLITDORF
5 TUBE T.R.F.
1924  $125.00

GAROD V
6 TUBE NEUTRODYNE
1923  $195.00
GAROD RADIO CORP.

HETRO-MAGNETIC
TYPE 5H
5 TUBE T. R. F.
1925  $75.00
SIDBENEL RADIO EQUIP.
BROADCAST RECEIVERS

STROMBERG-CARLSON 1A
5 TUBE NEUTRODYNE
1924 $180.00

INSIDE STROMBERG-CARLSON 1A

EAGLE NEUTRODYNE
BALANCED RECEIVER
1923 $175.00

HOWARD A6
6 TUBE NEUTRODYNE
1926 $200.00

FIVE TUBE NEUTRODYNE KIT
1924 $80.00
BROADCAST RECEIVERS

THOROLA
5 TUBE T.R.F.
1924    $85.00

PREMIER RADIO MODEL 7A
5 TUBE REFLEX
3 STAGES OF R.F. CRYSTAL
DETECTOR 3 STAGES AUDIO
1924    $250.00

SILVER-MARSHALL
SILVER SIX
1924

ELECTROLA
5 TUBE T.R.F.
1923    $90.00
BROADCAST RECEIVERS

A-C DAYTON X-L-5
1925

A-C DAYTON XL-25
5 TUBE T. R. F.
1926

A-C DAYTON XL-5
5 TUBE T. R. F.
1925 $95.00

MAGNUTROL
5 TUBE T. R. F.
MAGNUS CO.
1924 $90.00

RADIO SERVICE LABS R212
5 TUBE NEUTRODYNE
1923 $120.00

PACIFIC CLARATONE
5 TUBE T. R. F.
1925 $75.00
BROADCAST RECEIVERS

KEMPER PORTABLE K-52
1925 $90.00

PARMAK 5 TUBE T.R.F.
1924 $85.00

TRAV-LER PORTABLE 5 TUBE
1925 $75.00

HALES CALIFORNIAN 5 TUBE T.R.F.
1925 $80.00
The Real Secret of Clear Tone and Quiet Operation
told in simple, every-day terms which everyone can understand

SOMETHING has recently happened to radio which makes it a much simpler, more dependable and sweeter-toned instrument. That something is the complete elimination of internal noises by the radio inventor, Carl Pfannstiehl.

The technical means which he employed is a scientific story of great interest to radio engineers. The average radio user does not care about that. But, briefly, in popular language, this is what he did:

For years he had observed what complicated devices were being used to neutralize stray oscillations in the set, the oscillations of radio energy which cause chatter and squeaks and squawks, and often distorted speech or music. Potentiometers were employed and extra condensers. These were makeshift. They only partially succeed, and they need adjustment.

He made up his mind that some way could be found to go to the root of the trouble and eliminate it entirely, instead of merely trying to offset it. By tracing back the oscillations to their separate sources he discovered their true nature and how to keep them out. Nobody had ever known this before.

The remedy is as simple as it is effective. All complicated devices are dispensed with. He so designed the structural relationship between coils and condensers that the stream of radio energy is perfectly controlled; there is no feedback causing stray oscillations. All the radio energy is utilized in developing the true signal. The set is internally noiseless. Speech and music come in without interference. You get a liquid clear enunciation of every syllable and a supremely pure tone.

See and hear this new system that is revolutionizing radio—the Pfannstiehl Model 7—at your dealer's. Or let us send you a free descriptive booklet.

Desire. Write for the special Pfannstiehl proposition.

PFANNSTIEHL RADIO COMPANY
Highland Park 23 Second Street Illinois

* Pfannstiehl

MODEL 7 RECEIVER
A 3-tube Receiver using the new system of tuned radio frequency
BROADCAST RECEIVERS

MELCO SUPREME
AMSCO PROD. INC.
1924 $140.00

STEWART WARNER
MODEL 305
5 TUBE T.R.F.
1925 $120.00

STEWART WARNER
MODEL 300
5 TUBE T.R.F.
1925 $75.00

SLEEPER SERENADER
5 TUBE T.R.F.
1925 $190.00

KELLOGG
WAVEMASTER
1925 $125.00

STEWART-WARNER
MODEL 385
1927 6 TUBES $75.00
A Thousand and One Nights Entertainment

The MELCO is a silver-tongued Scheherezade—offering a thousand and one nights entertainment.

Entertainment without interference, noises and fade-aways.
Supreme radio reception—Full-toned, clear-throated true to life.

Ask for interesting literature

MELCO SUPREME RECEIVER ★
TUNED RADIO FREQUENCY
AMSCO PRODUCTS INC. BROOME & LAFAYETTE STREETS, N.Y.

★ Tested and approved by Radio Broadcast ★
Not so easy for all of us to read. But it is much easier to hear this cheery greeting and lively music all the way from Holland when you tune in on station PCLL with the THRILL Box.

Words and music from 20 different countries in a dozen different languages, may be heard with the NATIONAL Screen-Grid THRILL-BOX. This new Radio is full of new and ingenious features for your convenience and pleasure.
METRODYNE SUPER-SEVEN
METRO ELECTRIC CO.
1926 $75.00 7 TUBES

KOLSTER
6 TUBE T.R.F.
GANGED TUNING
1926 S.P. $150.00
FEDERAL-BRANDES

KING
5 TUBE NEUTRODYNE
ONE DIAL TUNING
1926 $125.00

THREE CIRCUIT REGEN.
4 TUBES
1923 KIT $30.00

MOHAWK
5 TUBE T.R.F.
1924 S.P. $125.00

ADVANCE AUTOMOBILE ACCESSORIES CO.
NEUTROWOUND SUPER-6 1926 $95.00
SUPERHETERODYNE SETS

In 1918 Major Armstrong invented the superheterodyne circuit; the heterodyne principle was not new, having been used in undamped wave wireless telegraphy. This was the ultimate in a receiver, for it gave better selectivity and had a low noise ratio. The front end of the superheterodyne used a loop antenna, an oscillator and a frequency changer or mixer. The intermediate frequencies were fixed at from 45 to 60 KC. A second detector and transformer-coupled audio stage followed. Initial problems with the “super” sets were bad radiation and two-spot tuning.

When RCA brought out their first superheterodyne sets in 1924 they used a revised circuit devised by Armstrong and Houck which employed a second harmonic from the oscillator and cut down radiation. J. H. Pressley developed a circuit, the Autodyne, which combined the oscillator and mixer in one tube. This circuit used a tuned front end and increased the gain while at the same time prevented radiation.

LOOP ANTENNAS

The loop antenna was first used for direction finding, and is still thus employed. In the early broadcast era the loop was used where an elaborate antenna could not be erected, and to prevent radiation and cut out strong local stations. For home receivers loops were made from about 12 to 24 inches square, they were often made to fold for storage purposes. Eventually loops became smaller and were placed within the sets, as they are today.

Norden-Hauck C-10 Navy Super, 10 Tubes, $250.00, 1925

Collapsible Loop Antenna
WESTERN ELECTRIC
48 SUPER
1923

CHARLES R. LEUTZ
MODEL C SUPERHET
160-600M
1924  7 TUBES

REMLER
9 TUBE SUPER
45 KC. IFs
1925  KIT $90.00

MAGNAFORMER
9 TUBE SUPER
RADIART LABS
1926  $200.00

INSIDE VIEW
MAGNAFORMER SUPER

CUSTOM-BUILT
SUPERHET

See also pages 112 and 113.
FRESHMAN EQUIPHASE

acids
trouble
batteries

no

water
excuses
makeshifts

Model G-7, illustrated, panelled entirely of genuine mahogany, contains a large cone speaker mounted on a Baffle Board, which is placed in a remarkably resonant tone chamber, rendering exceptionally fine tone quality and "true-to-life" reproduction.

$185

COMPLETE
Ready to operate with new RCA AC ELECTRIC TUBES


Sold on Convenient Terms

By Authorized Freshman Dealers

CHAS. FRESHMAN CO. Inc., Freshman Bldg., New York
BRANDES B-10
BRANDES DIVISION, KOLSTER RADIO
1929 7 TUBES $85.00

NATIONAL CARBON CO.
EVEREADY MODEL I 1927

PILOT A-C SUPER WASP
SHORT WAVE RECEIVER
PLUG IN COILS
5 TUBES 1928

PHILADELPHIA STORAGE BATTERY CO.
PHILCO MODEL 514
1928 7 TUBES $125.00

STROMBERG-CARLSON
WITH UTAH SPEAKER 1928

BRUNSWICK 5WO
(RCA 60 CHASSIS)
1928 9 TUBES

See Also Pages 77, 81, 94, 113, 116.
CONSOLE RADIOS

Console radios were available in the early 1920’s, but were not really popular until A-C radios swept the market. By 1929 there was a console in almost every living room, and it was an important member of the family.

**SUPER ZENITH VIII**
1924 6 TUBES $269.00

**RCA RADIODA 30**
1927 8 TUBES AC $575.00

**FRESHMAN MASTERPIECE**
1925 5 TUBES

**FALCK**
"NO-BATTERY RADIO"
5 TUBES AC $150.00 1927

**ATWATER KENT 44**
POOLEY RADIO-CELLARETTE
1928 8 TUBES AC $536.00

**GRIGSBY-GRUNOW MAJESTIC**
1928 8 TUBES AC $138.00

**STROMBERG-CARLSON 638**
1929 8 TUBES AC $380.00

**PHILCO 86 NEUTRODYNE PLUS**
1929 8 TUBES AC $275.00

**ALL-AMERICAN MOHAWK LYRIC**
1929 10 TUBES AC $169.00
RADIO KITS

NATIONAL
BROWNING DRAKE KIT
1 STAGE R.F. REGEN.
DET. 2 STAGE AUDIO
1924  S.P. $36.50

BRANSTON
SUPER KIT
1924  S.P. $36.50

BREMER-TULLY
6 TUBE KIT
1925  S.P. $38.00

SAMSON
SUPER KIT
1925  S.P. $30.00
The principle of television was discovered in 1884 by Paul Nipkow who developed the Nipkow Scanning Disc. By 1928 scanning-disc TV was out of the laboratory. By 1932, Don Lee’s W6XAO, at 7th and Bixel in Los Angeles and W2XF operated by RCA and broadcasting from Al Smith’s Empire State Building were on the air with programming. By 1937 both Los Angeles and New York residents could receive transmissions on cathode ray tube reproducers. RCA, Gilfillan and others had console sets on the market. Meissner and Farnsworth were marketing kits. The DuMont Company, a pioneer in developing the VonArdenne C.R. tube had a 9” tube made by the Corning Glass Co. In 1940 RCA offered the 1” Iconoscope for amateur radio TV transmitters. Television started into full swing in 1946 with 3”, 5”, 7” and 10” receivers available to the public.

