NOVEMBER 1924 25 CENTS

Wireless Age

The Radio Magazine

Quality plus Service since 1915

C-12—Similar to C-11 with standard base

C-11—1.1 Volt .25 amp. Dry Battery Det. and Amp. Special Base

C-299—3 Volts .06 amp. Dry Battery Det. and Amp.

C-300—6 Volts Gas Content Detector

Cunningham RADIO TUBES

For Clear Reception

To perfection in design are added the productive resources and scientific skill of the great General Electric Laboratories.

The result—a series of Radio Tubes that give peak satisfaction in detection, amplification, and rugged long life.

Amazing accuracy governs every step in Cunningham manufacture. Testing is carried to extremes in order to give to every purchaser a tube as nearly perfect as is humanly possible.

Knowledge of Cunningham methods and policies is the answer to the why and wherefore of Cunningham preference.

PRICE THE SAME ON ALL FIVE TYPES

C-301 A C-299 C-300 C-11 C-12

C-301A—6 Volts ¼ amp. Amplifier

PATENT NOTICE

Cunningham Tubes are covered by patents dated 2-18-08, 2-18-12, 12-30-13, 10-23-17, 10-23-17, and others issued and pending. Licensed only for amateur, experimental and entertainment use in radio communication. Any other use will be an infringement.

E. J. Cunningham Inc.

Branch CHICAGO

HOME OFFICE
182 Second Street, San Francisco

Branch NEW YORK

Wireless Age

The Radio Magazine

Vol. XII No. 2

November, 1924—Contents

Your Authors

PROFESSOR TODD, as director of the Lowell Expedition to the Andes in 1907, went to Northern Chile to observe Mars when it came within 35,000,000 miles of the earth and took 12,000 photographs of the planet.

Again in 1922 he organized the Mars Expedition to the Bahamas, when Mars came again within 35,000,000 miles of the earth. He states that radio brought greater results from the study of the 1924 opposition, when Mars was within 34,630,000 miles of the earth, than had been possible to obtain in former years.

GOLDA M. GOLDMAN (A Villainess With Real Golden Hair) is an instructor of English in a New York High School, the Juvenile Critic of the New York Sunday World, and editor of "The Candle-Light Page" of The Candle-Light Lady. She has been writing radio personality sketches since the old WJZ days in Newark. Her interviews reflect her own vivacious interest in others, and certainly contain the feminine "interviewer" point of view that strikes a good balance with the all-too-masculine in radio.

JOHN R. MEAGHER (One Tube Circuits) originally designed the Uni-Control Receiver that brought out such remarkable response from our readers, and in this, the result of several months' experimentation and investigation, he has incorporated the best of his findings in a single article, and enough, to be sure, in one sitting.

PUBLISHED MONTHLY AT WIRELESS PRESS, INC., 326 BROADWAY, NEW YORK

Los Angeles, Calif., 1116 Chapman St., Coast Publishers Co. **Chicago, Ill.,** Wrigley Bldg., Wheeler & Northrup. **Boston,** 18 Stewart St., Charles M. White.
San Francisco, 821 Market St., Coast Publishers Co. **Great Britain,** 12-13 Henrietta St., London. **Australia,** 97 Clarence St., Sydney, N. S. W.

Yearly subscription in U. S. A., $2.50—Outside U. S. A., $3.00; Single Copies, 25 cents. Entered as second class matter Oct. 9, 1913, Post Office, New York, N. Y., under the Act of March 3, 1879.

When subscription expires you will find a renewal blank enclosed. Return with remittance promptly.

James G. Harbord, Pres. Pierre Boucheron, Vice-Pres. and Gen'l Mgr. L. MacConnach, Secy. George S. DeSousa, Treas. H. H. Reber, Bus. Mgr. C. F. Boag, Adv. Mgr.
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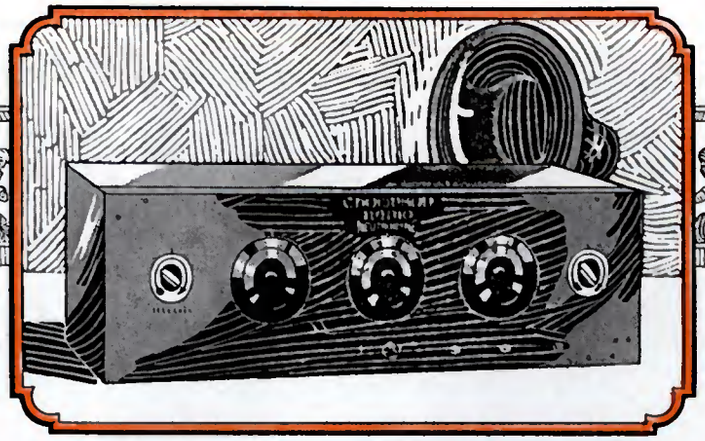

"EXPERIENCE IS THE VITAL FACTOR IN EXCELLENCE"

THOMPSON RADIO

Thompson radio products are as fully developed and as standardized in radio as is the telephone in wire communication. Thompson owners do not worry about how their set and speaker will compare with "next year's model." Perfection remains Perfection.

Thompson simplicity of operation as well as Thompson range and power makes it possible to receive the desired radio program just exactly as it is given before the microphone. Those who wish *real* radio entertainment at low cost will be decidedly interested in the Thompson Neutrodyne Radio Receiving Set—*NOW* $125—and the Thompson Speaker—*NOW* $28.

The fully developed Thompson Radio Products at such reasonable prices are possible only to an organization that has been making radio products *exclusively* for many years.

If your dealer does not handle Thompson radio products, write to us for descriptive literature and the name of a Thompson dealer near you.

R. E. THOMPSON MANUFACTURING CO.
Manufacturers of Radio Apparatus for the U. S. Army and Navy and numerous foreign governments
30 CHURCH STREET · · NEW YORK, N. Y.
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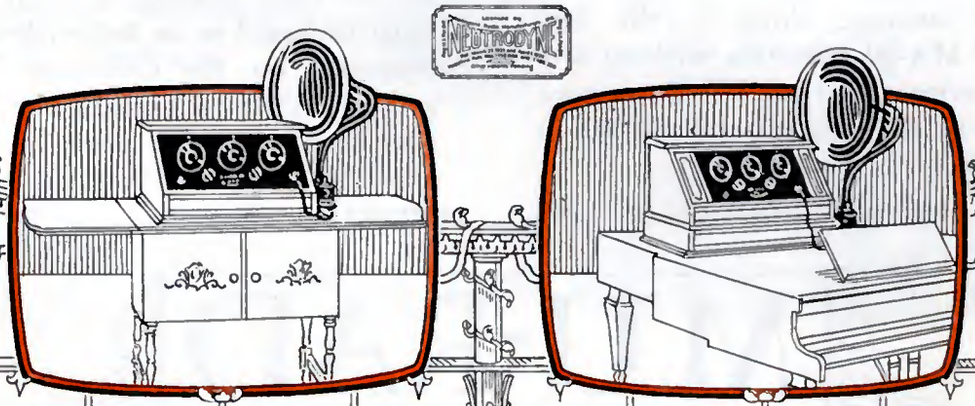
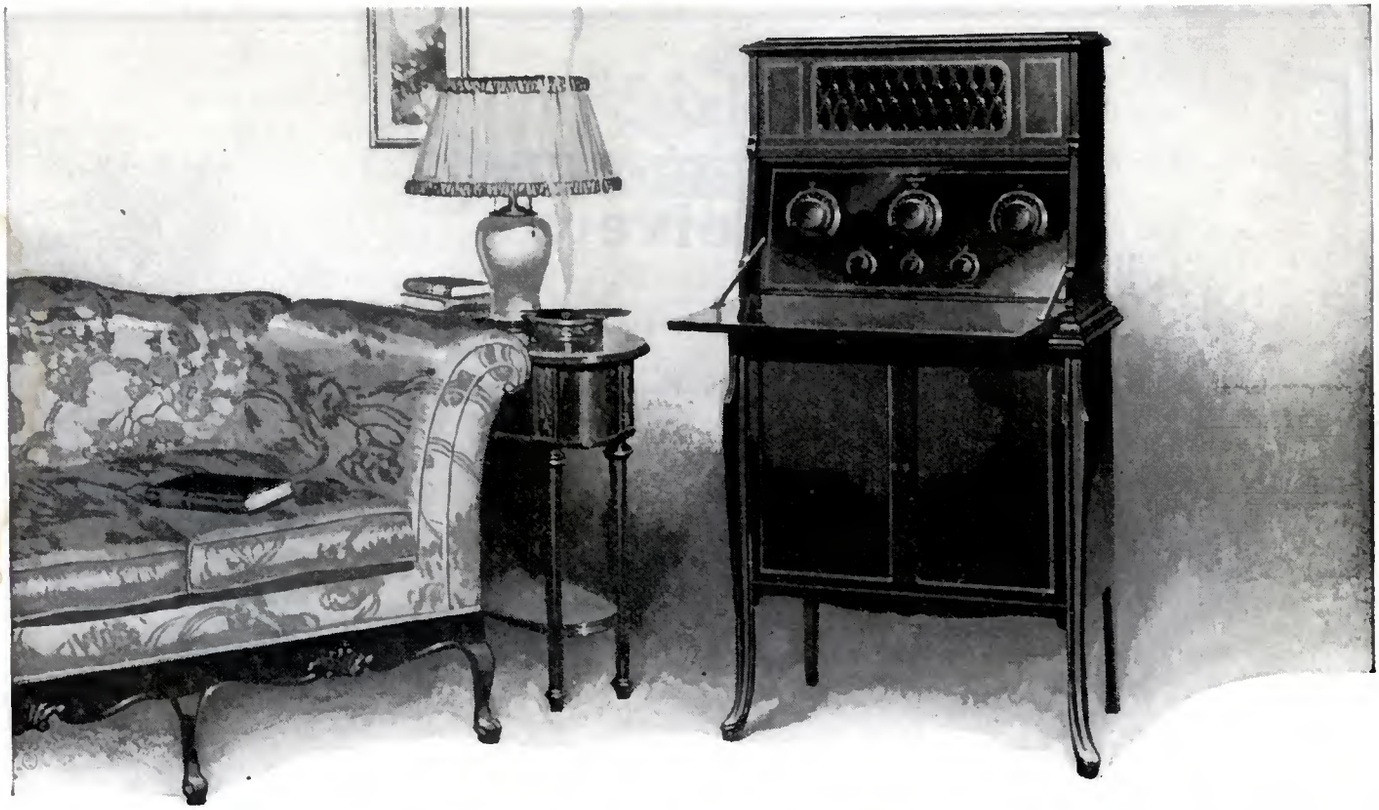




The FADA Neutrola Grand

new beauty, new perfection in Radio

AN EXQUISITE instrument. Encased in beautifully finished genuine mahogany. A gem of the cabinet designer's art. A piece of furniture that will adorn any home.

Here in this new FADA Neutrodyne is a real achievement in receiving beyond anything you ever heard. Wonderful naturalness of tone. The high C of the coloratura soprano and the lowest bass of the human voice are reproduced precisely as sung. In selectivity the FADA Neutrola is remarkable.

FADA Neutrola Grand

The deluxe five-tube FADA Neutrodyne, with self-contained loud speaker. Receiver and cabinet in genuine mahogany, artistically decorated with wooden inlay. Ample space for all batteries and charger. Drop desk lid that hides receiver when not in use. Price, exclusive of tubes and batteries, $295.

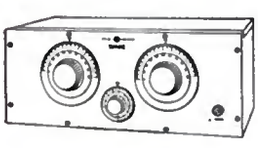
Ease and simplicity of tuning make it the ideal receiver for all the family.

The FADA Neutrola Grand is the finest of the complete line of FADA Neutrodynes, which includes a model to suit every taste, every radio requirement, every pocketbook. Three, four and five tube FADA Neutrodyne receivers in plain or de luxe cabinets are now available at your dealer's. See them today and make your selection. You will never regret buying a FADA.

You have a range from $75 to $295 from which to select—six models, each extraordinary in results; each a remarkable value.

F. A. D. ANDREA, INC.
1581 Jerome Avenue, New York

FADA Radio



FADA Neutro Junior
No. 195

Three-tube Neutrodyne. A wonderful performer. Price (less tubes, batteries, etc.) $75.

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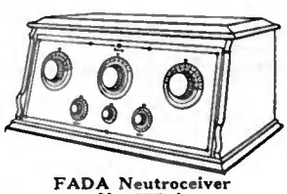
NEUTRODYNE
REG. U.S. PAT. OFF.



FADA Neutroceiver
No. 175-A

Mahogany cabinet. Inclined panel and roomy battery shelf. Five tubes. Price (less tubes, batteries, etc.) $160.