COMPLETE SCANNING DISC TELEVISION KIT – 1928

36-aperture scanning disc
Daven television Lamp — 1½ sq. in picture
1700 rmp motor for disc
Synchronizer control
Daven resistance coupled television amplifier
Television coil kit for receiver
In this chapter we describe the parts that were pieced together to make useful wireless receivers. Then we move on to the add-on parts that were needed to make broadcast receivers play.

In wireless days, the entire receiver was pieced together. A "syntonizer" tuner would be coupled to a detector, and the detector would be coupled to an output device (headphones, usually, or maybe a tape printer). For weak signals a sensitive relay or an amplifier tube would be used. Great skill and tender loving care were needed to make a wireless receiver do its job. In the right hands the conglomerate receiver was a faithful work-horse. In the wrong hands, it was worse than useless.

Later, in the early days of broadcasting, buying a radio was like buying an automobile without engine, wheels, or tires. As the proud new owner, you found you needed an antenna (or aerial, as it was called), a ground wire, a lightning arrester, batteries, tubes and headphones or speaker. Your original $60.00 outlay would spiral to $85.00, $100, or $125, depending on how fancy you wanted to be. This wasn’t all bad; you were proud of your “Balady” headphones, or exquisitely-curved horn speaker. You were willing to discuss the merits of your special sodion detector tube as compared to the 200A gas tube or the more pedestrian 201A vacuum tube. It was a big thing to get your radio aerial up an extra ten feet high, or to find a way to make it twenty feet longer. All these add-on parts helped in the race to hear more stations farther away than your neighbor could.

Dealer: “How do you like your new radio set?”
Scotsman: “The music is fine, but the wee little light is too dim to read by.”

—1927

Home Set Builder: “I built that receiver all by myself and a thousand wouldn’t buy it.”
Neighbor: “You’re right. I’m one of the thousand.”

—1928
Syntony or tuning was used as early as 1900. Brass tubes, Leyden jars, coils and variable resistors were used to tune the transmitter and receiver. The coils were tapped every ten turns and switch points were used. Then the slide tuner appeared, using up to three sliders. But the slider would wear out the wire on the coil and deposit copper between the turns. The E. I. Company corrected this in 1910 with a ball bearing slider. Litz wire came into use; this was many strands of small enameled wire wound into a cable.

The two-circuit or "loose coupler" next arrived, using a secondary winding sliding within the primary, and greatly increasing selectivity. By 1917 receivers were being made with a panel on which were found vario-couplers and variometers, making it possible to calibrate a dial.

The honeycomb coil was used by DeForest and others and produced the first all band receivers. By changing coils one could tune from 200 to 31,000 meters without using the former loading coils. In the 1920s, with the coming of the tuned radio frequency receiver, many coils appeared on the market. Toroidal (doughnut) coils, spiderweb, figure 8, binocular and basket weave coils. The spider webs had a low loss as no coil form was used.
RECEIVING TYPE TRANSFORMERS
LOOSE COUPLERS

NAVY TYPE RECEIVING
TRANSFORMER 5A
WM. DUCK 1915 $19.50

MURDOCK 337
1914 $12.00

MURDOCK 334
1913 $25.00

MURDOCK 335
1913 $13.50

ARLINGTON RECEIVING TRANSFORMER
WM. DUCK 1915 $9.00

CLAPP-EASTHAM
1914

NAVY TYPE COUPLER

TRESCO LOADING COIL

AMCO SLIDE TUNER
1914
EARLY RECEIVING GEAR

WIRELESS SHOP
A. J. EDGCOMB
NAVY TYPE TUNER
1917 S.P. $24.00

CLAPP EASTHAM
SLIDE COIL TUNER
1912

VARIABLE SLIDING CONDENSOR
ABOUT 1912
Assembly of vacuum tube receiving set and how it is connected with the ground and antenna. The location and connections for the lightning switch and lead-in insulator are also shown.
DUO-LATERAL HONEYCOMB COILS & MOUNTINGS

DEFOREST COILS & MOUNTING $16.50

SIGNAL MOUNTING FEDERAL COILS $15.00

REMLER COILS & MOUNTING $15.00

CROWN TWO COIL MOUNTING COTO COILS $10.00

BRANSTON COILS & MOUNTING $17.50
Kellogg Radio Accessories

The Kellogg Switchboard and Supply Company have been manufacturing complete telephone exchange equipment, telephones, switchboards, apparatus and supplies for over twenty-five years. Our plant in Chicago is probably the largest factory of its kind in the world. Our floor space covers fourteen acres, and our manufacturing equipment is complete, up to date and of high efficiency.

The Kellogg Company is known throughout the telephone world, it may be said, but we include this brief explanatory statement in this bulletin which is addressed to the Radio trade.

The Kellogg Switchboard and Supply Company has been foremost in the production of standard, high efficiency telephone equipment. Its extensive laboratories and experienced engineering personnel guarantee Kellogg products to be of the utmost reliability.

In theory, design, and practice, Kellogg circuits and apparatus are conservative, yet known to be of the greatest dependability. Kellogg insulating products, such as receiver shells, transmitter mouthpieces, and the many forms of insulators necessary in the telephone field are in the front rank.

With such equipment and such experience it is reasonable that Kellogg radio apparatus should take first place in reliability and economy, as it has done. We are receiving the most satisfactory reports from the trade generally at the fine performance of the Kellogg head sets, and other Kellogg equipment. The engineer, the practical radio man, and the amateur, all acknowledge this superiority.

In extreme sensitiveness, accuracy, sound reproduction, and convenience in use, the Kellogg radio telephones are in a class by themselves.

For twenty-five years, our motto has been, "Use, is the Test."
VARIABLE TUNING CONDENSERS

About 1905 both receivers and transmitters were being tuned with some type of variable condensers. Some of the early types were just a series of fixed condensers with switch taps, some were brass plates that slid in and out like a drawer. Marconi built a condenser with rotor and stator plates much like those in use today. Crosley used a "book" condenser. Murdock was famous for its variable condensers and made some with Bakelite cases that could be filled with oil to increase the capacity.

When broadcast stations began to crowd the band a condenser that spread the stations at the high end was needed. Some makers elongated the plates, others cut away part of the plate to make them elliptical. Then came the low-loss era; Bakelite end plates were left off or replaced with metal ones. C. J. Fitch used triangular plates which operated like a clamshell. Remler used square plates that operated the same way. Both of these gave a straight line frequency condenser which spread the stations and gave a high maximum and low minimum capacity.

Soon simpler tuning was needed and one and two dial receivers appeared in which the condensers were ganged with metal belts, chains, universal joints and levers. Ten gang condenser units were known. There were also compression types, but losses were very high.
EARLY TUNING CONDENSERS

MURDOCK 360
7 PLATE .0005
1913 $5.00

MURDOCK 361
TAPPED DISC, 0 TO .001
1913 $8.50

MURDOCK 367
43 PLATE .001
1914 $4.50

MURDOCK 366
43 PLATE .001
1914 $4.50

161
EARLY TUNING CONDENSERS

BLITZEN
CLAPP-EASTHAM .001
43 PLATE 1914 $5.00

MURDOCK 368
23 PLATE .0005
1914 $4.50

TEWNO #53
21 PLATES .0005
1916 $4.75

CONNECTICUT
COMPRESSSION TYPE
1910 .001 $6.50
EARLY TUNING CONDENSERS

Camfield Type 888  Acme A-600

Chelsea 1919  General Radio Vernier
WIRELESS DETECTORS

The first detector was a “coherer,” simply a glass tube containing iron filings. A strong wireless signal passing through it caused the filings to cling together. But the top code speed was about 15 words per minute, too slow for commercial use; land telegraph lines were then doing 45 WPM.

In 1899 Lee DeForest read articles by Ashkinas and Neugschwender, who had found that a piece of tin foil on a glass plate, when cut into with a razor blade, would detect electric waves if a drop of alcohol and a battery was attached across the cup gap. DeForest developed this detector by using tin for the gap and peroxide of lead paste as the electrolyte. This detector was self-restoring and could be used at any code speed.

Magnetic detectors were introduced in 1902, using the properties of an iron wire moving through magnetic fields.

About 1902 Pickard used two needles and a carbon block as a detector; Fessendens patented the electrolytic detector about the same time. This was a carbon cup of diluted acid with a platinum wire immersed in it; this like the carborundum detector required a battery. H. H. Dunwoody patented the silicon crystal detector in 1906, followed by Pickard with other crystals.

Other types followed: The Barr mercury cup, the Perikon using two minerals, the Ferron and the famous Crystaloi using a hollow button filled with a sensitive mineral powder and many needle points; it only needed to be revolved to find a sensitive spot. When arc, alternator and tube transmitters came in, producing an undamped wave, the crystal detector would not receive them. So a buzzer circuit was inductively coupled through the antenna or a “ticker wheel” was used to break the signal into audio frequencies. A motor driven chopper wheel at the transmitter achieved the same purpose.

In the 1920's the crystal detector was made in many types; fixed for the reflex sets, and the common Galena with “cats whisker.”
DETECTORS

BRANLEY COHERER AND DECOHERER WITH KEY WIND TAPE PRINTER
ABOUT 1902 TO 1905

ELECTRO IMPORTING CO.
E. I. CO.
PRECISION COHERER
1910

SENSITIVE RELAY
USED WITH COHERER DET.
1910

BRANLEY COHERER
ABOUT 1902

CRYSTALO
WIRELESS DETECTOR
TYPE AA ABOUT 1914
$6.00

ELECTRO IMPORTING CO.
RADIOSON ELECTROLYTIC
DETECTOR, ABOUT 1914

MURDOCK
SILICON DETECTOR
WITH CONDENSOR
1913 $4.50

J. J. DUCK FERRON DETECTOR
HOLLAND BLUE MARBLE BASE
1913 $4.00
WIRELESS DETECTORS

CLAPP-EASTHAM
FERRON DET.
HOLLAND MARBLE BASE
ABOUT 1914  $3.25

ELECTRO
GALENA DET.
F.I. CO., 1914

PEROXIDE OF LEAD
DRY ELECTROLYTIC
E.I. CO., 1913

BABY DETECTOR
E.I. CO., 1915  $ .25

BALL SLIDERS
FOR SLIDE TUNERS
E.I. CO., 1910

THREE MINERAL DET.
JOHN A. FIRTH CO.

MINERAL
FIXED DETECTORS
WIRELESS DETECTORS

DEFOREST D-101 CRYSTAL DET. $2.60

DEFOREST CRYSTAL DET.

MURDOCK 324 DETECTOR 1919 $ .75

WIRELESS SPECIALTY APPARATUS CO. 1919

WIRELESS SPECIALTY CO. TRIPLE DETECTOR STAND 1917

DETECTOR MINERAL CATWHISKERS

PHONE CONDENSORS MURDOCK A. J. MORGAN PARKIN 1912 TO 1915
CRYSTAL DETECTORS IN THE 1920's

KENNEDY

KOLSTER

CARBORUNDUM WITH BATTERY

FRESHMAN

DE FOREST D 101

PACENT

FIXED DETECTORS

FADA
THE FLEMING VALVE

Thomas A. Edison laid the groundwork for thermonic detection of high frequency oscillations in 1883. Edison found that a black deposit formed on the inside of an electric light with use. These particles, he discovered, were part of the filament. He sealed a plate in one of his lamps and found that with it connected to the positive end of the filament, current would flow from the filament to the plate. Edison patented this as an "Electrical Indicator" and called the phenomenon, "The Edison Effect." Other pioneers became interested in the effect. Prof. Edwin J. Houston, Sir William Preece, Julius Elster and Hans Geitel of Germany all made experiments but it remained for Ambrose J. Fleming to perfect a new type of detecting device for receiving wireless oscillations.

Fleming, formerly with the Edison Co., had taken a new job with Marconi. He was hard of hearing and desired a visual indicator to use in place of audio detection. He thought of his work with Edison and decided to try one of the Edison Effect lamps. He set up the necessary circuits and found that a galvanometer gave a steady direct current reading. He then knew he had found a better rectifier for wireless oscillations.

Fleming, then, was not the inventor of, but actually the first to find an application for the Edison Effect phenomenon. On Nov. 7, 1905 he patented the "Fleming Oscillation Valve" or Glow Lamp, as he called it and it was the first thermonic wireless detector.

This valve was a diode and was made in many forms. It detected but did not have any intensifying qualities. By 1907 the Marconi Corporation was manufacturing Fleming valves for commercial use. They varied from approximately an inch to an inch and one quarter in diameter and from three and a half to four inches long. Both the Edison bayonet base and the Edison medium screw base were employed. No plate battery was used, merely a filament battery, and it was found that four volts was sufficient for wireless detection.
THE VACUUM TUBE

The vacuum tube was given its start in 1880 when Julius Elster and Hans Geitel of Germany found that adding a plate to an incandescent lamp gave a “valve” effect. Thomas Edison in 1883 found that a current would flow from a heated filament to a positively charged electrode within a lamp. John Fleming found that using the “Edison effect” rectification took place and could be used as a wireless detector.

In 1900 Dr. Lee DeForest while testing his new type detector (called a “Responder”) noticed that his Welsbach gas burner would dim when he operated his spark coil. In 1903 he used two platinum electrodes, one holding table salt, and detected signals by the change in the flame as current passed across the electrodes. This led DeForest to heating gas in a carbon filament lamp, and he had the H.W. McCandless Co. (makers of Xmas tree lights) make some two element tubes, which he patented. In 1906 DeForest applied for a three element tube patent, publicly announced a year later. In 1908, at the suggestion of the McCandless Co., the Audions were made spherical, and remained that way for some time. In 1909 they were made with a double grid and a double plate.

About 1910 DeForest made the RJ4 detector, sold as a unit with a DeForest Audion, the only way it could be bought. By 1915 the Audion tube was tubular and had a double filament. Next came Moorhead with Shaw bases, and diodes with a control electrode on the outside, done to bypass the DeForest patent. During the war Western Electric made the famous VT-1 and VT-2. In 1919 General Electric made their advanced UV-200 and UV-201 for R.C.A. From this date many makes appeared on the market.

Replica of DeForest gas flame detector.
DEFOREST GAS FLAME DETECTOR
FORERUNNER OF THE VACUUM TUBE
REPLICA 1904

DEFOREST AUDION DETECTOR
TYPE RJ4
1909 $18.00 COMPLETE

HANmdADt EXP. TUBE
1916

AUDION CONTROL BOX
FOR DEFOREST AUDION
1910
DE FOREST TUBES

DE FOREST SPHERICAL AUDION
SINGLE GRID & PLATE
1909
TUBULAR VERSION
ALSO MADE IN 1910

DE FOREST SPHERICAL AUDION
DOUBLE GRID & PLATE
1909

DE FOREST AUDION
PATENTED 1907

DE FOREST OSCILLION
SINGER TUBE 1917

DE FOREST TUBULAR AUDION
1916
EARLY TUBES

ELECTRON RELAY
PACIFIC LABS, 1915

WEAGANT VALVE
EXTERNAL GRID
1913

MARCONI TUBE
MADE BY
H. J. ROUND
1911

AUDIOTRON
DOUBLE FILAMENT
1915

AUDIOTRON
WITH ADAPTER
WESTERN ELECTRIC TUBES

Western Electric was one of the earliest tube manufacturers. In 1915 they worked on the trans-Atlantic telephone tests at Arlington, Virginia, using a bank of 550 tubes in parallel — which would be an accomplishment even today. In 1917 they started work on the repeater bulbs for telephone use, using the ladder grid construction. In 1918 W. E. made the VT-1 and VT-2 tubes for the U. S. Signal Corps; the former was a general purpose detector-amplifier and the latter a five watt oscillator-modulator. In 1919 Western Electric introduced the 50 watt type 211 transmitting tube and the "Peanut" N tube (215A) used in Western Electric receivers.
EARLY TUBES WITH SHAW BASES

- A-P TRANS. TUBE 1920
- MOORHEAD ELECTRON RELAY 1920
- MOORHEAD AMPLIFIER
- MARCONI VT 1920
- MOORHEAD 1917
- DE FOREST TYPE H
- VT-14
DE FOREST TUBES

DE FOREST DO1A
DE FOREST DV 1
DE FOREST DV 2
DE FOREST DV 3
DE FOREST DV 3

DE FOREST DV 3A
DE FOREST DV 4
DE FOREST DV 5
DE FOREST DL 4

DE FOREST DL 5
DE FOREST DL 7
DE FOREST DL 15
DE FOREST AMP.
EARLY TUBES

VT 14 AUDION
DE FOREST AUDION DET
TB1 G. E. VOLTAGE REGULATOR

MOORHEAD ROUND TYPE AMP.
MOORHEAD ELECTRON RELAY
DE FOREST AUDION MADE BY MOORHEAD
ATLANTIC-PACIFIC A-P AMPLIFIER
1920
1920
1920
1920

179
BROADCAST VACUUM TUBES

In 1919 radio was given a real boost when the Radio Corp. of America and Elmer Cunningham announced the 200 and 201 tube made by General Electric. The type 200 was a soft detector and the 201 was a hard detector-amplifier. Both were rated at five volts and one amp filament, with “A” versions at .25 amp.

Radio stations with regular broadcasts were in full swing by 1921, and the receiver business was booming. A growing business was that of rebuilding tubes due to the tube shortage; charge was usually one to two dollars. Bootleg tubes were common and sold for about $5.00; some were very good.

1923 saw a need for tubes that would operate on dry batteries. Westinghouse made the WD-11 and WD-12 for RCA (both 1.1 volts, .25 amp.), and G.E. made the type 199, rated at three volts, .06 amp. The next two years brought many special tubes: The DeForest DV series, the Connecticut T&T Co. double sodium vapor detector, the Electrad diode to be used in place of a crystal detector, and the Welsh peanut tube with the control element outside the tube.

1926 brought better tubes such as the 120 and 112 series. They were hard amplifiers, and with proper bias circuits improved tone quality. The Raytheon BH cold cathode rectifier for “B” battery eliminators appeared. Also the first tubes to use A.C. on the filaments: McCullough, Ardon and Kellog. The following year extremely practical A.C. tubes appeared: the 226 with a filament slow to cycle action and the 227 with a cathode unit. These made possible the era of all-electric sets. Screen grids became common in 1928.
EARLY TUBES

STEWART WARNER 201A TYPE AMP. 5 VOLTS
QRS 201A TYPE DET. AMP. 5 VOLTS
SUPER AIRLINE GX 201 A MONTGOMERY WARD
MAGNAVOX TYPE A AMPLIFIER
OK X 200-A SOFT DETECTOR 5 VOLTS

5 VOLTS PERRYMAN H 201A DET. AMP. 5 VOLTS
CONCERT MASTER DAVEN MU 6 SONATRON 201A SUPERTRON SX 201 AMPLIFIER 6 VOLTS AMPLIFIER 5 VOLTS

MAGNATRON DC 201A A. P. TWO IN ONE DET. AMP. CONNEWAY ELEC. LAB. TWO SEPARATE TUBES ATLANTIC-PACIFIC
MARATHON MX 201A PHILCO 112A DET. AMP. 5 VOLTS LAST AUDIO STAGE

MUSSELMAN
EARLY TUBES

CUNNINGHAM C 301A AMPLIFIER 1923
RADIOTRON UV 201A AMPLIFIER 1923
RADIOTRON WD 12 DETECTOR 1923
CUNNINGHAM C 12 DETECTOR 1923

RADIOTRON WD 11 DETECTOR 1923
WESTINGHOUSE WD 11 AERIOLA DETECTOR 1923
WESTINGHOUSE WR 21 VACOBUB 201 AERIOLA DET. 1923

CUNNINGHAM C 199 DETECTOR 1923
RADIOTRON UV 199 DETECTOR 1923
KR Q201A DETECTOR AMPLIFIER 1923
PANAMA 0201A DET. AMP. 5 VOLS
Get a good detector

Radiotrons WD-11 and WD-12 are the same tube but with different bases. 
Radiotron WD-12 has a standard navy-type base. With it, you can change your set to dry battery operation. Ask your dealer today.