"Quality Goods for Quality Readers"

PARAGON
FOUR
$65

A BASICALLY new four-tube receiver employing the new Paradyne Circuit. *Capable of loudspeaker reception over practically unlimited range. Extremely simple to operate. Major dial control. Operates either as a three-tube or a four-tube set. May be used with any standard tubes of either dry cell or storage battery type. Handsome mahogany cabinet. Cheap in no respect but price.*

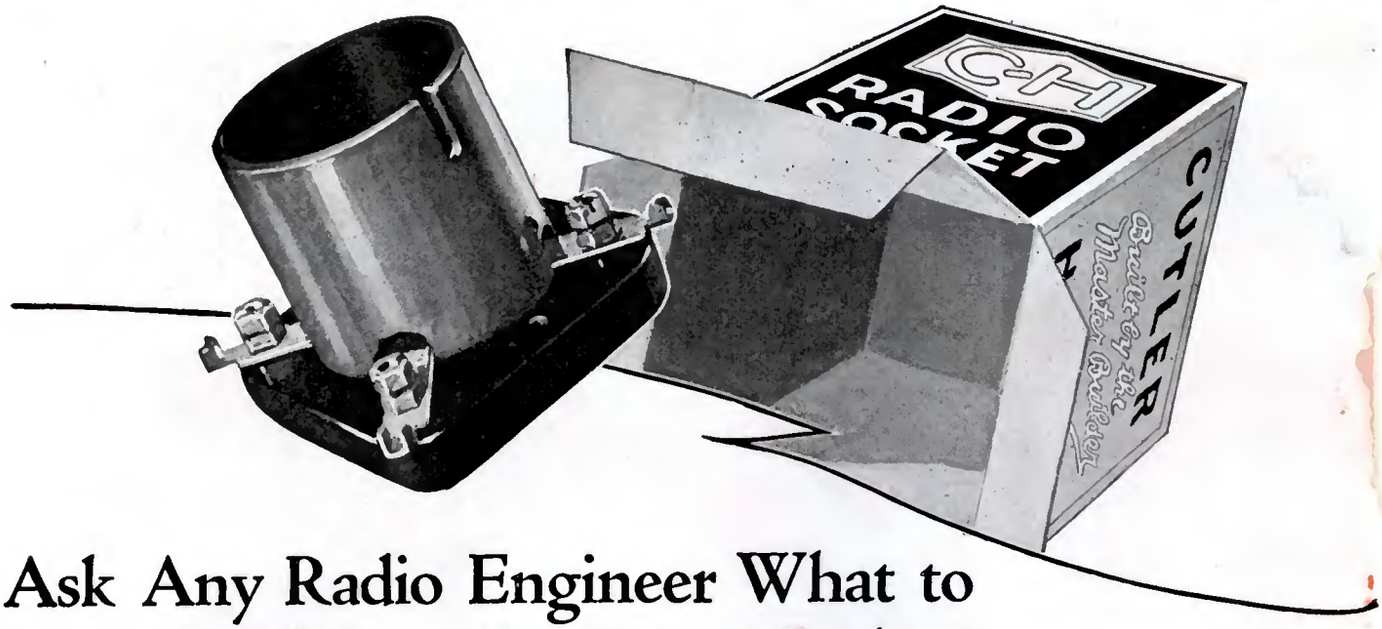
REVOLUTIONARY!

EVERY year there's a big advance in radio knowledge. This year's advance has *revolutionized* Paragon Receivers and produced a brand new line having all the Paragon fine tone, sensitivity, selectivity and high quality of the past with new *simplicity of control* and new *lower prices.* In addition to this new four-tube set, there are also

The New Paragon *Three,* price only.....$48.50
And the New Paragon *Two* at..... 27.50
Ask to see these new receivers at your radio dealer's. Free descriptive folder on request.

ADAMS MORGAN CO., Inc., 8 Alvin Avenue, Upper Montclair, N. J.

DEALERS: Write for attractive new Dealer Proposition and address of nearest Paragon Distributor



Ask Any Radio Engineer What to Look for When You Buy a Socket!

Radio experts are continually stressing the necessity of using good sockets. In some of the more sensitive circuits such as the Superheterodyne, poor sockets often completely destroy results. In fact, in thousands of sets today, with scores of different circuits, the so called "static" often mentioned, or "battery noises," are in reality merely the result of poor socket contacts—certain proof of dissipation of the feeble currents that we rely on for distant reception.

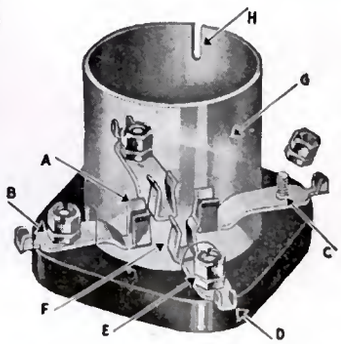
Minimum Dielectric Capacity

In the Cutler-Hammer Socket, designed by the same engineers whose precision rheostats and other radio current control apparatus have justly become world famous, every effort has been bent toward greatest efficiency. Custom has no consideration—and from its striking color scheme to its novel contact construction, the design is radically new.

It embodies a minimum of both insulation and metal; capacity absolutely minimized without sacrifice of mechanical strength. The insulation materials (shell of thin orange Bakelite and base of genuine Thermoplax) are ideal—high in quality and dielectric strength; low in dielectric capacity and losses. And all metal parts are widely separated, both in the insulation and in air to conserve every last bit of energy received.

Maximum Dielectric Resistance

Its contacts—the source of losses and noise in most sockets—are of entirely new construction. Each one is a springy clip



These Exclusive Features Assure Better Reception

A Perfect contact. Both sides of tube prong cleaned when inserted—no contact or wear on soldered end.

B All metal parts *silver* plated—perfect contact for the life of the set. Silver may tarnish but its contact resistance does not change.

C One piece contact construction. The binding post is NOT a part of the circuit—the wire to the socket always touches the contact strip which carries the current direct to the tube prong—no joints to cause losses.

D Convenient terminals for soldering—full length to allow bending down for under-wiring. Ears hold wire in place for soldering.

E Extra handy binding posts—tight connections with either wrench or screw-driver. Lock washers hold terminals rigid.

F Wide spacing of current carrying parts both in air and insulation—true low-loss construction.

G A minimum of both metal and insulation for low capacity. Shell of thin Bakelite—the base of genuine Thermoplax.

H The tube is held in place by merely a vertical motion—no twisting to separate bulb from base.

"Built by the

C-H

The Perfect

that clinches the tube prong without strain; yet cleans it bright whenever the tube is inserted or removed. These contacts are formed of phosphor bronze and *silver* plated—because the contact resistance of silver does not increase as it stands exposed to air. The area of contact is greater than that found in any other socket; and the construction is such that these feeble currents which mean so much in radio pass directly from the wire to the prong of the tube without meeting a single joint. *(In so many sockets the wiring is attached to a binding post to which the contact strip is in turn attached below. This presents a joint which causes noise and losses. The* C-H *Socket affords perfect connection even if the screw that holds the contact strip in place is entirely removed.)*

Silver Plated Phosphor Bronze Contacts

No Joints to Cause Noise or Losses

In this socket the tube is inserted and removed without turning—just pushed in and pulled out—to prevent twisting the bulb from its base. And the tube is held tight, absolutely rigid so that any vibration cannot cause contact noises. Its small size and convenient soldering terminals, too, mean a great deal in most sets for space is usually at a premium. The Thermoplax base is only 2⅛" square—scarcely more than the diameter of the tube, and the soldering terminals extend out far enough from the rounded corners that they may be turned down for under-wiring when this system is used. These terminals have handy ears which are bent up to hold the wire while the solder is being applied—adding much to the ease with which this work is accomplished. For temporary connection, or where soldering is not used, a slotted hex-nut is provided which securely clamps the wire against the contact spring with either wrench or screw-driver.

Convenient and Efficient Terminals

No Twisting to Damage Tube

In all it is as perfect a socket as engineering skill can devise. It offers maximum efficiency and ease of installation, coupled with an appearance that adds much to any set. And best of all you will like the price, 90c. *This socket that meets the specifications of the most exacting radio engineer costs no more than most of those on the market today!* If your dealer has not been stocked, you can be supplied direct from the factory at list price plus 10c for packing and postage.

THE CUTLER-HAMMER MFG. CO.

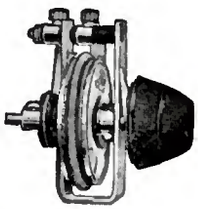
Member Radio Section, Associated Manufacturers of Electrical Supplies

MILWAUKEE, WISCONSIN

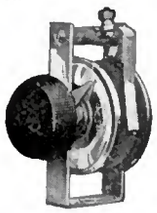
Master Builder"

C-H

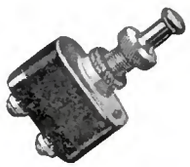
Instruments of Guaranteed Quality Assure Success in Radio



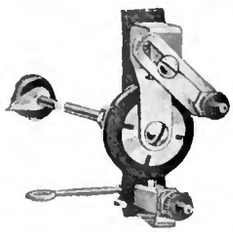
The C-H 4 Ohm Vernier Rheostat
Perfect detector tube control. Also furnished without vernier for amplifier tube control.



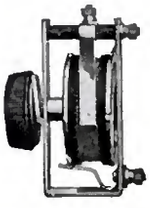
The C-H 30 Ohm Radio Rheostat
For control of the ¼ ampere, "UV201-A-C301-A" type receiving tubes and the "UV199-C299" type; also made in 125 ohm size.



The C-H Radio Switch
The switch with the perfect mechanism for providing easy control of the most delicate circuit without introducing microphonic noises—one hole mounting.

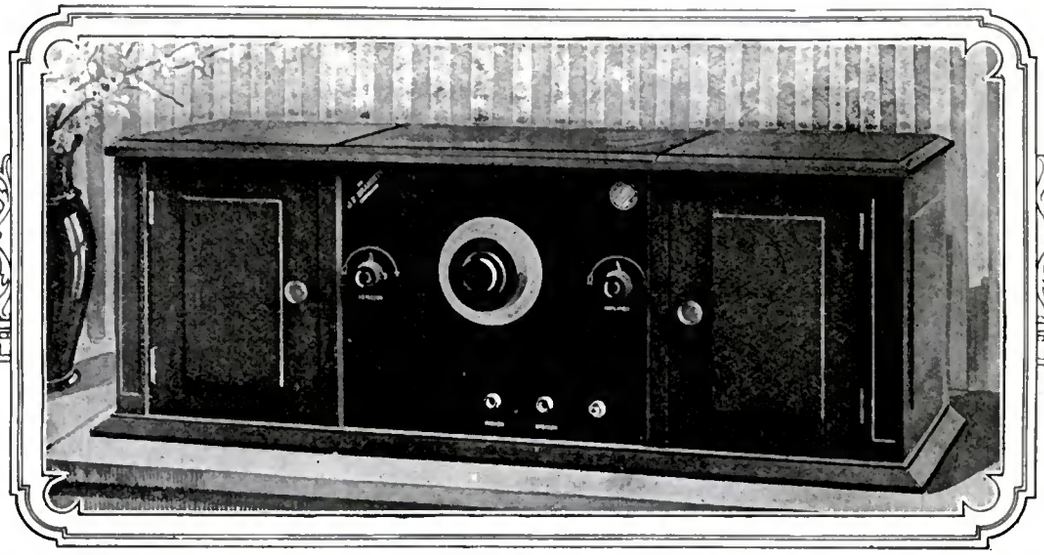


The C-H Variable Grid Leak
Mounted on the tube socket-panel controlled. Adjustable for all grid condensers.



The C-H Radio Potentiometer
The potentiometer with the resistance unit that does not wear and cannot be displaced under constant use.

RADIO SOCKET



The Ultimate Radio Receiver
ONE DIAL — SIX TUBES

THE "BRANDOLA" is the latest achievement in radio. In its simplicity of control, purity of tone, volume, extreme sensitivity and clear reception of distant stations combined with its very accurate logging, the "BRANDOLA" is far in advance of any radio receiver now offered to the public.

OPERATION. As you will note in the illustration, the "BRANDOLA" has but one dial to adjust—so simple, that a child of six years can tune in local and distant stations with the same ease and confidence as its parents. It is very selective in its operation—a simple adjustment of the one dial and you may choose between the many programs in the air.

TONE QUALITY. The newest and most improved method of amplification is employed exclusively in the construction of this wonderful receiver. By the use of Resistance Coupled Amplification, reception of music has been transferred into the realms of higher musical expression.

LOGGING. The "BRANDOLA" logs perfectly. When you listen in, note the position of the dial, jot it down in your log book for future reference. Because of its simplicity of operation, the number of stations you may listen to in one evening, is only limited by the number you may choose to hear. The slightest turn of the dial absolutely eliminates one station and brings in another.

The "BRANDOLA" may be purchased at any first class Radio Store. If you cannot obtain it, write us and we will mail list of nearest dealers.

TRADE BRANDOLA MARK

Any Dealer will be glad to demonstrate the "BRANDOLA" for you.

List Price	$125.
West of Rockies	135.
Canada	165.

The Brandola

The J. F. Brandeis Corp., 37 Oxford St., Newark, N. J.

Editorial Chat

IN this age of marvels, "We are not as happy as kings." There are many marvels, and life is brief. The railroads saw the birth of a wood burner on iron rails, and the growth of an electric mogul, giving way to automobiles, increasing at a prodigious rate under the shadow of soaring planes. Now, the ZR-3 makes the trans-Atlantic flight because of radio—the universal Red Book of the airways—and the government builds a radio highway for 24-hour continental mail delivery. Not satisfied, we turn from the spill-over of a radio show to crush each other in another, seeing far too little, and yet determined to know the last word in radio!

The Fall Shows

The crowds crowding the radio shows are mass evidence of the tremendous impetus given radio this fall. Amateur interest is large, but overshadowed by women-appeal designs in complete set displays. This means recognition of radio in the light of wholesome household approbation—a stamp of approval issued to commodities of merit by the family institute.

Phonograph manufacturers were quick to appreciate the sight-selling value in merchandising home furnishings, and have established a show-room display precedent the radio industry is not slow to follow.

Program Standard

After the first flush of novelty appeal, radio becomes a service, and in that service, must maintain a standard of some sort. If the broadcast stations are unable to hold general interest, then they will gravitate naturally to the specific.

In this issue of your magazine, you will find the November schedule of agriculture programs in "Harvest Time on the Air." December, and the 1925 schedule, is included. Then turn to "Sports" for the football programs, but before reading it again, you might browse through the contents a little further on. The Third National Radio Conference is opened by Secretary Hoover in a lucid review of the past and a prophetic vision of the future.

Fiction—interviews—opinions of national figures—all yours for the reading.