What will Radiotron WD-11 and WD-12 do as detectors? First—they are sensitive to weak signals—superlatively sensitive, as remarkable distance performances show in thousands of one-tube sets. Second, they are good “oscillators”—and that is important in regenerative circuits. And third, they are quiet in operation—add no electrical noises to the music, or speech. Radiotrons WD-11 and WD-12 are famous as audio and radio frequency amplifiers—too—and have made possible the hundreds of thousands of dry battery receivers that are in use today. They mean clear, true reception—over big distances—with dry batteries! Be sure to get a genuine Radiotron.

Radio Corporation of America
Sales Offices: Suite No. 32
233 Broadway, New York 10 So. La Salle St., Chicago, Ill.
28 Geary St., San Francisco, Cal.

★ Tested and approved by Radio Broadcast ★
EARLY TUBES

199 DET. AMP. 3.3 VOLTS

UX 120 LAST STAGE AUDIO 3.3 VOLTS

WX 12 DETECTOR 1.1 VOLTS

UX 199 DET. AMP. 3.3 VOLTS

UX 112 LAST AUDIO STAGE

UX 112A LAST AUDIO STAGE

UX 114A LAST AUDIO STAGE

UX 171A LAST AUDIO STAGE

UX 171 LAST AUDIO STAGE

UX 200 SOFT DETECTOR 5 VOLTS

UX 200A SOFT DETECTOR 5 VOLTS

UX 201A DET. AMP. 5 VOLTS

UX 201A DET. AMP. 5 VOLTS

5 VOLTS

5 VOLTS
The Golden Rule Tube

The Sodion does not oscillate. No declaration as to sensitivity, signal strength—or quality of tone—can mean half so much to every broad-minded radio enthusiast as this simple statement of fact. For there—in five words—you have the key to the solution of the problem of eliminating the whistles, the squeals and the howls that interfere so seriously with your enjoyment of radio today.

Don't misunderstand—The Sodion does not protect YOUR reception against these noises from other sets.

But, because it does not oscillate—because it cannot reradiate—because it cannot whistle and howl—the Sodion DOES prevent your reception from interfering in any way with the reception of others.

This, we believe, is the practical way of eliminating one of the greatest faults in broadcast Radio reception.

In point of efficiency the Sodion Tube is far more sensitive and produces stronger signals than any detector now on the market. Its tone is fully equal to that of the finest crystal with the added advantage of great volume.

Descriptive Bulletin upon request.

CONNECTICUT TELEPHONE ELECTRIC COMPANY

MERIDEN Radio Division CONNECTICUT
EARLY TUBES

CARDON AC 373
MFG. CARDON CORP.

ARCTURUS 28
15 VOLS AC

ATWATER KENT
AC RECTIFIER

MARATHON 608 A
AC TUBE

KELLOGG 401
AC TUBE WITH
CAP

McCULLOUGH 401
FIRST AC TUBE
PAT. BY McCULLOUGH

SOVEREIGN
AC TUBE WITH
CAP
EARLY TUBES

MERCURY ARC
RECTIFIER
GENERAL ELECTRIC
3,000 VOLTS  1918
HEADSETS

Low resistance telephone receivers were the first used with radio receivers. The coherer was usually used with a tape printer. With the coming of self-restoring detectors it was found that receivers with higher resistance ratings were needed. Early 1,000 Ohm receivers usually appeared as a single unit, soon followed by double headsets. Some of the early makes were: Holtzer-Cabot, Brownies, Mesco, Brandes, Baldwin and Western Electric.

Murdock “55” receivers were sold by the thousands at $5.00; they were a good reliable unit. Brandes were popular at $10.00. Baldwin headsets were made with mica diaphragms and gave more volume than others; the makers claimed they were equal to an extra stage of audio amplification, and sold for $16.50.

During the 1920s other common makes were Automatic Electric, Kellogg, Frost, Kennedy, Stromberg-Carlson, Federal and Red Head.

Holtzer-Cabot.

Mesco.
This illustration shows the amplifying mechanism in a Baldwin unit. Note that four pole pieces of a single solenoid act on the armature, which in turn connects with the super-sensitive mica diaphragm.

Equal to two stages of radio amplification

The experience of leading radio operators—who have found Baldy Phones "equal to two stages of radio amplification"—clearly indicates the outstanding advantages of using good phones. From a standpoint of radio efficiency, you will get "more value per dollar" from your investment in Baldwin Amplifying Phones than from any other item of your equipment.

Here are the actual (un-asked-for) letters from experienced radio men, telling of their results with Baldys. They're worth careful reading!

"Have used a pair of Type 'C' Baldys for some time, in naval communication and commercial service. Consider them the most sensitive telephone on the market." (Name on request.)

"I faithfully believe the use of Baldwin Phones will improve any receiving set at least 50%." (Name on request.)

"Have found your Baldwin Telephones equal to one and two stages of radio amplification." (Name on request.)

"In our station it is a common occurrence to place the receivers (Baldys) on the table and copy in daylight the long undamped wave stations with but one V.T." (Name on request.)

"Equal to one and two stages of radio amplification"; Of course Baldys cost more—but where can you get better value? Where else can you buy amplification equal to the super-sensitive Baldwin mechanism for so little?

And the more limited your investment in radio must be, that much more important becomes the use of a super-sensitive and selective Baldwin head set!

The best radio dealer in your town undoubtedly has a supply of booklets explaining the superior construction of Baldwin Phones, Eldridge Meters, and other Firth Specialties. If he does lack a supply, write, mentioning his name and address, direct to

JOHN FIRTH & CO. Inc., 18 Broadway, New York

Distributors for
Baldwin Phones U. S. Bureau of Standards
Eldridge Meters Wave-meter
Kolster Decrometer Brownie Adjustable Phones

Dealers: Write for advance information on new popular-priced loud speaker

BALDY PHONES
WIRELESS HEADSETS

BALDWIN RECEIVERS
ALUMINUM DIAPHRAGMS
TYPE G $20.00

BALDWIN RECEIVERS
PATENTED MAY 1910
FIBER DIAPHRAGMS
TYPE C $16.50

MURDOCK 55
1913 $4.50

MURDOCK 56

BALDWIN RECEIVERS
MICA DIAPHRAGMS
TYPE C $16.50

WESTERN ELECTRICS
2200 OHMS 1919
$20.00
THE PRICES ARE REMARKABLY LOW
THE QUALITY IS UNUSUALLY HIGH

MURDOCK
No. 55

REAL RADIO RECEIVERS
capable of record reception of signals when used with sensitive detecting apparatus. From the time of their introduction seven years ago to the present, they have earned a deserved reputation for unusual sensitiveness and long-lived dependability. The thousands of sets now in everyday service all over the world are evidences of the esteem which they have won. The unprecedented present demand for "MURDOCK 55'S" is conclusive proof that their wonderful value cannot be duplicated anywhere.
RADIO & WIRELESS HEADSETS

KENNEDY
$6.00

EISEMANN
$3.50

FROST
$5.00

BRANDES SUPERIOR
ABOUT 1916  $7.00

WATCH CASE RECEIVER
75 OHMS ABOUT 1914
$.60

SAMPSON WATCH CASE RECEIVER
HAND MADE PHONE TIPS
ABOUT 1912
Better Radio Receiving

Listen In—On The World—With Kellogg

Do distant points come in with a clearness that satisfies?

Get the most out of your radio set by using Kellogg receivers.

Lightest in weight—Super sensitive—Simple adjustment—Durable construction. No sharp or projecting parts to catch in the hair—Minimum pressure on the ears with maximum outside sound exclusion.

Purchase a trial set from your dealer to-day.

We also manufacture Radio Tube Sockets—Insulators—Transmitters—Plugs—Jacks—Condensers.

With Kellogg, use is the test.

Kellogg Switchboard and Supply Company
For Twenty-five Years Manufacturers of Standard Telephone Equipment
Chicago, Ill.
HEAD PHONES

MESCO HEADSET
MANHATTAN ELEC. SUPPLY
SP $6.50 1916

KILBOURNE & CLARK HEAD SET
1919

WESTERN ELECTRIC HEAD SET
1500 OHM. 1918

KELLOGG HEADSET 2400 OHM
SP $12.00 1921

DEFOREST LOUD SPEAKER
1922
“A Little Knowledge Is a Dangerous Thing”

AND that’s the truth which applies to the business of making Radio equipment. It is something to think about when you buy Head Sets.

There are two kinds of manufacturers of Radio head sets—those who know little or nothing of telephone design—and concentrate their efforts in quick production regardless of quality. And then there are those who know the business through years of experience and who place scientific design and quality above everything else. So this is a plea for the good of the industry — and for your protection.

Specifically — these Automatic Electric Head Sets have been developed by telephone engineers who’ve devoted more than thirty years of effort to the designing of better telephone apparatus. The time spent in the perfecting of this improved receiver is shown by the remarkable results which are produced under all conditions.

It has many distinctive features which prove its superior effectiveness. The powerful single pole electro-magnet and complete soft iron magnetic path — assure perfect clearness of both weak and loud signals. No distortion or foreign noises — whether used with crystal, V. T. detectors or multi-stage amplifiers.

If your dealer handles Radio equipment of the finest quality he is familiar with the Automatic Electric Head Sets. Ask him.

If your dealer cannot supply you, we will send you a complete Head Set, postpaid, for $10.00 — with plug attached $11.50.

Automatic Electric Company
ENGINEERS, DESIGNERS & MANUFACTURERS OF THE AUTOMATIC TELEPHONE IN USE THE WORLD OVER
HOME OFFICE AND FACTORY: CHICAGO, U. S. A.
Tower's Scientific

$2.95

THE MOST POPULAR HEADSET in the World
Sales prove it

Every set tested and approved by government licensed radio operators

The Reason

Out of the jungle of yesterday, leaving behind the maze of inaccurate, uncertain apparatus, TOWER'S Scientific phones have blazed a trail to undisputed leadership, being recognized as the World's Greatest Headset Value

Millions today enjoy music and entertainment reproduced in those clear, mellow tones so characteristic of TOWER'S Scientifics. TOWER'S Scientific headsets are guaranteed to be made of the best materials money can buy—highest test enamel, insulated magnet wire, best grade five-foot tinsel cord, unbreakable caps, polished aluminum cases, using the famous scientific head-band constructed for maximum comfort.

THE TOWER MANUFACTURING CORPORATION
98 BROOKLINE AVENUE Dept. 1
BOSTON MASSACHUSETTS

★ Tested and approved by Radio Broadcast ★
LOUDSPEAKERS

By 1921 the broadcasting stations were increasing in number and the radio receiver was entering the home everywhere; kits and parts were easily available. One tube sets and crystal sets were most common, and to allow the whole family to hear the headset was often put in a wooden bowl or cardboard box to increase the volume. The first loudspeakers were horns with arms to accept the standard headset receiver.

Magnavox brought out a speaker with a six volt field which gave much better volume, and units appeared that enabled the homeowner to use his phonograph horn as a loudspeaker. Broadcast stations were then transmitting signals that were heard as 200 to 2500 cycles/sec audio, so speakers did not need to be elaborate; when broadcast quality became better so did the loudspeakers. They were commonly made of pulp, hard rubber and wood. By 1924 wooden box and cone receivers were in use.

Western Electric came out with their cone speakers in three sizes: 18”, 24” and a 36” that hung on the wall. Prices ran from $35.00 up to $60.00. The Baldwin unit was used in many of the speakers; the same firm made a unit designed to attach to the sounding board of a piano. Baldwin also made their own horn speaker.

Magnetic speakers soon appeared, and were able to handle more audio and take higher plate voltages. 1926 brought the RCA 104 dynamic with voice coil; these were tops in their day.
LOUD SPEAKERS

ARKAY
MADE FROM AUTO HORN
1921  $5.00

ATWATER KENT
TYPE-H
1924  $22.50

BRANDES TABLE TALKER
1924  $15.00

UTHAH
1924  $18.00

THOROLA JR.
1924  $25.00

Vocarola Loud Speaker
1922  30.00

MANHATTAN
1924  $15.00
LOUD SPEAKERS

TRUTONE
1922 $15.00

MADERA CLEAR-TONE
1923 $17.50

WESTERN ELECTRIC
1921 $30.00

SADLER
1922 $8.00

FEDERAL PLEIOPHONE
1921 $14.00

DICTOGRAPH
1921

WESTERN ELECTRIC SHAWPHONE
1922 $10.00
What matters bad weather when Radio entertains?

Radio's "every-hour-every-where" broadcast schedule is the most stupendous organization of the means of entertainment the world has ever witnessed.

The Magnavox Co., Oakland, California
New York: 370 Seventh Avenue

Magnavox Radio
The Reproducer Supreme
MAGNAVOX LOUD SPEAKERS

MAGNAVOX R-3
1924 S.P. $35.00

MAGNAVOX TELEMEGAFONE
PUBLIC ADDRESS SET
1920 S.P. $150.00

MAGNAVOX TELEMEGAFONE
TS-2 1921 18” BELL
$93.00

MAGNAVOX 1923
14” BELL $45.00

MAGNAVOX M-4
1924 $25.00
Thrill With the Big Crowd

For real thrills, tense moments and dramatic situations, what can compare with a football game between two great American colleges?

A crisp fall day, stands jammed to the bursting point, bands playing, college songs and cheer, stirring the very souls of spectator and player alike—what could present a more inspiring, colorful picture?

You may not see the game, but with MUSIC MASTER attached to your radio set you can, in the comfort of your home, follow your favorite team up and down the field. The vivid word-picture of the announcer, play by play, will reach you with bell-like clarity through this wonder instrument of radio.

Until you hear the voice of MUSIC MASTER you have not heard radio at its best. Your dealer will send one to your home to prove with your own set.

Get a MUSIC MASTER and have it ready for the next game.

Dealers Everywhere

Music Master Corporation
Masters and Distributors of High-Grade Radio Apparatus
10th and Cherry Streets
Chicago PHILADELPHIA Pittsburgh

Music Master
RADIO REPRODUCER

Connect MUSIC MASTER in place of headphones. No batteries required. No adjustments.

14-inch Model, for the Home $30
21-inch Model, for Concerts and Dancing $35

★ Tested and approved by Radio Broadcast ★
LOUD SPEAKERS

BALDWIN 1924  $30.00

ROLA 1923  $25.00

DICTOGRAND 1922  $20.00

THOMPSON 1924  $35.00

CHANSON 1925  $25.00
A New Cone Speaker—
Companion to the No. 601 Receiver

To the epic achievement of Stromberg-Carlson's No. 601 Receiver is added that of their announcement of the New Cone Speaker. Produced after exhaustive research and experimentation, this speaker embodies an idea, old to the master creators of musical instruments, but new to the radio trade—that of a soundboard.

The soundboard which functions the same on the new cone speaker as on piano or violin—accomplishes the same purposes—that of giving true pitch and modulation to notes over the entire musical register. Whether it is reproducing the majestic roll of the organ, or the piping of the flute, this soundboard liberates the true beauty of intonation and phrasing which the music lover desires and appreciates.

Standing unobtrusively against a wall or in a corner the Stromberg-Carlson Cone speaker so fills the entire room with music that it is difficult to tell from where the sound is coming. In addition, it is as ornamental as a Mahogany Tip-Top Table which it so closely resembles.

STROMBERG-CARLSON TELEPHONE MFG. CO.
ROCHESTER, N. Y.

Licensed under Lek-telephone patents 1271-527 and 1271629.
Other patents pending.

STROMBERG-CARLSON
For over 30 years manufacturer of voice transmission and voice reception apparatus for musical and musical purposes.
LOUD SPEAKERS

ATWATER KENT
1926  $20.00

ATWATER KENT
1927  $25.00

CROSLEY DYNACONE
1927  $22.50

THOROLA
1927  $25.00

OVENSHIRE
1925  $32.50

THOROLA
1927  $30.00

STROMBERG-Carlson
24" FLOOR MODEL
1927  $65.00

WESTERN ELECTRIC
24" 1927
Hear the difference!

A loudspeaker is a critical thing. Any vibration in the horn adds sounds that nature never gave to the speaker's voice. And limited range thins down the tone to flat, unreal quality. Some people think that a near-real voice is the best that radio can give . . . but not after they have heard a Radiola Loudspeaker!

The difference is the result of elaborate experiment and extended scientific study. The Radiola Loudspeaker has an extraordinary range—gets the full richness of tone. And it adds no sound of its own. To know how clear—how mellow—how real your music can be—ask to hear a Radiola Loudspeaker.

Radiola Loudspeaker
Type UZ-1325
Now $25.00

☆ Tested and approved by Radio Broadcast ☆

RADIO CORPORATION
OF AMERICA
Sales Offices
233 Broadway, New York
10 So. La Salle St., Chicago, III.
28 Geary St., San Francisco, Cal.
RADIO CORPORATION OF AMERICA
LOUD SPEAKERS

RADIOLA 100
1925 $35.00

RADIOLA 103
1927 $35.00

RADIOLA 100A
1926 $30.00

RADIOLA UZ-1320
1923 $36.50

RADIOLA UZ-1325
1923 $25.00
LOUD SPEAKERS

ACME DOUBLE CONE
1926  $35.00

MAGNAVOX CM-4

LOUD SPEAKER UNITS' PHONOGRAPH ATTACHMENTS 1922 TO 1926
AMPLIFIERS

By 1921 one-tube and crystal sets were thought to be not loud enough for the whole family. Crystal sets could be amplified without tubes by use of an amplifier consisting of a receiver directly coupled to a carbon mike, the output of which would operate a loudspeaker.

The audio, or tube amplifier, developed by W. H. Priess and L. L. Israel of Wireless Specialties Co. in 1917 was in use after the war. In 1919 the Federal Tel. & Tel. Co. put on the market the famous 226W transformer, the first to be offered to the amateur and experimenter. Before this time two tube amplifiers were available in complete form at about $65.00 with tubes. By 1924 there were many transformers on the market with step-up ratios of 1:2 to 1:12, all claiming to be the best. By this date the technique of biasing the amplifier tube was in use, this not only saving the "B" battery but improving the quality.

The cheapest way to build an amplifier was to use the simple Loftin-White circuit, which with proper bias worked well. Two stages of transformer-coupled audio were all that could be used unless they were cascaded by using 45 V. on the first stage and 90 V. on the second and 135 V. on the third and biasing each stage correctly. The resistance-coupled amplifier next came on the market and was a decided improvement.

Radio frequency transformers came in use about 1922; both air and iron core were made, and tuned from 200 to 600 meters. Iron core I.F. transformers came in ranges from 45 KC to 75 KC and were used for long wave R.F. and I.F. in superheterodyne sets. The radio frequency transformer made possible the use of a loop antenna and stopped radiation from a regenerative receiver.
AMPLIFIERS

MAGNAVOX
2 STAGE AUDIO AMPLIFIER

WESTERN ELECTRIC
258 AUDIO AMPLIFIER

WESTERN ELECTRIC
7-A AMPLIFIER WITH 216-A TUBES
AMPLIFIERS USED IN THE 1920s

Allen Bradley
3 stage res. coup. with tubes $26.00

Sonotron Audio Amp.
3 stage res. coup. with tubes $21.00

Daven Audio Amp.
Res. coupled with tubes $24.00

Sampson

Muter
Res. coup. audio amplifier with tubes $21.00

R.F. amplifier using Meyers tubes
BATTERIES—BATTERY ELIMINATORS—CHARGERS

Liquid cells were used in early wireless service. The Lalande cell used caustic soda for the electrolyte, with plates of cupric oxide and zinc. The plunger battery used an acid solution and carbon plates, with a zinc electrode that was plunged into the solution to turn the cell on. Rechargeable storage batteries, mostly of the lead-acid type, were widely used in the 1920's. Dry cells came into wide use, especially in “B” and “C” batteries.