A Family Receiver

Technical articles are selected on the premise that there are only a few outstanding subjects in one month the reader cares to assimilate over one month's span.

The 6-Tube Family Receiver, this month, can be built by the family, the ease of operation being to the family's taste, and a tone quality above distance; though DX hunting is the individual's prerogative. Blessed be distance!—if we don't have too much if it.

This—your issue of WIRELESS AGE—is another you'll enjoy.

—THE EDITORS.

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

Radiola

REG. U. S. PAT. OFF.

LOUDSPEAKER

This symbol of quality RCA *is your protection*

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

"Quality Goods for Quality Readers"

N&K

Imported PHONES

N & K Phones, Model D, 4000 ohms, reproduce more clearly because of their watch-like accuracy of construction, and the increased diaphragm area. The slightly larger ear caps and the sanitary leather covered head bands make them the most comfortable head set. Price $8.50.

Ear caps accurately machine threaded, to insure proper seating of diaphragm.

Extremely sensitive diaphragm, 2¼ in. diameter.

Thin, calibrated metal washer maintains accurate spacing between magnet and diaphragm.

Magnets of special magnetic metal wound to 4000 ohms resistance.

Built like a watch

THE scientific design and painstaking workmanship of European watches have earned a worldwide reputation. These identical qualities are what have given N & K Phones their remarkable reputation.

As in fine watches, the design is absolutely scientific, the workmanship the highest type of delicate hand-craftsmanship. The magnets are made of a special magnetic metal of a quality that insures uniformity and long life. The ohmage (4000 ohms total D. C. resistance) has been proved by tests to be the most efficient for all general purposes. The diaphragms are peculiarly and unusually sensitive and have a *greater area*. The spacing between the diaphragms and the magnet poles is scientifically correct.

Clear, mellow Tone

The results of this scientific design and painstaking workmanship are evident from the first moment you listen to broadcast music through N & K Phones. The entire reproduction is clearer, mellower, more natural. Every note, highest to lowest, of voice or musical instrument is heard distinctly. Compare them with any other phones you know of and you'll prefer N & K. Sold on a money-back guarantee.

Made by the makers of N & K Imported Loudspeakers, $27.50; and N & K Imported Phono-units, $7.50

Dealers: N & K Head Sets mean easy sales, excellent profit. Use them to demonstrate your radio sets, especially the small ones. They'll sell the set for you every time. Show your customers the sanitary leather-covered head bands—so easily cleaned. And take advantage of the important fact that there are no come-backs on N & K Head Sets. As an N & K dealer said after handling them for a year: "I have yet to see one pair come back for repairs." We guarantee it fully and carry a complete stock of spare parts. If your jobber is not yet supplied with N & K Head Sets, write us.

TH. GOLDSCHMIDT CORP., Dept. W11, 15 William St., NEW YORK

VOLUME 12

Wireless Age
The Radio Magazine

NUMBER 2

Radio on the Farm

MRS. CLAWSON wiped her florid face with the blue-checked apron girdling her rotund figure, placed herself at the table and waited expectantly. The others waited, too, for the signal that would occasion well nigh hysterical outbursts of emotion.

Hiram Clawson, prelate *magnificent* of the farmstead, skillfully balancing a knife in his right hand, clutched a fork in his left. The attitude was portentous. A posture suggestive of the imminent, terrifying onslaught.

"Well, stranger!" he commenced. "Just received a bulletin from the Commission Brokers' Exchange showing up the reason for poor farming conditions."

The stranger, a chance visitor, and city-bred, understood the situation. Having just come from the city, he represented the evil cult of trade unionism, the sharp practices of business magic and the glamour of carbaret tinsel. He represented, in truth, danger with the element of injury removed. A situation always alluring.

"Yes?" he encouraged.

Everyone leaned forward. The moment has arrived.

"Yes, sir!" Hiram affirmed. "The bulletin said that labor was responsible for poor prices on produce. Suppose I wanted to hire a painter for the day? It would cost me about 23½ dozen eggs. That's what one hen lays in 272 days. Suppose I wanted a mason for a day's job? It would cost me about 42½ pounds of butter, which represents the care, feeding, and milking of 14 cows. And that's a big item. Then suppose I needed a carpenter for one day? Just one day! I'd have to pay him one hog weighing around 170 pounds. That's the care and feeding of a pig for eight months."

"Yes?" the stranger still encouraged.

Hiram scored his bull's-eye.

"That's why you city folks can't tell the farmers how to run their business!"

AFTER dinner the stranger announced the purpose of his visit.

It seemed that he had brought a radio set to this isolated farm with the sole intent of providing entertainment and instruction, but particularly information. Market and weather reports, he indicated would prove invaluable to the planting, harvesting, and marketing of produce. Likewise for livestock shipments.

Candidly, Hiram Clawson was dubious. But the stranger was not offended.

Lively music intrigued the gathering. Good humor heightened their spirits. Pulses quickened with the rhythm of old-time songs. Hearts warmed as youth and vigor and life itself flowed from the loud speaker.

Then came the bolt from the ether. Agricultural reports!

Eyes sought eyes. Was this a service or a presumption? Did this portend a valuable acquisition to the day's labor, or warn them of another attempt at meddling?

Hiram Clawson leaned forward, intent. A painter must pay $15.00 for 23½ dozen eggs. A mason must pay $23.00 for 42½ pounds of butter. A carpenter must pay the sum of $70.00 for a 170-pound hog!

Turning he stared at the stranger. "What," he demanded, "becomes of the difference between the prices in eggs, butter and pork that I pay to labor for a day's work and the price *they* pay to secure the food?"

The stranger laughed. He laughed long and uproariously.

"That," he replied, "shall be answered by radio. What you have now unwittingly learned is the proper use of radio facilities. I have brought to you the radio. It remains for you to use it."

"Who are you?" Hiram asked.

There was no answer. The stranger had gone.

HARVEST TIME ON THE AIR

Fay Bainter and Walter Woolf in Shubert's Operetta, "The Dream Girl," broadcast through WJZ. The farmers enjoyed this show as much, if not more, than city folk—except, of course, those who saw it—and it is well worth seeing

"When the corn is in the shock"

it is Harvest Time on the Air

Broadcast programs scheduled for this winter will surely promote a contented agriculture— A contented agriculture in America means our individual betterment economically

By WILLIAM A. HURD

RADIO will be more alluring to the farmer when we stop talking about the fireside. True, there is a strong appeal in the picture of the family hearth. Whittier added a touch of romance with his "Snowbound." But the fireside on a farm is isolation. Crackling embers punctuate the moan of a north-east wind and the tempo is loneliness. Wintry blasts sweep across the barren fields to sigh and whistle under the eaves of bleak isolation.

Radio alone can dispel the frozen silence of a rural winter. The play-grounds of the world may be selected on a circular scale. Sinbad, the Sailor, would envy the wonders of the twirl of a dial. Yet there are those of us who would presume upon the farmer's sphere.

Broadcast programs are an editorial function that cannot be performed by a cabaret artist. Those who broadcast to farmers sense this fact and diversify their programs with engineering, lectures, music and pertinent information. But the question arises as to how much of each should be broadcast.

THE Farmers' Union, functioning as a strong co-operative marketing and buying organization in the West, the Farm Bureau Federation in Chicago, operating as a political organization, and the National Grange Association in the East, with a social and fraternal objective, ought to know what to broadcast to farmers. But the programs would require careful editing. These three organizations, all powerful, are not friendly. Most broadcast stations now serving the farmers, blanket the entire country and can ill afford to favor one organization or offend the members of another.

How can a broadcast station in New York serve best the natives of Arkansas? Location of broadcast stations was not originally chosen with any consideration of the field to be served. And this in a land of 48 provinces, each with problems of its own and a perspective peculiar to its locality. Many farm publications knowing this are content with a concentrated, but altogether healthy circulation in a particular section. The most successful farm publication of national distribution calls the farmer a gentleman and prints material of real interest to city dwellers. The truth being that country gentlemen and city folk have more in common than is usually conceded.

WHAT the farmer will not read in a magazine he will not listen to on the radio. He wants variety. He is particularly keen for news because he cannot buy the five star extra before the print is dry. As a matter of fact, there are more things of real interest to the farmer than there are stations to broadcast them.

Put Luther Burbank on the air. Let the editors of farm journals each broadcast a five-minute talk. The moment the Ambassador of China lands, put him in a taxi and rush him to the nearest broadcast station. Agricultural conditions in China are much more impressive than identical conditions in the mountains of South Carolina.

Stations broadcasting livestock, grain, and general market reports serve the farmer much as the stock ticker serves the broker. One farmer receiving such reports acts as the central bureau for all his friends who have telephone service. If the estimated receipts of the governmental report indicate a shortage in the following day's shipments, the farmers rise at 3:00 A. M. to haul their hogs and produce to market. Prices are thus brought down. Likewise, the farmers avoid overloading the market. Prices go up. The result is a tendency toward stabilization of the market.

THE big stations should co-operate, and each help the smaller ones in disseminating information and amusement. The question of who will pay the broadcasting bill does not need to worry us now, as it is being paid. It only remains to make the radio so much alive, the farmers will be the first to offer a solution when the question arises. Radio will break down the isolation peculiar to the American farm. This alone justifies any precaution, any expense, to make the radio alive with world events at first hand.

The farmer makes his own radio, repairs his own tractor, and in short is fast becoming mechanicalized. Classes in domestic economics are maintained for farm women. The boys and girls in rural communities are organized to serve the farmers who do not have radio sets. These juvenile organizations spread broadcast reports across the countryside with astonishing effectiveness.

Why should the farmer of Iowa emigrate to California when the world at large can be brought to him? Competition between the Los Angeles Chamber of Commerce and Hollywood has been keen. Broadcast gossip of the film stars has finally won over weather propaganda. And Iowa no longer suffers the terrifying inroads on its population.

THE educational and cultural effect of radio on the farmer is felt in the Chautauqua circuit. Less comedy and better music distinguished the Chautauqua season of last summer. This is more significant when we pause to reflect that only two per cent. of thirty-six million farmers now own radio sets.

The percentage of radio equipped farms should be

higher. The farmer can purchase a good receiver for less than it will save him on crops. Approximately 117 stations broadcast daily weather reports and forecasts, a service that can be definitely calculated and figured in any medium of exchange.

Various writers, inspired with a sort of prophetic wisdom, have declared that the troubles of the farmer can be solved by placing a radio in every farm home. Just how this is to be accomplished is not a part of any one of the solutions offered. Perhaps giving the farmers what they want might do it.

What, may we ask, can the farmers desire more than to hear Lida Mae in "The Dream Girl," Shubert's broadcast success?

THE Northwestern Farmstead working through WLAG was one of the prime movers in broadcasting agricultural service. Their programs consist of market reports, opening prices on all northern grown grains, livestock, potatoes, butter, cheese, milk, fruits and vegetables. Investments best suited to the farmers' interest are also broadcast as a permant feature. These are supplemented with investment talks for the rural banks. Closing prices are given with time signals in order that last minute prices can be checked against the clocks in the warehouses and shipping rooms. In the evening, two or three short lectures on farm topics are delivered by experts, usually members of the State Agriculture College, commissioners of agriculture of other states, grain supervisors, men from the stock yards, experts of agricultural marketing organizations, and practical farmers. The lectures are on subjects dealing with farm supplies, seeds that will grow best in Minnesota, and a variety of informative suggestions.

THE Department of Chemistry of the University of Pittsburgh, broadcasts a series of radio talks through KDKA every Wednesday at 8:15 P. M. Their schedule for the remaining classes is: October 29, "Coal, a Factor in Industry and Health;" November 5, "Heat and Cold: What They Seem to Us," and November 12, "Glass, One of Man's Blessings."

A bulletin has been prepared briefly outlining the lectures and containing a list of reading references. This may be obtained by addressing the radio manager, University of Pittsburgh, Pittsburgh, Pa. The lectures will be printed in a bulletin at the close of the series and may be obtained at the same address.

The Missouri State Board of Agriculture at Jefferson City, operates WOS for the farmers of that section. This station is trying to standardize broadcast reports to facilitate ease of reception. The attempt is difficult. Potato quotations are not of value to a sugar cane district, nor do cotton growers have much in common with the farmer who is wondering what price he will get on his alfalfa crop.

WPG, Nushawg Poultry Farm, New Lebanon, Ohio, broadcasts poultry news and information. This station co-operates with the City National Bank of Dayton, Ohio, on the arrangement of programs.

The powerful Naval Station at Great Lakes, Ill., being in the corn belt, broadcasts proper programs for corn growers, six hours daily.

St. Louis University, WEW, broadcasts quotations on cabbage, fluctuating prices in beef, hay, fruits and vegetables.

THE air mail stations, identified with the distribution of data relating to farm products since the inception of radio crop and market-news service, continue as a useful link in the chain. North Platte, Rock Springs, Elko, Reno and Omaha are the air mail stations thus identified. Omaha is the western terminus of the leased wire of the Bureau of Agriculture and Economics The leased wire service and the air mail station at this point form the connecting links with the East and the West. The section west of the Rocky Mountains resolves itself into a unit for the development of a market news service. Representatives of the Department of Agriculture are maintained at San Francisco and Los Angeles and co-operate with the local broadcasting stations. Important crop and market developments in the East are transmitted by wire to the West and broadcast to the farmers of that section.

East or West, the country bank now has the appearance of a miniature stock exchange. These banks are actively co-operating with the local stores in a nation-wide drive under the auspices of the federal authorities to place at least 500,000 sets in farm homes.

The winter's program schedules for the following stations may be secured by addressing your requests to THE WIRELESS AGE.

Iowa State College at Ames, Ia.
University of Texas at Austin, Texas.
Ohio State University at Columbus, Ohio.
New Mexico College of Agriculture & Mechanical Arts
Nebraska Wesleyan University.
Wisconsin Department of Markets at Waupaca, Wis.
Sears-Roebuck Agricultural Foundation, Chicago.

THE Kansas State Agricultural College, this Fall, has made the first concerted effort of any educational institution to disseminate a systematic course of instruction by radio. They have prepared a thoroughgoing catalogue listing the radio extension courses. The agricultural, engineering, home economics and general science divisions of the college have earnestly co-operated with the Extension Service in the formulation of this radio program.

No attempt has been made to parallel the regular college course of instruction. Particular attention, however, has been given to the selection and treatment of subjects which have a ready and practical application in the home, on the farm, and in business. Faculty members who have prepared, and who will broadcast these lectures, are authorities in their respective fields of work. They have selected the most interesting material available, care-

fully prepared it with regard to continuity, practicability, applicability and timeliness.

HORTICULTURE, Fruit and Vegetable Gardening, September 15 to December 30, is a sixteen weeks' course designed to increase interest in the production and use of fruits and vegetables. Suggestions regarding selecting the site and soil, nursery and varieties, the procuring and setting of plants, and their cultivation and care will be embodied in the lectures. Making and handling hotbeds, and the forcing of early plants will be discussed in time to help the gardener with his plans. Spraying to prevent injury by insects and fungi will also be given attention.

Agronomy, The Wheat Industry of Kansas, September 16 to December 30, presents an opportunity to obtain the most recent information on the growing and marketing of wheat.

The Beef Cattle Industry from November 10 to December 29, in eight lectures, will discuss the development of the beef cattle industry in Kansas, The United States and the World, with export balance and import balance and the characteristics, adaptability and distribution of the different grades of beef cattle.

Dairy Husbandry, November 10 to April 20, by the Department of Dairy Husbandry, offers a series of seventeen radio lectures. This course contributes essential information on dairying, the selection of dairy cows, a description of the different breeds of dairy cattle and discussion of the essentials in the feeding, care and management of dairy cattle of all ages.

Electrical Engineering, Electricity in Home and on Farm, November 12 to December 31, treats with electricity today as an essential element in the home, in the automobile and on the farm.

Shop Practice, The Shop, Automobile, and Truck, November 12 to December 31, will give suggestions regarding selection and care of the tools needed, the construction and layout of the workshop, and the best ways to make and repair articles of farm equipment. The problems that concern the owners of automobiles and trucks in the winter season, and how they may reduce operating expenses and at the same time get more out of the equipment, are pointed out in this series of lectures.

Arthur Murray is broadcasting a series of lessons through WOR, and fifty other stations in this country and abroad. His program has a wide appeal for those who live in rural sections

Chemistry in Everyday Life, November 14 to January 2, will discuss the chemical action and changes within our bodies and the chemical nature of our foods. This subject includes even the chemical reaction of our emotions and the result on our state of health. There is a treat in store for those who are fortunate enough to tune in when this course of lectures on the chemistry of everyday life is given.

Physics, Radio and Other Problems in Physics, November 14 to January 2. The first four lectures include many practical hints for the proper manipulation of radio receiving sets. The four additional lectures will include information of interest and value to persons concerned with the care and use of storage batteries, with artificial cooling and with the proper illumination of the home. The lecture on Weather Factors should likewise be of interest to everyone.

Textiles, November 13 to January 1, will aid the homemaker of today to judge the wide range of fabrics on the market at present, and suitability to the purpose for which the material is intended, as well as its serviceability.

The Hog Industry, from January 5 to February 23, will include the study of the development of the hog industry, the place of the hog on the farm, and hog statistics for Kansas, the United States and the World.

Incubation, January 6 to February 24. How eggs of high hatchability are produced, culled, cared for, shipped, and incubated will be discussed in this series of lectures.

Architecture, The Home, January to February 25, discusses the principles of house planning for rural and urban dwellings. Problems concerning equipment, conveniences, materials, and methods of construction will be dealt with, and special emphasis given to the subject of appearance. Helpful ideas in house designing will be developed. The landscaping of the home grounds, a very desirable part of any architectural effort, will receive due consideration. To anyone contemplating the building of a house or the improving of one already built, this course of lectures should prove to be very valuable.

Public Speaking Lectures and Readings, January 23 to January 30, includes reading of popular selections, lectures dealing with the correct idea or basis of modern public speech and its place in American community life, natural speech instead of the old time "elocution," arrangement and preparation of the speech and some suggestions for the person whose duty it is to plan a public program which is to include speeches.

Food Economics and Nutrition, January 9 to February 26, deals with bread and cake making problems, the importance of fruits and vegetables in the diet, meat as a food, some reasons for using milk and milk products, why and how to use eggs and cheese to advantage in the diet, the cereal foods, and the place of sweets in the day's food.

(*Turn to page* 80)

SPORTS

One allure of sports is the foregathering of fellow beings to yell, and stamp, and shout

The rhythmic cadence of a hard fought game comes to us—grips us—becomes alive for us—in our radio

Polo-Racing-Tennis-Baseball-and Football

By STUART HYDE HAWKINS

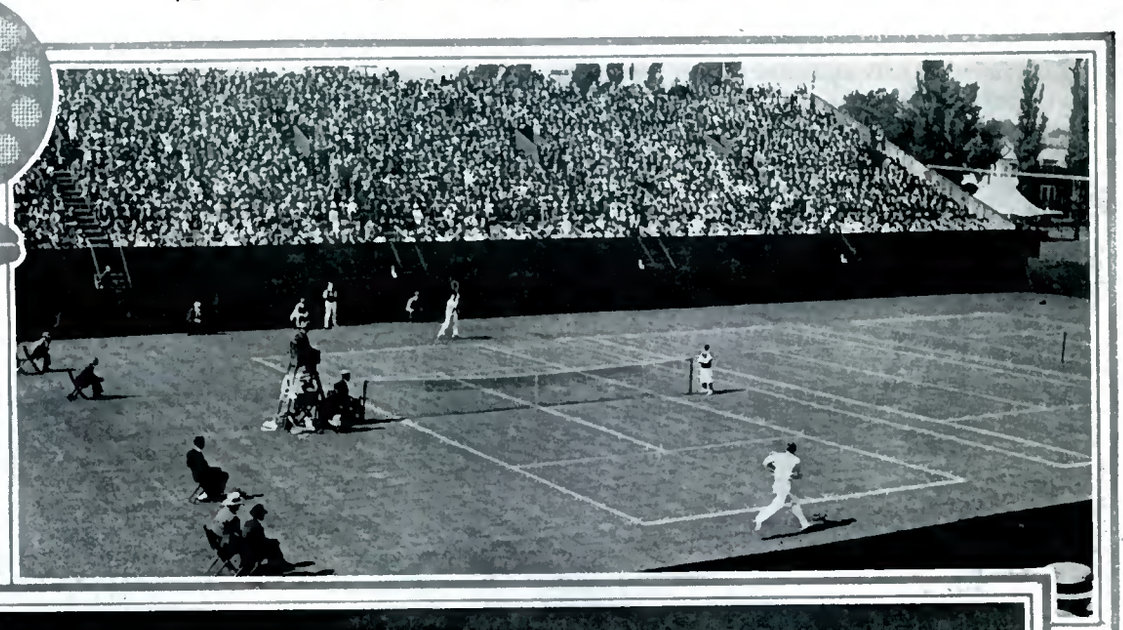
"RADIO ATHLETICS" — the latest paradox which this complex civilization has created for its edification and enjoyment—has become so inherent a factor of modern life in these United States through the heretofore unprecedented activities between the two fields this Fall that its paradoxical nature has practically ceased to be regarded. The idea of "seeing" such sporting events as a horse-race or a polo game without leaving the peace and quiet of one's living-room—an idea the expression of which even the wildest dreamer of five years ago would have laughed into scornful oblivion — is not only complacently accepted by the majority of that conservative brotherhood, the American Public, but is even enjoyed with scarcely a thought as to the seeming incongruity of the act.

To be sure, the way was to some degree prepared, for radio fans have followed the hooks and swings of champion prize fighters for some three years; and the home runs and the strike outs of two previous World Series have been visualized by the addicts to earphones and loud speakers. But in the mind of the sporting element of the radio audience the Fall season of 1924 will long retain an important position, for it was the greatest "Sport Season" the B. C. L. has ever known. Equally unforgettable will that season remain to those sport-lovers to whom radio had formerly meant little, for it was the radio which enabled them to follow Epinard around the tracks at Belmont Park and Aqueduct, to picture mentally the most widely heralded and eagerly awaited polo games in the history of that sport, to enjoy the thrills formerly reserved for the proud possessors of a World Series admission ticket, and to fidget and twist with excitement as the collegiate football teams crashed and strove upon the eastern gridirons.

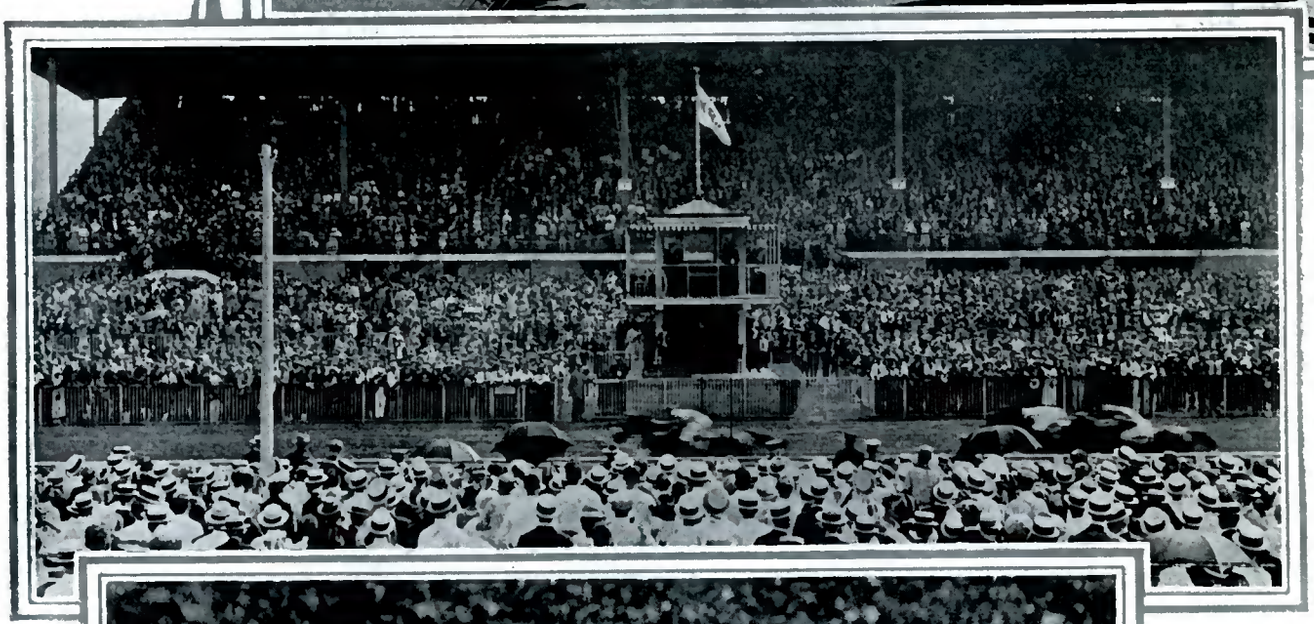
The sudden increase in the number and nature of sporting events broadcast is directly traceable, of course, to the perfection by radio engineers of economical "remote-control broadcasting;" i. e., that type of broadcasting wherein the microphone is situated miles from the station studios, portable amplifiers boosting the voice of the announcer over the resistance of the direct-wire connection between microphone and station transmitter. Ever since the first broadcasting of a World Series baseball game—in fact, since radio fans heard the description of the first remote-control broadcast ever attempted, the Dempsey-Carpentier fight in 1921—sporting men have recognized the beneficial value of radio in the stimulation of public interest in the various sports. But until the early fall of this year the cost of transmitting a "direct-from-the-scene" description of most of the less-universally-popular sports was prohibitive to the station managers.