When the storage battery entered the home it had many problems; acid ate holes in the rug, corroded terminals gave noisy reception, and fumes gave the home a bad odor. Storage batteries were expensive and needed frequent recharging. Battery charging stations would pick up a battery and charge it for $1.00, or would provide rental batteries for 25¢ a day.

The “B” dry batteries were also expensive, a 90 volt set costing $10.00 and lasting about three months; a five tube set usually cost about $5.00 a month for upkeep. When “C” batteries appeared the “B” battery’s life was more than doubled and the “C” lasted a year. Wet “B” batteries became available at some cost, but cut the cost of receiver operation. The Edison wet cells were best as they used a potash solution and were easy to recharge.

Those who could spend up to $125.00 for an “A” and “B” eliminator had the problem solved; all that was needed was a little water and care. The “A” eliminator was a wet storage battery with a trickle charger that operated when the battery wasn’t in use. The dry “B” eliminator used a Raytheon cold cathode rectifier and produced 22½, 45 and 135 volts with no attention needed.

“A” and “B” wet cells.
BATTERIES

EDISON B BATTERIES & CHARGER
1924 $42.00

BICHROMATE BATTERY
PLUNGER TYPE
ABOUT 1900

WET B AND A
BAT. CELLS,
1920s

B & C BATTERIES
1920s

HYDROMETER

BATTERY CONDITION
TESTER

"CROWFOOT"
GRAVITY BATTERY
USED FOR TELEGRAPH
AND WIRELESS 1905

COLUMBIA BATTERY
1907
No Need of Doing This

Is yours a tube set?

Yes? Then you have a storage battery which frequently requires recharging.

Do you carry it to a charging station, wait three or four days, pay from 75 cents to a couple of dollars and then lug it home again? You don’t need to.

A Tungar Battery Charger enables you to recharge your storage batteries for either radio or automobile use right at home—easily, quickly and at little expense. It operates from any a-c lighting circuit.

Any one can operate a Tungar. Once started, it requires no attention; nor is there the slightest danger of injuring the battery.

The initial cost is low; the operating cost is little. Send for our new booklet on Tungar for radio, if your dealer cannot supply you. Address Merchandise Dept., General Electric Company, Bridgeport, Conn.
"A" AND "B" ELIMINATORS
BATTERY CHARGERS

ATWATER KENT
"A" AND "B" ELIMINATOR

YAXLEY AUTOMATIC
CHARGER CONTROL

SILVER MARSHALL
"B" ELIMINATOR

TODD "B" BATTERY
CHARGER

TWIN-BULB
BATTERY CHARGER
PARTS KITS AND SERVICING

In 1905 the E. I. Company put transmitter and receiver parts on the open market. When receivers became fairly common in homes across the country many parts were offered to improve the set. Antenna eliminators designed to plug into the A.C. outlet, howl eliminators (metal caps for the tubes), variable grid leaks and condensers, phone plugs, vernier dial tuners to eliminate hand capacity effect, wave traps and lightning arrestors were all offered the home set owner.

An item that sold by the thousands was the “hum eliminator” which made possible the use of A.C. on D.C. filaments; it was a center-tapped 20 ohm resistor to hook across the filaments, with the center tap grounded. Phone jacks incorporating a switch to shut off the radio’s stage not in use were sold. Vibration proof sockets were offered as replacements for the original. Many varieties of outdoor antenna kits were offered at about $5.00.

When superheterodyne sets and “A” and “B” battery eliminators entered the home the occasional services of a trained repairman were needed. Storekeepers who sold the sets commonly did this up to about 1924. Among devices developed to serve the need were fast tube rejuvenators to bring back filament emission, tube testers and more accurate measuring meters. When A.C. sets came on the market in about 1928 the many receiver kits disappeared, and the role of the modern serviceman began.

Hum eliminators.
Watchcase voltmeter.
WATCH CASE BATTERY METERS
1915 TO 1920

METERS
1920 TO 1925
METERS, 1900 TO 1924

JEWEL PANEL MOUNT

WESTON PANEL MOUNT

FISHER PANEL MOUNT

HUSTON BROS. CHICAGO.
TABLE MIL. METER
PAT. 1899

JEWEL HIGH FREQUENCY METER
1919 $12.00

VOLT MIL. AND
HIGH FREQUENCY METERS
DECREMENT AND WAVE METERS

GENERAL RADIO WAVE METER
TYPE 358  $15.00

MARCONI DECREMENT METER
1909

GENERAL RADIO WAVE METER
TYPE 274  $10.00

GENERAL RADIO WAVE METER
TYPE 174
1922  $68.00

DEFOREST WAVE METER
1923

221
TUBE AND SET TESTERS USED IN THE 1920s

STERLING TUBE TESTER
$25.00

STERLING TUBE REACTIVATOR
$5.00

HEMCO TUBE VITALIZER
$5.00

JEFFERSON TUBE REJUVINATOR
$5.00

PEERLESS KONDENSOR TEST KIT
$10.00

STERLING TUBE AND SET TESTER $35.00
TEST EQUIPMENT USED IN THE 1920s

SYLVANIA TUBE TESTER

HICKOCK TUBE TESTER

WESTON MODEL 802 TEST OSCILLATOR

ELECTRON 5 INCH ELECTRON OSCILLOGRAPH GENERAL RADIO

VAN HORNE TUBE TESTER

BURTON TUBE TESTER
With Samson Radio Parts
THE PLEASURE IS ALL YOURS

SAMSON ELECTRIC COMPANY, CANTON,
Manufacturers of Quality Electrical Products Since 1883
Sales Representatives in Twenty Leading American Cities
Recommended for Super-Autodyne!

The "Super-Autodyne" receiver described in this issue of the Citizens' Radio Call Book has been tested and approved by leading authorities everywhere. It has been endorsed by such prominent publications as "Radio Broadcast," "Radio Age," "Radio Engineering," "On the Air," "Radio," "Christian Science Monitor," and others.

In every instance the remarkable results attained by fans who have built this unique six-tube receiver have been attributed to the use of Silver-Marshall parts, including the new silver-plated Straight-line-wavelength condensers, the bakelite cased intermediate transformers, and the S-M Coupling Unit. Such wholehearted approval can be merited only by actual performance.

SILVER—MARSHALL, Inc.
110C So. Wabash Ave. Chicago, Ill.
Set builders who strive for electrical and mechanical perfection inevitably come to AMSCO. Look behind the panel of the finest sets, and you will find the AMSCO trademark, the sign of engineered radio parts. Standardize on AMSCO Condensers, Vernier Dials, Rheostats, Potentiometers, Sockets and Binding Posts—each the best that can be made, and made to match each other.

Ask your dealer—or write Dept. R

AMSCO PRODUCTS, INC.
Broome and Lafayette Streets, New York City
MAKERS OF MELCO SUPREME RADIO RECEIVERS
What determines signal strength in Variable Condensers

Strength of signals, when you use a Variable Condenser, depends upon low “effective resistance.” In most ordinary commercial types this resistance lies between two and fifteen ohms.

Compare this with the CONNECTICUT Variable Condenser, about two-tenths of an ohm. This low comparative resistance not only permits, but insures, strength of signals.

There are other advantages—compactness, fine adjustments, stable in any position, sensitivity—any one of which should make the CONNECTICUT type your choice of variable condensers. Every well-informed amateur should know about this condenser. We will gladly send you a booklet describing it.
Thordarsons are Absolutely Uniform!
They always "match up" perfectly

One reason that leading builders of fine sets use more Thordarsons than all competitive transformers combined is because Thordarsons run absolutely alike; absolutely uniform; always "match up" perfectly; always amplify evenly.

The following statement was made recently by a prominent set maker (name on request): "Any radio manufacturer who is sincerely desirous of producing an instrument of the volume necessary and of a tone superior to anything else on the market, must be absolutely forced to use Thordarson transformers sooner or later." Follow the lead of the leaders—build or replace with Thordarsons. They are unconditionally guaranteed. Any store can supply you. If dealer is sold out, order from us.

SUB-PANEL MOUNTING TYPE
THORDARSONS NOW ON SALE
They permit a neater assembly, the shortening of leads and the concealing of wiring—as in factory built sets. Same ratios, same prices—as standard type Thordarsons. If dealer cannot supply order from us.

SUPER-HET BUILDERS!
TAKE NOTE OF THIS GOOD ADVICE
For the "Best" 40,000 Cycle Super-Heterodyne, "RADIO" and other leading authorities recommend in highest terms the Thordarson 2:1 ratio transformers. Take no others!

Use Thordarsons for Power Amplification, Too
Thordarson Power Amplifying Transformers equal in tonal purity our justly famous audio transformers. They give best results when preceded by two stages using Thordarson 3½:1 Audio Frequency Transformers. May also be used as 4½:1 a. f. transformers by disregarding center taps—or as a coupling transformer for loud speakers. Bulletins on request.

The Thordarson INTER-STAGE Power Amplifying Transformer with a pair of Thordarson Power Amplifying Transformers provides two stages of power amplification. Although two stages of this amplification involve the use of four tubes, the quality of the reception more than compensates for the additional expense. Bulletin on request.

Thordarson Types and Prices
Thordarson Radio Transformers include: Audio Frequency (sub-panel or top mounting types) 2:1, $5; 3½:1, $4; 6:1, $4.50. Interstage Power Amplifying, $8 each. Power Amplifying, pair $13. Autoformers, $5 each. All Thordarson Products are unconditionally guaranteed. Dealers everywhere. We ship direct upon receipt of price if dealer cannot supply.

THORDARSON ELECTRIC MANUFACTURING CO.
Transformer specialists since 1871
WORLD'S OLDEST AND LARGEST EXCLUSIVE TRANSFORMER MAKERS
Chicago, U.S.A.
Geared 80-1 Ratio

Preferred by Radio Experts

Commercial operators, men who know tuning efficiency, use Accuratune Micrometer Controls.

L. M. Cockaday, Arthur Lynch, R. E. Lacault, technical editors of the three leading radio publications, use and recommend Accuratunes for best tuning results to their thousands of readers.