On the afternoon of Labor Day last, radio sets in practically every state in

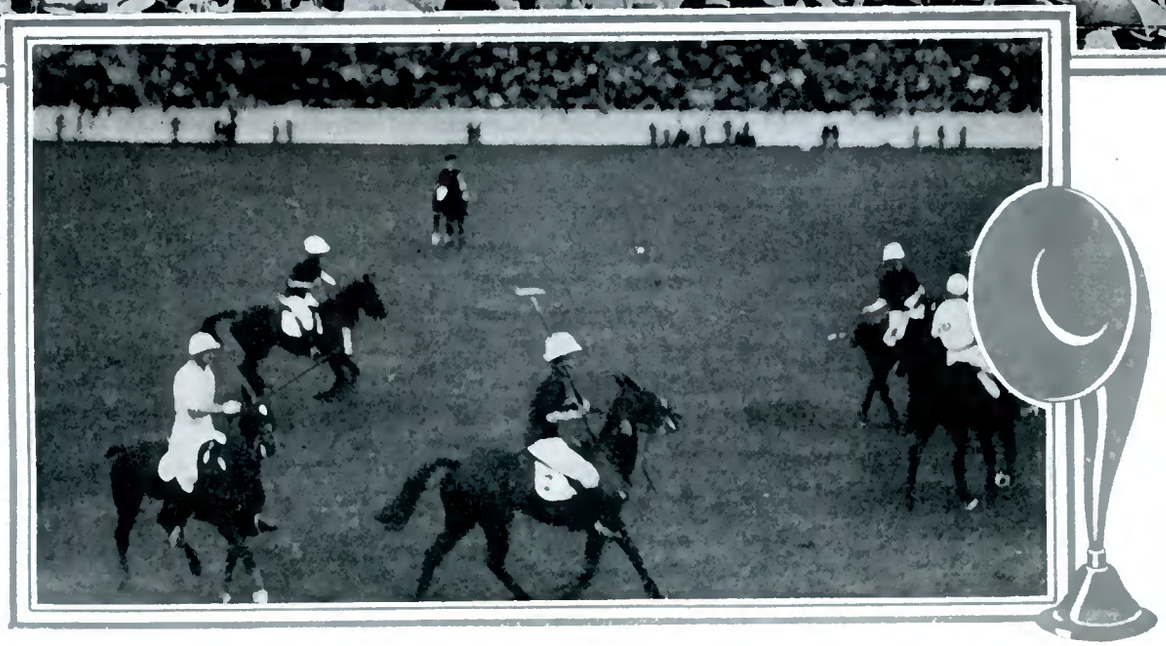
SPORTS



Tennis broadcasts won favor with the radio audience this season

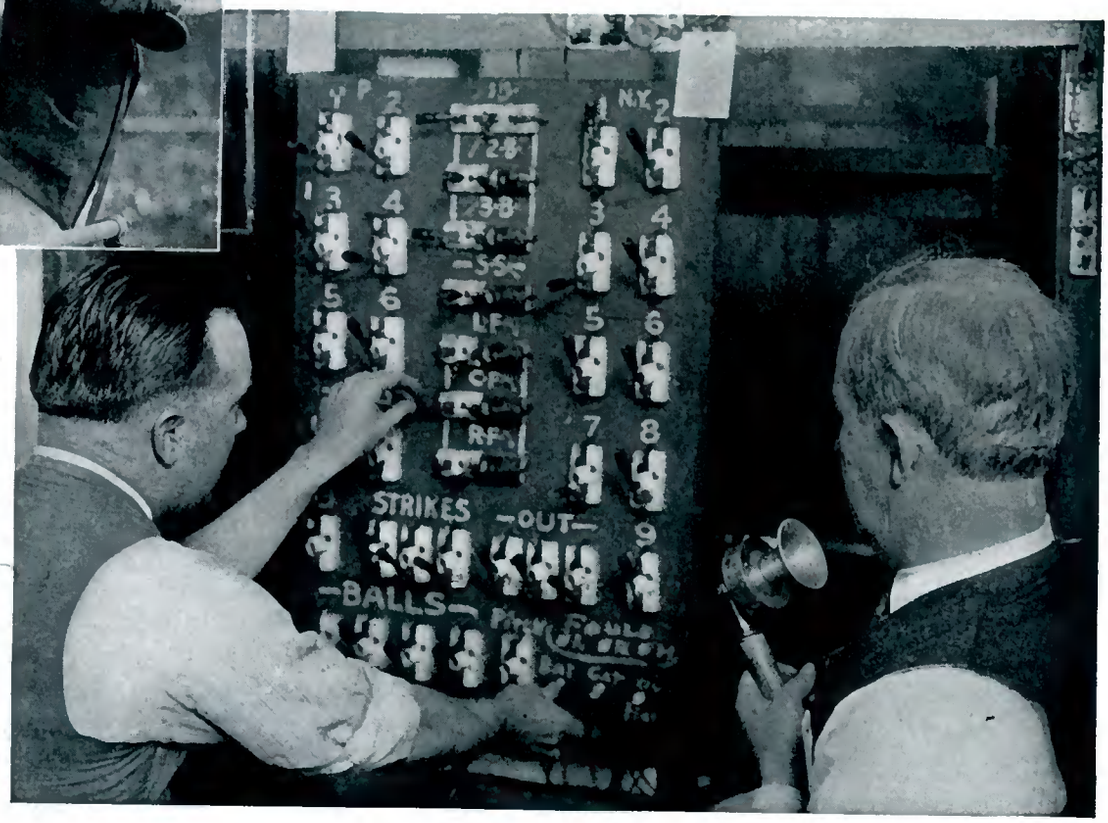


The finish of the first International Horse Race broadcast through WJZ and WGY



"Did you visualize the scene?"—One of the many movements of the International Polo Games described by Major Rudd, army polo expert, through WJZ and WGY. The important games, international, and major, are brought to those of us who could not otherwise attend

the Union and the greater part of Canada reproduced the words which precede the greatest thrill known to sportsmen—"They're Off!" And from a precarious perch on the railing of the judges' stand J. Andrew White, WJZ's famous sports announcer, juggled a microphone and a pair of field glasses the while he reported the progress of the greatest horse in Europe and the cream of American stables around the Belmont Park track. Between his words came the "thuddity - thud - thud" of the pounding hoofs, for microphones beside the track were switched on and off in turn as the horses approached and swept by them. Because White described the race as he saw it, and because he saw it with the same exciting uncertainty as did every spectator there, the listeners were thrilled to exactly the same extent as were the eye-witnesses. That creepy feeling in the region commonly designated as the backbone, which comes never so strongly as when one is standing on tiptoe gazing at a close-grouped field of swift race-horses; that tantalization of the mind as the eye telegraphs "he's ahead—no he's not—yes he is;" that emptiness of non-realization or that exultant rush of victorious relief which comes as the horse of one's choice sweeps across the finish behind or ahead of his rivals; all those, and a thousand others too familiar or too intricate for description, were experienced by the unseen spectators whose eyes were those of Major White and whose imagination recreated the track so many miles away. I know, because I saw the race through my loud speaker!



Left: Major J. Andrew White, WJZ's famous sports announcer describing the field at the Epinard race. The broadcasting equipment used on the fields is shown in the heading of this article. Below: How station WOAN of the "Scranton Times" served the fans with detailed reports of the world series. The radio director, furnished with reports of the press association over the telegraph wires, broadcasts each play, and alongside of him the scoreboard operator flashes the plays on the board. This method is widely employed to furnish immediate reports to listeners in, and at the same moment, supplement them with a visual diagram for those watching the boards outside

That race—the "First Special" of the International Match Races between Epinard, four-year-old of Pierre Wertheimer's and the pride of France, and the best horses in the United States—was attended by the greatest crowd which has ever witnessed any race except the "Second Special" at the Aqueduct Track almost four weeks later; for while the grandstands held thousands, the radio increased the number a hundredfold. Racing, the Sport of Kings, and Radio, the Pastime of the Public, were united for the first time; and the union was a most happy one for all concerned.

Less than two weeks after Wise Counsellor defeated Epinard—long before the thrill of that event had departed—the listener heard a strange voice saying strange things; "chukker"—"backed the ball prettily"—"clever riding"—were but a few of the remarks which issued from the loud speaker. And then his wonder departed, for the voice explained—"This is Major A. G. Rudd describing the first of the International Polo Games through stations WJZ and WGY direct from the field at Meadowbrook, Long Island."

Until this year polo has been a game for a minority—a minority which has been steadily increasing in size, to be true, but nevertheless a minority—of American sport-lovers; but through one of the unexplainable twists of popular fancy the International Polo Games assumed a position of importance in the public eye unexcelled by any sporting event of this season save that dearest of all American games, Baseball. Polo has always been replete with thrills not to be found in any other game—but it has hitherto been very much of a closed book to the average citizen. The broadcasting of the games by stations WJZ of the Radio Corporation of America in New York and WGY of the General Electric Company in Schenectady, was scheduled solely because of the unprecedented amount of public interest in the match; it resulted in a most decided increase in the amount of that interest!

Major A. G. Rudd, U. S. Army, acted as verbal lens through which—or whom—the listeners could visualize the action on the field at Meadowbrook. Himself a polo player of repute throughout Army polo circles, the author of several magazine articles on polo, and so recognized an expert on the rules and play of the game as to be chosen as referee of the Intercollegiate Polo Games last year, Major Rudd was able to paint a moving-word-picture of the two games which held

the attention of every listener whether or not they had ever seen a polo game before. H. R. H. the Prince of Wales followed the action with no more interest than did Eddie Jones out in South Bend, Indiana—and it is probable that Eddie's sister followed the actions of the Prince with an even greater interest!

Almost immediately after the polo games came the second Epinard race, and close upon that followed the dearest treasure in the sports chest—the one and only event of complete national appeal, the World Series. Sports may come and sports may go, but none may attain the position occupied by that uniquely American game of Baseball. And in the broadcasting of the World Series the honors must go, not to one or two, but to many stations. To WJZ and to WGY may be credited the spirit of pioneering which was responsible for the dissemination of the description of the horse-races and the polo games to the millions—but in the case of the Game of Games let it be said that the larger stations stood united in their attempts to be of service to a clamoring public.

The World Series! Sufficiently explanatory of the Americanism of Baseball is the fact that the series has always been played on American soil between American teams. The possibility of an invasion of the realm of the diamond by any other nation is so remote as to be absolutely unthinkable. The strident bawls of "Strike Tuh!" and "He's out"—the sharp crack as bat meets ball—the dust-enveloped slide as runner matches the propulsion power of his nether limbs against the arms of an opposing team—these, and the hundred and one other moments peculiar to the game, are purely American institutions.

Until the advent of radio, those baseball fans in the smaller cities and towns were forced to expend their enthusiasm in rooting for the home team, be it the Backlot Bushers or the State University Nine; now, as everyone knows, all that is changed. Those who have a radio set followed every play of the World Series in their own home; those whose neighbors had a set followed the games in their neighbors' homes or through their neighbor's window; those who possessed neither radio nor neighbor stood with a hundred or more kinspirits, before a loud speaker suspended over the entrance to a radio store and cheered or grumbled as they felt moved.

From microphones so close beside the press-stands that the click of the telegraph-keys was transmitted, came the quick, clear-cut word pictures which brought a whole nation to the front of its chairs. The groans which echoed from the grandstands were as whispers to the groans which eddied about the countless loud-speakers from Maine to Mexico; the crowds which stretched cramped legs in the bleachers during the "Lucky Seventh" were insignificant when compared to the millions who rose religiously in scattered homes as the radio waves transported the words "Beginning of the Seventh." Baseball is a National Institution, and the broadcasting of the World Series was one of the most truly National Services which this country has ever seen. How many radio sets there are in these United States it is impossible to say; certainly the number would run well into the six-figure class. And certain it is that the number of those who listened-in on the broadcasting of the World Series this year was at least ten times as great as the number of receiving sets.

And even as you, gentle reader, peruse this page, radio is making another strong bid for the favor of the radio sport-lover, for the 1924 football season is in full swing. And there is not a big game which radio will not carry from the gridiron to the firesides of the nation. The schedules for stations WJZ and WGY—a schedule as complete as that of any station in the country—is included herewith for your benefit.

October 18th—Army-Notre Dame at Polo Grounds, New York City.
October 25th—Notre Dame-Princeton at Princeton.
November 1st—Army-Yale at New Haven.
November 8th—Yale-Univ. of Maryland at New Haven.
November 15th—Yale-Princeton at Princeton.
November 22nd—Harvard-Yale at New Haven.
November 27th—Cornell-Univ. of Pennsylvania at Philadelphia.
November 29th—Army-Navy at Baltimore.

WBZ—Football Schedule:

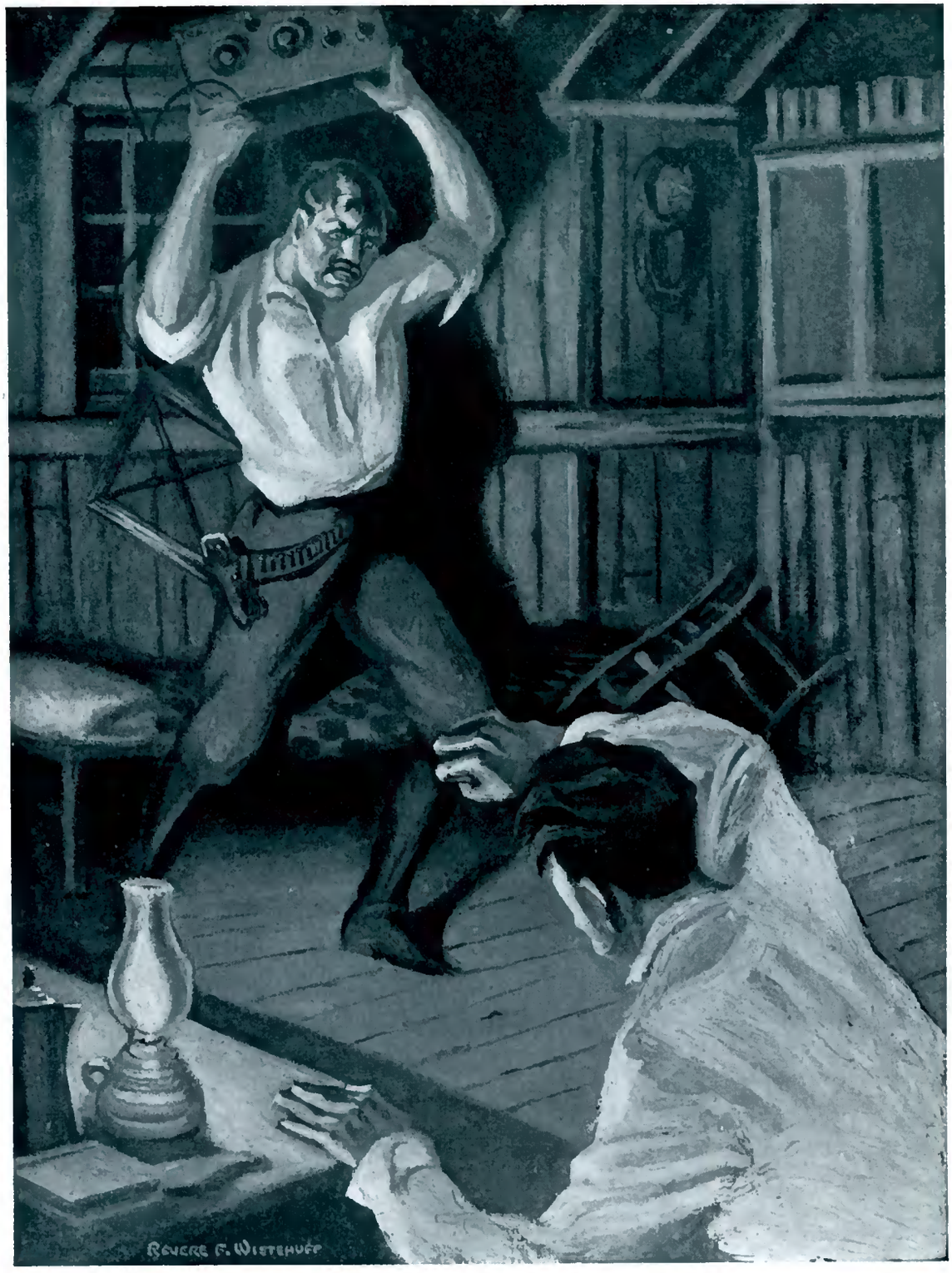
October 4th—Harvard-Virginia.
Oct. 11th — Harvard - Middlebury.
October 18th—Harvard-Holy Cross.
October 25th—Harvard-Dartmouth.
November 1st—Harvard-Boston.
November 8th—Harvard-Princeton.
November 15th—Harvard-Brown.
November 22d — Boston College-Vermont.
November 29th—Boston College-Holy Cross.