Accuratunes are actual Micrometer Controls, geared 80 to 1 ratio for infinite tuning precision. More efficient than built-in verniers or any other tuning device. An absolute necessity on Super-Heterodynes and other Receivers requiring unusually close tuning.

Accuratune Micrometer Controls give you greater distance, greater selectivity, greater volume. Well worth their price of $3.50.

At your dealers, otherwise send purchase price and you will be supplied postpaid. 1923

Accuratune

MICROMETER CONTROLS

Pioneer Manufacturers of quality vernier devices

Radio Ltd., Montreal, Canadian Representatives

MYDAR RADIO CO., 9-D CAMPBELL ST., NEWARK, N. J
MORGAN McMAHON AND SOME COLLECTIBLES
CHAPTER VI
COLLECTING

The collector is the strongest force in preserving the history of radio. He may have a single old radio in his den as a conversation piece. Or he may build a separate building to house his large collection. The Antique Wireless Association, a group of serious collectors, has an outstanding collection in Holcomb, New York.

There are many kinds of collectors. Some of us collect facts and interesting stories, and are the historians of the wireless-radio era. Some collect old technical publications. Some collect old radio programs, broadcast business publications and memorabilia of radio stars of the past.

Collectors of early-day wireless equipment have a very challenging job of locating and restoring the various parts that made up the wireless stations. In wireless days, (mostly pre-1920), most transmitters and receivers were assembled from separate pieces, rather than being bought as units. One problem is that it is impossible for the uninformed person to recognize that the piece of “junk” in his attic is a piece of wireless history. Wireless collectors continually prowl antique stores, swap meets, junk shops and garage sales in hopes of finding wireless components. Once the parts get into the hands of collectors, they are enthusiastically traded from hand to hand as each collector tries to enrich his own specialized collection. There is no “dollar market” in wireless parts; collectors prefer to trade rather than sell. When a collector does sell, the price is a stand-alone figure based on that transaction only. One word of caution; there are some beautiful replicas, which can be easily mistaken for the real thing.

The radio era brought complete transmitters and receivers. These items are more easily recognized, and can be more easily appreciated by the general public. Workmanship on many of the receivers is as fine as can be found on any top-grade furniture. The novice is captivated by the weird collection of knobs, dials and switches, and by the hand-crafted cabinets. Sophisticated collectors can get a tremendous thrill from seeing a rare Federal radio, or by filling in one more vacancy in a string of Atwater Kent radios.

Again, there is not a firm dollar market value in radio transmitters and receivers. A radio is worth what a collector can afford to pay for it. “Asking” prices vary widely; you may find a lovely old radio for $20, and then find someone next door asking $100 for the weathered hulk of a defunct set.
Wireless and radio add-on components make good collections. Some people collect headphones, of which hundreds of kinds were made. Others collect speakers, which have many kinds of insides and which range from weird to poetic in their styling. Vacuum tubes make perhaps the most interesting collection for the technical man. They are the key elements in the progress of radio, ranging from 1904 Fleming valves to 1929 screen grid tubes.

Most old radios do not operate after many years in storage. The paper-dielectric wound capacitors are bad, or will go bad shortly after batteries are connected. Sometimes they can be saved by starting at a low voltage and gradually increasing the voltage over a period of days. The remedy for bad capacitors (or condensers, as they were called), is not to replace them with equally old ones that will go bad just as quickly. Rather, one must replace the old foil windings with new ones. Most windings are tarred into the cans. The first thing to try is to freeze the condenser; the tar will usually shrink away from the can and the insides will slide out. Failing this the condenser can be heated and the tar poured out.

Transformers are another problem. In the old days, paper insulation contained traces of sulphur, which deteriorated the windings over the years. Old transformers may fail at any time. The old transformers can be re-wound, or a newer transformer can be put inside the old case by the non-purist.

WARNING: Do NOT attempt to hitch up voltage or repair antique wireless or radio equipment unless you know what you are doing. You can do irreparable damage to both yourself and the equipment. This is especially true of early A-C power supplies.

There are some excellent books on the radio industry and its people. “Radio Collector’s Guide” and “S. Gernsback’s 1927 Radio Encyclopedia” are companion pieces to this book. Erik Barnouw’s series “A Tower in Babel,” “The Golden Web” and “The Image Empire” (Oxford University Press, N.Y.) is a very interesting factual history of broadcasting. Ron Lackman’s “Remember Radio” (G. P. Putnam’s Sons, N. Y.) and Jim Harmon’s “The Great Radio Comedians” and “The Great Radio Heroes” (Doubleday & Co., Garden City, N. Y.) are entertaining and informative memory trips. Vintage Radio Co. also publishes a pictorial history book on the 1930-1950 era, called “A Flick of the Switch.” Tapes and records of old radio programs are also very enjoyable. These can be found in record shops or in the classified sections of antique periodicals.

If you are seriously interested in radio history and collecting, write to the Antique Wireless Association, Holcomb, N.Y. 14469; The Antique Radio Club of America, 516 Country Lane, Louisville, Ky. 40207; or the Canadian Vintage Wireless Association, P.O. Box 51, Station R, Toronto Ontario, M4G 2E6. The Radio Club of America.

Every day, valuable pieces of wireless and radio history are thrown onto the trash heap. Perhaps you, the reader, can help your relatives, friends, and neighbors dig up these modern-day antiques out of attics and basements. It’s a great way to start a hobby, or to get these bits of history into the hands of true collectors.

GOOD HUNTING!
CARL SIVERTSON AND EARL ENGLAND DISCUSS EARL'S RADIOLA III
AGE GUIDE

There are useful clues to the age of early-time sets. Early wireless equipment looks like experimental scientific equipment. Radios of the early and mid-1920's were battery sets with many knobs and dials. Early A-C sets built in the mid-1920's were simply battery sets with power supplies replacing the batteries. True A-C sets, with built-in power supplies and A-C tubes were introduced in 1927.

Console models became popular in the late 1920's when radio became part of the home scene. Well-constructed consoles were the showpieces of the home in the 1930's and 1940's. Smaller A-C cabinet "cathedral" radios (also known as "midget" or "depression" models) became widely used in the early 1930's as bad times made money scarce. These evolved into the box-shaped table radios that are sold today. Small AC-DC radios with plastic cabinets made the $9.95 "cheapie" available to every room in the home in the late 1930's.

Patent numbers appear on many radios built up through the mid-1930's. They are a good clue to age, since the item must have been made later than the latest patent shown.

<table>
<thead>
<tr>
<th>January</th>
<th>Number</th>
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<tbody>
<tr>
<td>1900</td>
<td>660,000</td>
<td>1926</td>
<td>1,580,000</td>
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<td>1902</td>
<td>720,000</td>
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<td>1904</td>
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<td>1908</td>
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<td>1934</td>
<td>1,940,000</td>
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<td>950,000</td>
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<td>1922</td>
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<td>1924</td>
<td>1,500,000</td>
<td>1950</td>
<td>2,500,000</td>
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Tube types give another rough guide to age. Four-prong tubes, most often —00A, —01A, WD-11 and —99 were used in the 1920's. Early A-C sets from 1927 to 1929 used four and five prong A-C tubes like the 26, 27 and 71A. The 24A tube, with its grid cap connection on top, hit in 1928 and was widely used well into the 1930's. Six and seven prong tubes were introduced in many sets in 1932. "Octal" tubes with plastic-keyed bases hit in 1935. Many of these tubes were made of metal rather than glass. "Loctal" tubes with metal bases were introduced in WWII. Miniature glass tubes were used in compact and portable sets starting in 1941, and were used in many sets after 1945.

One word of caution: Model numbers don't usually follow in time sequence. It's dangerous to assume that a radio is older because it has a lower model number.
DIRECTORY OF RADIO BROADCAST RECEIVERS, 1921-1930

YEAR OF INTRODUCTION BY MODEL NUMBER

This table lists receiver manufacturers and the year in which models were introduced in national magazines. If the same model number appears more than once, it means that a modified version was brought out. As with automobiles, radios were introduced as much as eight months before their "model year". Many companies stayed very small or folded very quickly; only companies that advertised nationally for more than two years are shown. "N/A" indicates that specific information is not available. Much of the original research for this list was done by Ralph H. Langley.