Here is the Chicago schedule. All games played on Stagg Field will be broadcast via KYW.

October 4.....Missouri
October 11.....Brown
October 18.....Indiana
October 25..Ohio State (at Columbus)
November 1.....Purdue
November 8.....Illinois
November 15.....Northwestern
November 22.....Wisconsin

Below: An exciting moment in a broadcast game. One of the men was knocked out of the battle with a damaged leg. The half-back is plowing head down into another player. The game was "put over" the air with thrilling exactness

Above: The Yankee Stadium crowds at New York have seen some real games in baseball history. At our radio we hear the tumultuous clamor of care-free souls pledged to an afternoon of hilarious abandonment. It is infectious. Spontaneous cheering greets the team as it straggles out over the diamond. It all comes to us for the tuning in



*"IT seemed to me that his safe-breaker's tricks, if permitted to proceed, might do damage to the radio set; so I took a good spring, and, as you might say if you were so disposed, fell on Mr. St. John, with my knee on his nose. * * * In a fraction of a second he'd grabbed the whole works off the table—the box, and the aerial, and about a half dozen batteries that clung to it by pieces of wire, swung it around his head twice, and hurled it at me—it was the aerial that came undone and spun a cocoon around me. * * * I arose to find Grizzly Chase looking at me with the expression of a tiger robbed of its young."*

Alias SLIMMY *O'Dyne*

Somehow Slimmy couldn't work the combination on the radio dials—but a radio is not a safe, nor is it safe to disturb a DX hunter in open season

By F. R. BUCKLEY

Illustrated by Revere F. Wistehuff

ONE of the most admirable qualities of the human race, if only the human race happened to possess it, would be Gratitude; by which I don't mean saying "Thanks" for $5,920.24 handed to one on a golden platter, but the giving of credit or discredit where they are due. I know the above remark sounds kind of highbrow to be put in circulation by a mere uneducated Western sheriff (though really I am far from uneducated, and farther still from being mere); but I've had enough complicated trouble on my hands lately to make anybody highbrow, if not actually insane.

I have hereinbefore mentioned how I darn near failed to be re-elected recently, giving all the credit for my election to the radio or wireless telephone, which as a matter of fact didn't deserve more than thirty per cent. of it. And no doubt, at the end of that narrative the reader figured that I was due for a spell of peace and quiet. I did myself; but such was not to be the case. For while it looked as though I wasn't going to be sheriff next term, there had been quite an inflow of criminals to Prairie Dog; and the outflow which took place when the name of B. Pokeson was announced as heading the poll, didn't quite clear the tank. Excuse my circumstabulativeness. I mean that after the district was supposed to have settled down again, a guy who could not be proved a criminal, but whose face was a good deal too clean-shaven to be honest, remained sitting pretty at the Stony Springs Ranch. His name was Adolphus St. John; and in addition to living at the Stony Springs place without making even a pretense at working, he was obviously laying his pipes to wed or marry Amelia Chase, the proprietor's daughter.

Being still in bed, pampering the remains of six or seven bullet-wounds, I heard about this from God-be-Good-to-us Wilson, whom I had kind of employed to make a survey of the county for me; and at first, I thought my emissary was mistaken, if not actually full of prunes.

"You mean to say that old Grizzly Chase is letting anything like that go on under his very nose?" I inquired. "Tell me not in mournful numbers! Go boil your head!"

"All right," says Wilson, rising as if I'd insulted him or something. "Good afternoon."

"Why, it's only yesterday, as it were, that the old chap was arrested for firing both barrels of a shotgun at a puncher who'd only tipped his hat to—"

"Very likely," says Wilson, opening the bedroom door. "Good-by."

"If the old chap's sitting by and letting anything like this go on," I remarked hastily. "Some terrible change must have—"

Wilson was now entirely out of my presence, and closing the door behind him. At my last words, he turned and stuck his head back in, just far enough to be rude, and not far enough to give a really good target for a boot.

"Yeah," says he. "And suppose you amuse yourself by ridin' over there and findin' out what the change is? Suppose you do some of your own work, for once?"

Well, to swallow the crow at one gulp—I had to do what he said; and, to relieve the reader's mind of all unnecessary suspense, I found Grizzly Chase sitting in the attic of his house, which in summer resembles nothing so much as a bake-oven, with batteries to the left of him, batteries to the right of him, wires all around him, a radio headpiece over his ears, and an expression on his face like as if somebody was tickling the soles of his feet with a feather duster.

He nodded at me as I entered, but anybody could see it was just a mechanical motion, same as an eel makes in a frying pan. The old chap really didn't have the slightest idea that I was there or that, if I was, I could possibly have anything to say half as interesting as what he was hearing through the wireless machine.

"Who's this embezzler your daughter's fixing to marry?" I asked loudly, in an attempt to catch his attention.

He held up one finger for silence, and twiddled a couple of dials—there were about six of them, not to mention a flock of little gadgets all decorated with "Off" "On," and curved arrows.

"His name is Adolphus St. John," remarked the old gentleman absently. "He—er—"

"Don't you know," I inquired, watching him twiddle another dial and forget my presence again, "that the name stated is an impossibility? There are no Adolphus St. Johns. They were all killed off in the frost of 1888."

"Beautiful!" says Grizzly Chase to himself; and then suddenly snatched the telephones off his head, and crowned me with them. "Listen to that! Do you know where that is? Listen to it! You're a witness that it's only three-thirty in the afternoon. Listen!"

Well, it was a long time before I could find anything to use my ears on at all; but finally, I did gain a consciousness of some jasper who apparently wore false teeth and lived in the bottom of a narrow-necked bottle, delivering a lecture.

"—dough is then put in the bumble-umble umble umble of the oven," says this voice from the unknown, trying to be cheerful in spite of everything, "and at the other end whorfle whorfle whorfle graaaaaaaa, OUT pop the biscuits we all love so much when we go to bed with our dollies clasped to our buzzbuzzbuzzbuzz—"

I took the headpieces off at this point.

"That's WEAF," says old man Chase. "WEAF! Think of that! Did you hear anything?"

"I heard a lot of buzzing," I informed him, putting the headpieces where he couldn't reach them.

"That's the bee battery," says the old lunatic, reaching for the forbidden phones. "I'll just—"

"I'm over here," I told him, "to discuss your daughter and this guy Aubyn Vere de Vere, or whatever his alias is."

"Yes?" says Grizzly, looking straight through me and twiddling dials.

"The fact of the matter is," said I, "that I'm kind of suspicious of all strangers who have come into the county since things generally got so upset as they have been lately; and

especially of strangers who call themselves—"

At this moment, the telephones I was holding interrupted me with a shriek of torment, which they continued until Grizzly, taking advantage of my surprise, grabbed them and retired into their shade.

"If this isn't PWX," he says, twiddling dials and fidgeting in his seat, "bee battery or no bee battery, I'll chop the set up into mincem—"

"The point is—" I began, beginning to feel as hot inside as I was out.

"Sssssh!" says Grizzly, waving one hand while he twiddled knobs with the other. "Sssssh! Quiet!"

I gave him thirty seconds more, and perspired another pint or so, then arose.

"Good afternoon," I said sternly.

"You're welcome," says old man Chase; and so I left him. It was my intention, at the moment, to keep my hands off, and leave PWX and WEAF and the rest of the gang to look after the old bloke's domestic affairs for him; but the thought of Duty and my mileage, prevailed. I therefore sought out Henry McTee, the Stony Springs foreman, and asked him to tell this Adolphus St. John I should like to see him.

"Got anything on him?" demanded McTee hopefully.

"Have you?" I inquired.

"Naw," said the foreman with disgust. "An' I ain't tryin' to get anythin,' thanks. Have you seen Elmer Williams lately?"

I shook my head.

"No, nor you won't," says McTee, "for a week anyhow. He up and told Miss Chase that he didn't believe St. John's name would stand exposure to the elements."

"Well?" I asked. "What's that got to do with my not seeing—"

"He's naturally sensitive about his eye bein' blacked by a woman," says McTee.

I thought this over for some time; made it clear that I wanted Mr. St. John to come over *alone;* and then retired to my office, where I proceeded to dip into some of the books I'd laid in when I anticipated a few weeks of peace. One of them was by a jasper called O. Henry; and right here I want to live up to what I said on the first page of this exercise book, and give the guy credit. It was a story of his, called "Alias Jimmy Valentine" that gave me an idea.

I had just finished reading it, and said the last word of a long and disputatious phone talk with McTee, when there were footsteps on the porch, and Mr. Adolphus St. John entered, with his left hand clutching the bottom left hand edge of the skirt of his jacket. For the benefit of the uninitiated, I may say that this was a highly suspicious circumstance. Men who carry revolvers with the idea of actually using them, wear the same on their left sides, butt forward, which naturally brings the nose of the holster where, in case of a quick draw, it can be grasped and held steady by the left hand. Mr. Adolphus St. John was holding down the nose of his holster as he entered; and it was with considerable difficulty that I greeted him with a winning smile.

"You wanted to see me?" he snapped.

I put the book down on my lap, keeping my thumb in the place.

"Eh?"

"You wanted to see me? The foreman over at Stony Springs said the sheriff left a message saying he wanted to see me. Well?"

I gave a pained chuckle.

"He got it wrong," says I. "What I said was, that I'd like to meet you. There's a difference."

"There sure is," says Adolphus St. John suspiciously, but still, at that, more lightsomely than he had yet spoken. "Well, now you've met me, what?"

Last month F. R. Buckley's "Per Land Line" brought so much enthusiastic response there was nothing for it but to have him do another. "Alias Slimmy O'Dyne" is certainly more humorous than any radio story written up to date.

Mr. Buckley has to his credit about 150 short stories and novelettes in various magazines; principally laid in the West, with occasional forays into the Italian Middle Ages, the sea, and the sky.

"I hear," says I, rising and feeling in a cupboard, "that you have a nasty cough."

"I—" he began.

"This," says I, turning around with a bottle in my left hand, "is a sovereign remedy for coughs, colds, fevers, and pretty near anything else. It is also very good for acquaintances. Have some."

Honestly, you'd never have believed he was the same jasper who had entered so suspicious. He sneezed twice, just to show he had a genuine need for medicine; and then, with one motion of his powerful right arm, he flung four fluid ounces past his teeth.

"Wow!" says the visitor. "Aren't you having some?"

There were reasons why I didn't want to dr— take medicine with him; and these reasons had nothing whatever to do with my recent wounds. The wounds, however, were the reason I put forward.

"At the present moment," I exaggerated, "I resemble nothing so much as a coarse sieve; and it seems a pity to waste such good stuff."

"It seems to me it's a terrible waste to leave it there in the bottle," says Adolphus St. John greedily.

Accordingly, I poured him out what I myself might have taken under other circumstances, and he threw that after the other dose. It's possible he may have made swallowing motions with his throat, but I swear I saw none.

"Bing!" says he prayerfully; and immediately began to tell me about his family in Illinois. He seemed to have some difficulty in saying "Father," the word emerging more like "favvy" than anything else; but there was no doubt whatever about their respectability, his brerrer being no less than a banksheer, while his sissa was marred to a breaker.

"House-breaker?" I asked tactlessly.

"Stockbreaker," says Adolphus St. John. "Stobbroker, as the unhicducated call it. I have a tickling in the throat."

This was a hint, which I duly honored; and then, side by side, we sat on my porch with our feet on the railing, I myself wondering how to introduce the subject of literature without frightening my client.

He himself saved me the trouble.

"Sbookabout?" he demanded. "Read to me."

Now, this was just what I had intended to do, whether he liked it or not; but, being asked thus, of course I protested that in my weakened state, I couldn't think of it. And naturally, the more I refused, the more he insisted, and so finally, I read him this "Alias Jimmy Valentine" story from end to end.

Probably you don't think there was much to that; but that is because you don't know that Mr. Adolphus St. John corresponded very closely with the description of a safe-burglar wanted in Wyoming for robbery and manslaughter; or else because you've forgotten that this story is about a safe-cracker who had turned from his wicked ways, and who goes back to his trade, thus giving himself away, to rescue a child who's suffocating to death in a bank-vault. I'd got about half way through before Mr. St. John woke up; but from that point to the end, he didn't give me a moment's nervous peace. I shall never forget reading the description of how Jimmy Valentine sandpapered his finger-tips to pick the combination lock, with one eye; while my other eye was focused on Mr. St. John's hand, which was closing on the butt of his revolver. I have never walked on the tightrope across Niagara Falls, and now I don't need to. It would be comparatively a tame experience.