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>YEAR</th>
<th>MODEL</th>
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<tbody>
<tr>
<td>A. C. Dayton Co.</td>
<td>'23</td>
<td>(crystal set)</td>
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<tr>
<td></td>
<td>24</td>
<td>Super Polydyne six</td>
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<td></td>
<td>25</td>
<td>XL 5 Polydyne, XL 5, XL 10, XL 15</td>
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<td></td>
<td>26</td>
<td>XL 20, XL 25, XL 30</td>
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<td></td>
<td>27</td>
<td>XL 25, XL 50, XL 60, XL 70</td>
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<td>28</td>
<td>XL 61, AC 63, AC 65, AC 66</td>
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<td>29</td>
<td>XL 71, Navigator Series: XL 72, AC 98, AC 9960 AC 9970, AC 9980, AC 9990, AC 99100</td>
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<td>Acme Apparatus Co.</td>
<td>'23</td>
<td>Acmephone</td>
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<tr>
<td></td>
<td>24</td>
<td>Acmephone</td>
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<td></td>
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<td>'21</td>
<td>Paragon Regen., RD 5 Paragon, A-2, RA 10</td>
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<td>DA 2</td>
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<td>23</td>
<td>RD 5 Paragon, DA 2</td>
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<td>24</td>
<td>RA 0, RD 5, RB 2</td>
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<td>'25</td>
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<td>26</td>
<td>Adrola Series: R5P, R5B, R5C</td>
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<td></td>
<td>27</td>
<td>Adrola All Electric</td>
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<td>Advance Electric Co. (Formerly Falck)</td>
<td>'30</td>
<td>77, 88, 89</td>
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<td>Air-Way Electric Appliance Corp.</td>
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<td>F, G</td>
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<td>Ajax Elec. Specialty Co.</td>
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<td>Crystal</td>
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<td>Marveltone, ACS Crystal, CST Junior Crystal Marveltone, Crystal</td>
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<td>All American Mohawk Corp.</td>
<td>'25</td>
<td>Junior, Senior, R</td>
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<td>Duet, R HiBoy, Sovereign, Loraine, Forte, Sextet, 226</td>
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<td>44, 55, 80, 90, 77, Duet, 115, 66, 88, Sextet, Forte, 99, Loraine, Sovereign</td>
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<td>60, 61, 62, 65, 66, 70, 77, 80, 83, 84, 85, 88</td>
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<td>93 Lyric, 95, SG1, 94, 96</td>
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<td>D11, D19, D29, D39, D69, H19, H29, H60, Battery Model, DC Model</td>
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<td>Amborola</td>
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<td>American Specialty Co.</td>
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<td>King Cole</td>
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<td>B Tom Thumb, B DeLuxe, DC, AC</td>
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<td>C Tom Thumb, Automatic, Junior</td>
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<td>Baldwin Inc., Nathaniel</td>
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|                               | 30   | 40, 50 Baldwinette, 51 Baldwinette, 70 Conso-
|                               |      | lette, 71 Baldwinette, 75 Hydaway, 80 |
| Balkeit Radio Co.             | '28  | A3, A5, A7, B7, B9           |
|                               | 29   | C, F                         |
|                               | 30   | Balkeit, SG8 Balkeit, Midget Balkei|
| Blue Seal Mfg. Co.            | '24  | N/A                          |
|                               | 25   | 4, Cinco, 5, Blue Seal       |
|                               | 26   | Blue Seal                    |
| Bosworth Elec. Mfg. Co.       | '25  | B-1 Air Set                  |
|                               | 26   | B-2, B-1, B-3               |
|                               | 27   | B-6, B-3, B-5, B-7           |
| Brandes Inc., C.              |      | See Kolster Radio Inc.       |
| Brandes Products Corp.        |      | See Kolster Radio Inc.       |
| Branston Inc., Chas. A.       | 24   | R310 DeLuxe, R-95 Superhet, R304, Superhet |
|                               | 25   | Wired, R-306, R-55, Crystal  |
|                               | 26   | R45Hetrola, R46 Hetrola, R47 Hetrola |
| Bremer Tully Mfg. Co.         | '26  | Counterphase Series: 5, 6, 6 Power, 8 |
|                               | 27   | Counterphase Series: 6-22, 6-35, 6-37, 8-12, 8-13, |
|                               |      | 8-13, 8-16, 8-17, 6-38       |
|                               | 28   | 6-40, 6-41, 7-70, 7-71M, 7-71D, 8-20, 8-21, 8-22 |
|                               | 29   | 80, 81, 82, 81A, 881, 882, 83|
| Bronx Radio Equip. Co.        | '23  | Breco                        |
|                               | 24   | D, 2A                        |
|                               | 25   | BSC-3 Breco                  |
|                               | 26   | BS-3 Breco, BR-5             |

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<th>MANUFACTURER</th>
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<td>Bronx Radio Equip. Co.</td>
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<td>12 Breco</td>
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<td>Browning-Drake Corp.</td>
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<td>Official Kit, 5R, 6A, 7A</td>
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<td>34 Eight in Line, 36, 38</td>
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<td>53, 54, 56, 57, 63, 64, 66, 67, 83, 84</td>
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<td>Bruno Radio Corp.</td>
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<td>999, Diamond, Oriole, Nightingale</td>
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<td>Brunswick-Blake-Collender Co.</td>
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<td>Radiola III 30, Radiola 3A 35, Regenoflex 100, Superheterodyne 160, 260, 360</td>
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<td>(Brunswick Radio Corp.—1930)</td>
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<td>Brunswick:</td>
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<td>PR138C, Cordova</td>
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<td>PR17-8 Radiola 17, 5KR Radiola 18, 5KRO Radiola 18, 3NC8, 3NC8, 148, 2KRO Radiola 18</td>
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<td>1924 or 1925 on a 5 tube</td>
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<td>3NW8, 3KR6, 5KR6, 2KRO, 3KRO, 3KR8,</td>
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<td>3 dial TRF receiver with</td>
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<td>3NC8, R1, 14, 21, 31, S14, S21, S31, 81, 82, S81, S82</td>
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<td>RF transformers and condensers</td>
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<td>built by King Quality Products Inc.</td>
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<td>15, 22, S31, 42, 32, DC14, DC21, DC31, 15B, DC15, DC22, DC32</td>
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<td>used chasses bought from</td>
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<td>other manufacturers.</td>
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<td>See Malone Lemon Products Inc.</td>
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<td>Clapp-Eastham Co.</td>
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<td>DD, Gold Seal</td>
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<td>32 Cavalier, 32 Picadilly, 32 Moderne,</td>
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<td>33 Princess, 33 Mayflower, 33 Windsor, 34 Lafayette</td>
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<td>960, C1, C2, C3, C4, C5, C6, C7</td>
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<td>981, Telefocal Series: C20, C21, 939, 991</td>
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<td>26-5 Arborphone, Arborphone</td>
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<td>BRA, Cell, C-22, C-133</td>
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<td>Continental Five</td>
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<td>Crosley Radio Corp. (Crosley was also Precision Equipment Company in 1922, and took over the Amrad line for 1930 production.)</td>
<td>'22</td>
<td>Harko Sr., Harko Sr.V, Model I, VI, X, XV, XX, Ace</td>
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<td>IV, VI Super, VIII, XJ Super, XII, XV, XXV, 3B Ace, 3C Ace, V Ace, V Special Ace, VC Ace, 2A Ace</td>
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<td>Day Fan Elec. Co.</td>
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<td>(Dayton Fan &amp; Motor Co.)</td>
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<td>A, B, E, C, F, D, Batteryless</td>
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<td>Super Reinartz 2L0, “1926”, Super Reinartz</td>
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<td>Emerson Radio &amp; Phonograph Co.</td>
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<td>Distributing: Amrad Neutrodyne, Federal 135 Panel, 125 Cabinet</td>
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|                                  | 25   | DX 58, 135, 200, 141, 142, 143, 144, 161, Ortho-
<p>|                                  |      | sonic Series: A10, B20, B30, B35, B36, C20, C30, |
|                                  |      | C34, C40                |
|                                  | 26   | D40, E40, F40. Ortho sonic Series: D10, E10, F10 |
|                                  | 27   | F10-60, E45-60, F45-60, Oxford, Louvain, Mandarin, |
|                                  |      | Milan, D10-60, E10-60, D40-60 |
|                                  | 28   | E40-60, E41-60, F-11, F40-60, F11-60, F41-60, |
|                                  |      | F50, F50-60, F51-60, F60, F60-60, F61-60 |
|                                  | 29   | F70, F70-60, F71-60, F80, F80-60, F81-60, |
|                                  |      | G10-60, G40-60, G41-60 |
| Federal Telegraph Co.            |      | See Kolster Radio Inc.  |
| Ferguson Co., J. B.              | '24  | “TRF”                   |
|                                  | 25   | “TRF”, TRF 3V, TRF 3    |
|                                  | 26   | 10, 6, 8, 12            |
|                                  | 27   | 12, 10, 18, 14          |
| Flint Radio Co. Inc.             | '28  | Little Chief, AX, CX, C |
|                                  | 29   | Chief, Standard, 79, 113, 129 |
|                                  | 30   | Dolores, San Gabriel, Del Rey, Fantasy, Spanish Mission |
| Freed-Eisemann Radio Corp.       | '23  | 105 Marvel, 350, 370, NR5 |
|                                  | 24   | NR6, NR12, NR20, NR215, NR400, Aristona LaSalle |
|                                  | 25   | NR7, NR35, NR45, NR405, FE15, FE18, FE30 |
|                                  | 26   | NR15, NR30, NR40, NR48, NR70, NR800, |
|                                  |      | NR850, 10, 30, 40, 48, 50 |
|                                  | 27   | NR8, NR9, NR11, NR57, NR60, NR66, NR67, NR77, 411, 130 |
|                                  | 28   | NR50, NR80 Great Eighty, NR80W, NR80 |
|                                  |      | Hand Decorated, NR80, NR85, NR85W, NR85-9 |
|                                  |      | Adler Royal, NR85 Hamilton |
|                                  | 29   | NR10, NR53, NR55, NR56, NR78, NR79, NR95, NR90 |
| Freshman Co. Inc., Chas.         | '24  | Masterpiece             |
|                                  | 25   | Masterpiece, 5F2, 5F4, 5F5, 5F6, 5F7, Concert, |
|                                  |      | Master Unit, Franklin   |
|                                  | 26   | 6F1, 6F2, 6F3, 6F4, 6F5, 6F6, 6F7, 6F9, 6F10, |
|                                  |      | 6F11, Master Unit, 6F16 |
|                                  | 27   | G1, G2, G3, G4, G5, G6, G7, G10, F1, F2, F4, |
|                                  |      | F5, 7F1, 7F2, 7F3, 7F4, 7F5, 7AC2, 7AC3, |
|                                  |      | 7AC4, 7AC5               |
|                                  | 28   | H9, K, L, LS, M11, N11, N12, N14, N17, Q15, |
|                                  |      | Q16, QD16, 3Q15, 3Q16, 2N |
|                                  | 29   | 21, 21 Earl, 22, 22 Earl, 24, 31, 31 Earl, 31S, |
|                                  |      | 32, 32S, 33 Earl, 33S Earl, 41, 41 Earl, 121 Earl |
| Garod Corp.                      | '23  | RAF Neutrodyne          |</p>
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<td>5166 Dayfan 25 8AC (5069), 26 8AC (5069 &amp; 80), 27 8AC</td>
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<td>Grebe, A. H. &amp; Co.</td>
<td>'20</td>
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<td>5-S Elkay Super Selector Kit</td>
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<td>105 Super Wav-O-Dyne, 201 Wav-O-Dyne, 100 Standard, 401A Concert,</td>
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This book traces the growth of radio from 1887 to 1929, as it became a tool for reaching millions of people. The next 20 years were the heyday of radio broadcasting. Perhaps the “cathedral” radios shown above best recall those days. If you’re interested in the story of radio’s golden years, and in the beginnings of television, write to Vintage Radio for details of the fascinating 1930-1950 story.