"Now, isn't that a good yarn?" I

demanded, getting to the end without bursting into tears, laughter, apoplectic fits, or any other nervous phenomena.

Without asking my permission, or even going through the ceremony of coughing, Mr. St. John walked over to the table by a curved route, and inhaled another dose of mescal. Mescal, I may say for the benefit of those who know no better, is the Mexican word for cough-medicine.

Having done away with this, Mr. St. John fixed me with a slightly bloodshot eye, and said that he disapproved of the story root and branch.

"Spretty," he remarked however, holding on to the edge of the table. "But's senmental. Heard enough of those bedtime stories lately. Over the radio. Well, good evening."

"Your cough," says I, watching him miss the doorway three times in succession. "Seems to have weakened you some. Would you like me to ride along with you?"

"No!" says Mr. St. John, little knowing what the night air (it was now evening) would do to him when he got outside.

"Well, I'm coming, nevertheless," I told him. "I never desert a friend in distress —much less you."

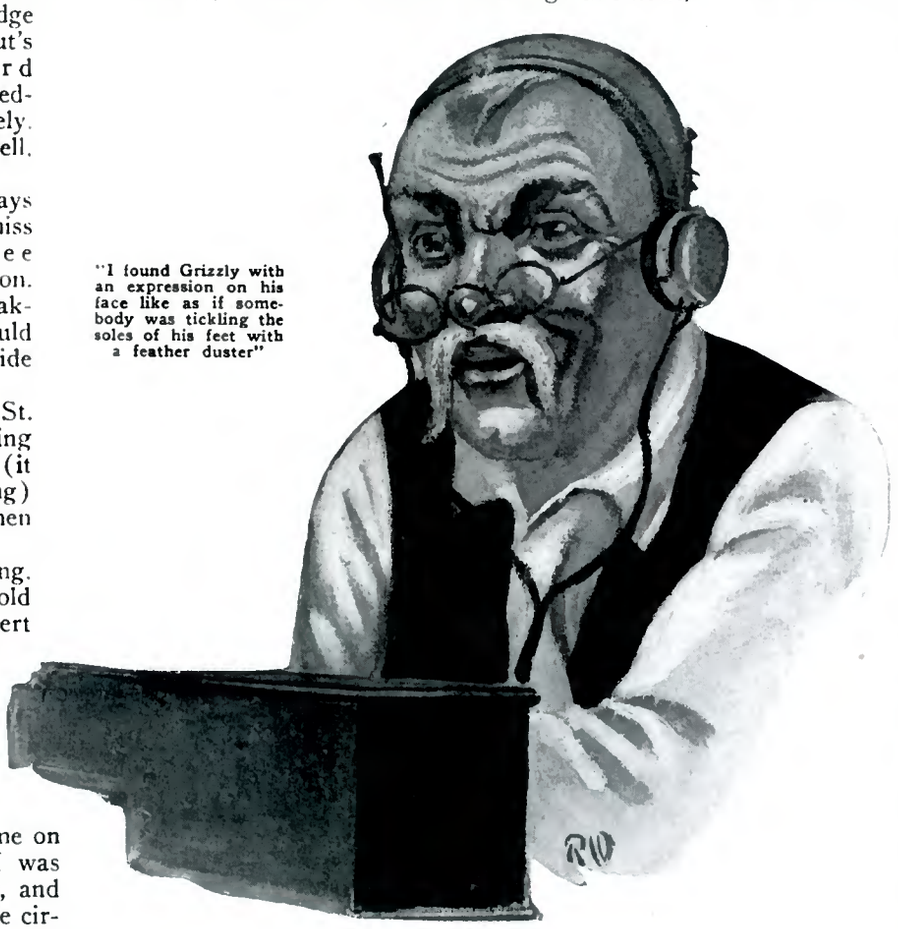
This remark ought to have made him bristle all over; but it didn't. Quite the reverse. In fact, he kissed me on both cheeks, said I was his only benefactor, and permitted me to ride circles all around him all the way home — shoving him into the perpendicular from one side or the other as occasion required. I appreciated this—not that I shouldn't have followed him in any case; but his cooperation made it so much easier to get the revolver out of his belt, spill the cartridges on the ground, and put it back again.

"There mus' have been drugs in that stuff," said Mr. St. John, when we arrived at Stony Springs. "I'm goin' straight up an' turn in."

"Without sayin' good night to Mr. Chase?" I demanded with horror, pushing him half way up to the attic with a single shove.

"What's the use?" demanded St. John in a loud voice. "The old goat can't hear anythin' nearer than Chicago from ten p.m. until the roosters start barkin.' However, if you insiss— Why, what the—"

It was the lamentable fact that old Grizzly Chase presented a surprising spectacle. Since last we met, somebody appeared to have tied him into the chair by his radio machine; to have stuffed about half of an embroidered pillow into his mouth for a gag, and to have deserted him. He was sitting there, with the headphones still on, all trussed up like a bull at a barbecue; and from where I stood, I could hear XYZ or somebody shrieking at the top of their voices. It seemed as though this howl, right up against his ear-drums, must pretty nearly have deafened him; and so it proved; for when I cut his bonds and got the bedding out of his jaws, he could do nothing but talk.



"I found Grizzly with an expression on his face like as if somebody was tickling the soles of his feet with a feather duster"

"That scoundrel McTee!" he roared. "He's taken my little girl away! Where's my guns? Where's my belt? I'll have his life! He came in here draggin' her by the wrist, and two more men with him, and he tied me up—"

"How long's he been gone?" I shouted, casting a look from the tail of my eye, at Mr. Adolphus St. John, who appeared to be thinking of bursting.

"He said he wasn't goin' to have any dudes with French names hanging around his girl, and that—"

"How long's he been GONE?"

"Hours! And why the devil—"

"Then he's over in Mexico with her by now," I shouted. "We can't pursue them in the dark, in a strange country, and all the rurales waitin' for a shot at an American citizen. We'll just have to throw out the dragnet; and all the telegraph offices are closed, and— Can't we send out an alarm on this radio thing?"

Well, of course I knew we couldn't, the thing being no use except for receiving. Yeah, I'd known that, even when I was doping up the little stratagem. But it made no difference. While old man Chase rushed around the room cursing and swearing and looking for the guns he'd laid aside when he took up radio; while Adolphus Alleged St. John stood holding onto the doorjamb, swelling visibly with rage and cough medicine, and while Havana, Cuba, lay on the table screaming its heart out, I rushed over to the radio machine, and started twiddling the knobs.

"Hello, hello!" says I, into one of the holes in the front of the box. "Hello! Is this the Texas Rangers? Get off the air! Hello! Is there no help for the widow's son? Hello!"

After about three minutes of this, I turned away with my best despairing manner, and shouted to old man Chase to tell me the combination. I was very careful not to shout until he had left the room and was half-way down the stairs; so naturally, I got no answer.

"We're ruined!" I then said to Adolphus St. John, tearing out a square inch of my hair, for which I have received no compensation, either from the State or from any private party. "I don't know the combination of this thing, and unless we can broadcast an alarm, McTee'll have married the girl before some jefe politico or other, and you'll have been made the laughing-stock of the State of Texas! And me too!"

Saying which, I dropped on my knees before the radio, and started to twiddle knobs in a last despairing effort, shouting "Hello!" at the top of my lungs all the time. For several

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Astronomy Makes Its Bow to Radio

in

The Study of Mars

Scientific bodies and leading astronomers all over the world attempted to receive possible radio messages while studying Mars

By David M. Todd, M.A., Ph.D.

Emeritus Professor of Astronomy and Navigation and Director of the Observatory of Amherst College, Author of "New Astronomy," and Foremost Authority on Cosmogony, Mathematical Astronomy and Related Sciences

DID the Martians try to radio to us on earth?

Could the mysterious signals reported when Mars was closer to the earth than it has been for 120 years have been from Mars?

Is there any physical condition on Mars that would prevent the Martians from having radio?

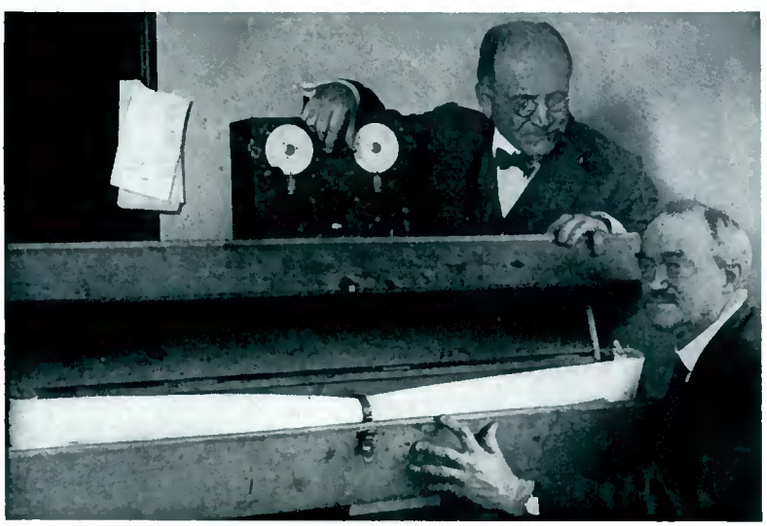
If the Martians have mastered radio is there any basic reason why they should have fallen into the use of dots and dashes?

Is Mars likely to have an atmosphere like the earth's own, with a heaviside conductive layer?

Was Mars responsible for surcharging the air with electric-energy and interfering with radio communication between ships at sea on August 24, when the planet was nearer the earth than it will be for centuries?

Before answering the first we must realize that the Martians may have been trying to communicate with the earth for tens of thousands and millions of years, without sign of response from us, and they may have grown tired of trying, and have given our planet up as being a lifeless world as we will be tempted to do if we do not note signs of response to our attempts to signal.

But radio played a large part in the Mars checkup independent of whether the Martians did or did not try to communicate with us.



Professor David M. Todd (left) and Francis Jenkins (right) with the automatic recorder, containing a slow reeling tape, which was set up and run for 100 hours in the effort to pick up any unusual radio signals during the study of Mars. Photograph at top of the page: The Jansen Observatory, highest in the world, situated on Mont Blanc

In fact, radio made the study of this last Mars opposition a great success in many ways. It has opened new avenues for study that may establish whether Mars has two major magnetic poles and a magnetic equator and the occasional mysterious flashes on the surface of the planet heretofore registered by astronomers are huge curtains of auroral lights from 300 to 500 miles deep, similar to auroral displays that are registered in the Arctic and Antarctic regions of the earth, and caused by electric-magnetic discharges from the sun striking the planet's most intensive

magnetic fields in the magnetic polar regions.

Radio's Part in the Mars Checkup

Radio played an important part in the checkup on Mars in August, when the planet was within 34,630,000 miles of the earth, first by making possible world-wide action in listening to possible messages from that planet as it drew close to us.

It would have been unscientific to dismiss the opportunity for such a test by assuming that there cannot be intelligent beings on that planet. Science cannot assume a negative attitude about anything.

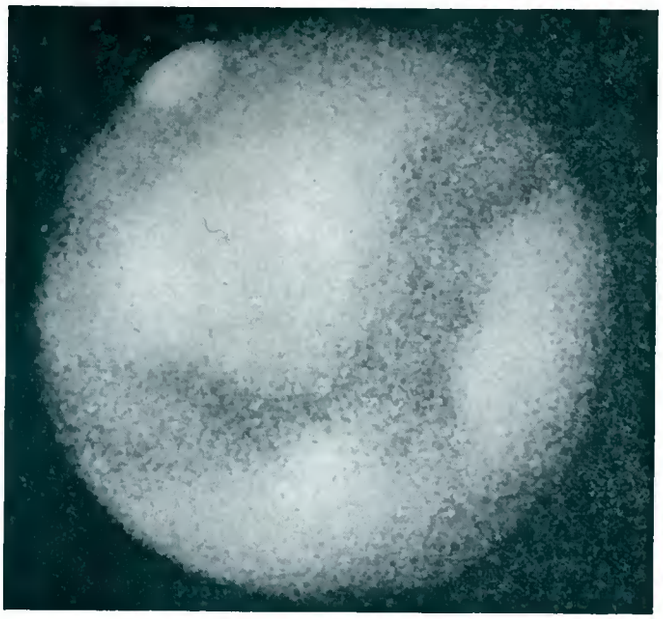
If Martians exist and happened to be observing the earth, as we observed Mars, during the week of August when the two planets were less than 35,000,000 miles from each other, they saw a planet looking not much different than Mars appeared to us, and that is very little.

It must not be overlooked that even when Mars was nearest, within less than 35,000,000 miles on August 24, 1924, the planet was still very far.

Thirty-five million miles is a vast distance, absolutely speaking; it is something like 150 times greater than the distance to the moon. With no telescopic power at our command could we possibly see anything on the moon of the size of the largest buildings or other works of human intelligence? We seem forever barred from detecting anything of the sort on Mars.

Nevertheless, the closest scrutiny of the ruddy planet by observers of great enthusiasm and intelligence, coupled with imagination and persistence, have built up a system of canals on Mars, covering the surface of the planet like spider webs over a printed page, crossing each other at intersecting spots known as "lakes," and embodying a wealth of detail which challenges criticism and explanation.

To see the canals at all requires a favorable presentation of Mars, a steady atmosphere and a perfect telescope, with a trained eye behind it. Not even then are they sure to be visible. The training of the eye has no doubt much to do with it. So photography has been called in, and very excellent pictures of Mars have already been taken, some nearly half as large as a dime, showing plainly the lights and shades of grander divisions of the Martian surface, but only in a few instances revealing the actual canals more unmistakably than they are seen at the eyepiece.



Actual photograph of Mars made at the Yerkes Observatory, Williams Bay, Wisconsin

While it may be true that the Martians, if there are any, may not be able to harness sufficient energy to flash messages to let us know that radio communication is possible on that planet, that is not necessary. The sun supplies the necessary energy to ascertain whether Mars is, like the earth, a gigantic magnet having two major magnetic poles, which are the areas of intensive magnetic force.

If Mars is like the earth in that respect, it is subject to having wide auroral curtains, and it is likely when near to the earth, to affect the earth's atmosphere, as one giant magnet would when coming close to the other.

Mars is a planet next in order beyond the earth, and its distance from the sun averages 141½ million miles. It has a relatively rapid motion among the stars, its color is reddish, and, when nearest to us, it is perhaps the most conspicuous object in the sky.

Mars appeared to the ancients just as it does to us today. Aristotle recorded an observation of Mars, 356 B. C., when the moon passed over the planet, or occulted it, as our expression is. Galileo made the first observations of Mars with a telescope in 1610, and his little instrument was powerful enough to enable him to discover that the planet had phases, though it did not pass through all the phases that Mercury and Venus do. This was obvious from the fact that Mars is always at a greater distance from the sun than we are, and the phase can only be gibbous, or about like the moon when midway between full and quarter.

Many observers in the seventeenth century followed up the planet with such feeble optical power as the telescopes of that epoch provided: Fontana (who made the first sketch), Riccioli and Bianchini in Italy, Cassini in France, Huygens in Holland, and later Sir William Herschel in England.

It was Cassini who first made out the whitish spots or polar caps of Mars in 1666, but not until after Huygens had noted the fact that Mars turned round on an axis in a period but little longer than the earth's. Cassini followed it up later with a more accurate value; and observations in our own day, when combined with these early ones, enable us to say that the Martian day is equal to 24 hours 37 minutes 22.67 seconds, accurate probably to the hundredth part of a second.

Mars is a planet of intermediate size between the earth and the moon: twice the moon's diameter (2,160 miles), very nearly equals the diameter of

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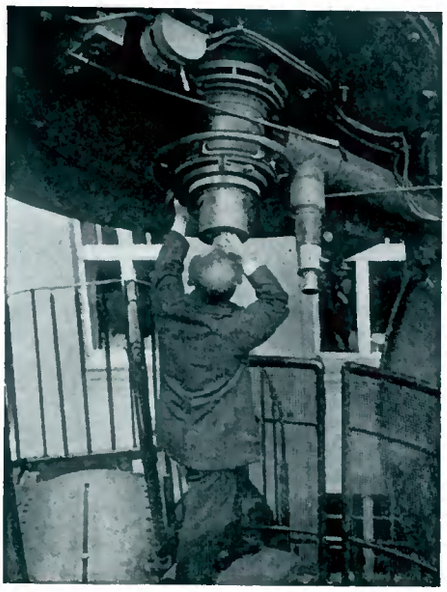
Professor David Todd, the dean of American astronomers, had been known since the year 1889 as "the man who beat the moon," owing to his feat during the New Year day eclipse of 1889, when he used the telegraph, which was then still in its infancy, to "beat the moon's shadow around the world," by telegraphing information of the approaching shadow of the moon to observation stations faster than the moon's shadow could travel.

This year, 35 years later, Professor Todd used radio to check up on Mars, as the planet was nearer to the earth than it had been for 120 years and than it will be within the lifetime of the people of this generation.



The largest telescope in the world, at Yerkes Observatory. The photograph of Mars (above) was taken with this telescope

Evelyn Herbert, the pupil of Caruso, and friend of Mary Garden, Scotti and Farrar

Evelyn's love for animals is equaled only by the love of the radio audience for her

A Villainess with real *Golden Hair*

By GOLDA M. GOLDMAN

A CHARMING little lady with real golden hair and blue eyes came into the studio of the Capitol Theater carrying a cat. It was a Sunday night and the little lady was daintily attired in a powder blue gown ornamented with green and blue beads. But with no care at all for the loveliness of her frock, close against her she pressed this cat, and, if one may venture to announce it, it was not a very attractive cat at that. It was gray and not too plump, but the most astounding thing was that she had carried it all the way from Harmon-on-the-Hudson in a Pullman on a Sunday afternoon. Why? Because it had strayed into the house where she was visiting and had appeared to be attached to her. Not that this was the first time that Evelyn Herbert had displayed her fondness for felines. Several years ago when she was spending the summer at the Thousand Islands, she was out in a row boat one morning, when she discovered a kitten struggling in the water. Fearing that the poor little thing would be drowned, she reached over the side of the boat and found herself very unceremoniously floundering about in the water. An hour later the gardener rescued her and the kitten, both very much the worse for wear, after Evelyn had held on to the side of the boat all that time.

Evelyn's love for animals is equaled by other people's love for Evelyn. When she was a very little girl, Mr. and Mrs. A. G. Miles, son-in-law and daughter of George C. Boldt of the Waldorf-Astoria, heard her sing and immediately began to help her to obtain a musical education. A few years later, by an interesting incident, she came under the recognition of the world's greatest tenor. At that time her father was manager of the Hotel Ansonia and at a benefit performance, he won a doll dressed as Rigoletto which had been donated by Caruso. When he presented it to his little daughter the next morning, in her wild excitement and delight she wrote to Caruso telling him of her own ambition to sing. The result was an invitation to let him hear her voice. So pleased with it was he that he henceforth directed her musical education and heard her sing yearly until she was fifteen.

During this time she owed many things to his interest in her, especially her acquaintance with the people of the Metropolitan, including Scotti, Farrar and Mary Garden. He gave supper and dinner parties for her at little Italian restaurants and while she was abroad she visited his home in Italy. As her education included the study of both French and Italian, she was able to conduct her correspondence with him entirely in the latter tongue. At the age of eighteen Miss Herbert made her appearance as "Mimi" with the Chicago Opera Company, but after only a year she fell ill. For two years she was unable to use her voice. Then she found that it had suffered too much to be risked in the singing of leading rôles, so she entered the chorus of "Honey-dew." It was at that time that Samuel L. Rothafel persuaded her to go to the Capitol and that is how it came about that when "Roxy and his Gang" began to broadcast almost two years ago, she was one of the first to sing from his studio. Since then radio audiences have listened to her voice every Sunday night with interest and delight.

Last season she appeared as the villainess in "Stepping Stones" and everyone will remember this bright Spanish girl who added so much zest and real music to the play.

Starting with a Pick and Shovel

Raymond A. Heising manifested the instincts of invention while tamping ballast with a section gang. And so today he has the discovery of modulation to his credit — and we have the radio

By RICHARD LORD

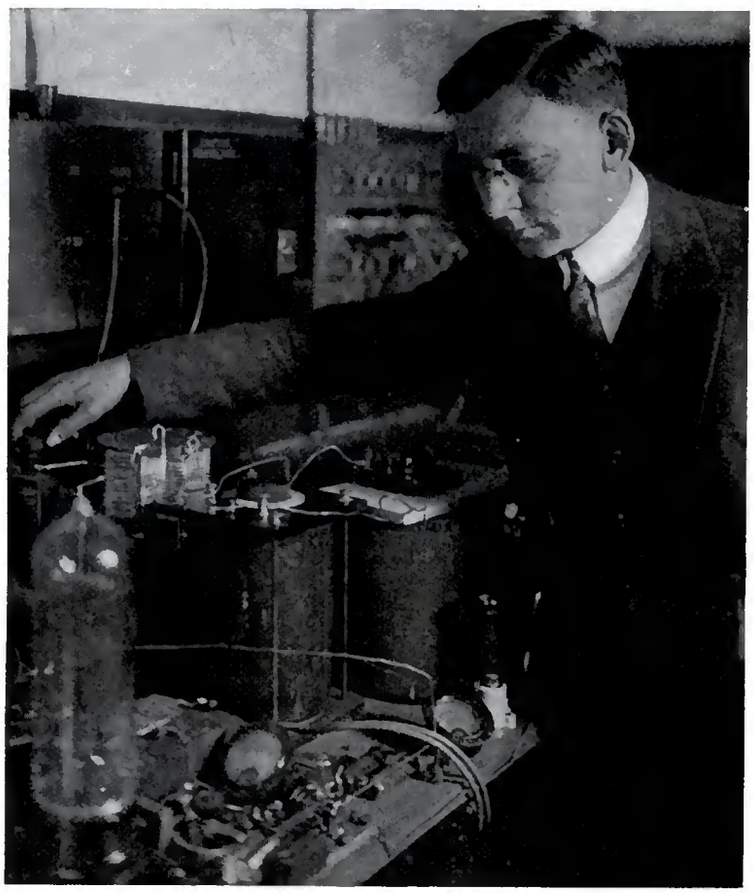
THE life story of most inventors is a tale of insurmountable handicaps surmounted, of inviting temptations to abandon the apparently hopeless struggle, of family and friends in opposition, of financial hardships and suffering, with a climax of final success as the reward for indomitable persistence.

The story of Raymond A. Heising, the discoverer of the only practical method of modulation, is on the other hand one of extraordinary efficiency. His discovery followed his clear conception of the problem with astonishing rapidity. Nor was this the result of chance. It was an example of the clear thinking which is evident from the moment that you first speak to Mr. Heising.

"Heising speaking," were the first words I heard when I called his office on the telephone to make an appointment. There were neither lengthy explanations nor the customary cross examination by a private secretary. In one minute it was arranged for me to see him the next afternoon. When I opened the door of his office, he was seated behind his desk; he rose quickly, indicating a chair which was ready. Immediately he showed his readiness to answer questions.

Those who make inventions and discoveries which eventually have a profound effect on the lives of millions of people usually have their names engraved in gold letters on the pages of history and during their lifetimes are honored with interviews by reporters on every conceivable question and by places on the executive committee of every money raising organization. Heising remains in comparative obscurity. Yet there is no broadcast listener who is not indebted to him.

Before Heising, radio telephony was a laboratory experiment; today it is a national and international fixture. Modulation is the process by which the characteristics of speech and music are impressed upon the carrier or radiating wave—a process which makes radio telephony possible.



Raymond A. Heising at work in his laboratory

For a moment, I hesitated, for Mr. Heising's directness left me without the usual preliminary meaningless pleasantries from which the interviewer glides imperceptibly to his subject. His keen blue eyes appraised me quickly but not searchingly, as he sat erect but not stiffly in his chair. He gestured little; his answers came in a firm clear voice, its quietness indicating not only reserve voice power but a seemingly immeasurable reserve of knowledge and diversity of interests.

"How did you succeed in solving a problem upon which so many had worked for years in a short six weeks?" I asked Mr. Heising bluntly.

"I realized at once that the microphone had, for many years, received the attention of men much more ingenious and capable than myself and obviously I could not hope to do what they had failed to accomplish. Therefore I sought an entirely different method. I realized that the microphone was satisfactory for controlling very small currents accurately. I therefore planned to use it in this way, instead of attempting as did my predecessors, to overload the instrument or to adapt it to carrying larger currents. I worked out a method whereby vacuum tube amplifiers were employed in successive stages to increase these microphone currents to considerable value, in fact, to the same order of magnitude as the continuous wave carrier which it was desired to modulate.

"In a nutshell, the system involved uses amplified audio frequency currents to control the source of plate potential of the oscillator tubes which supply the continuous wave carrier current."

"Solving the problem of modulation, while I was working on it, was a sort of a game. It was not until the principle was clear that its possibilities occurred to me. Within a very short time, compact aircraft radio telephone transmitters were developed and they did their bit on the western front. International communication occurred to me as the first possibility, but, as you see, broadcasting preceded it, although I am sure that international commercial telephony is simply a matter of continuing development work until the remaining obstacles are successfully surmounted."

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Exit the Jonas Hayseed of *1880*

Two bathrooms, electric toasters at breakfast—and lo! we have the modern farmer with an office, and radio his stock ticker

By MRS. CHRISTINE FREDERICK

TO properly appreciate the old and the new on the farm before the era of radio one must make a few comparisons.

Radio is a communication device. What were the most up-to-date devices which the farmers and their families had to rely upon before radio? The answer is, the rural telephone and the rural free delivery mail system.

It wasn't more than a decade ago that these two things looked like marvels. It isn't fair even now to say they are *not* marvels, for they certainly did great things for the farmer. The era of the rural telephone and free mail delivery is supposed to be an important one. Yet we have only to think back before their time! It seems like a vision of Colonial days!

You, perhaps can yourself recall how it was if you had a relative living on the farm, or perchance lived there yourself. I recall it well. It will do no harm, for contrast's sake, to draw the picture.

Six miles from the railroad station or the village was the farm; and in the spring rainy season, and in winter, it was an adventure to get there or leave it. The snows sometimes blocked the road, or the wheels of the buggy sank almost hub-deep in the mire. Once at the farm, you were literally cut off from the world. A buggy passing on the road gave you a flutter, for it was the only sign of life you got. The rural free delivery man arrived during forenoons and gave you another flutter, especially if you saw him stop and put something in the metal box on a post at the farm entrance. Even then it sometimes cost you a drenching or a chilling to walk out the length of a city block to your mail box!

The only three events of the year were Chautauqua, the county fair, and the annual Sunday School picnic. You never dreamed of going to church except on rare days, because there were services held only once a month, on an itinerant pastor's journey, and too often on that one Sunday the weather was too bad for the twelve mile drive..

As for the day when the rural telephone came, it was all very thrilling for a time, but what did it actually amount to? The telephone line was brought to your farm sometimes by means of fence wire part of the way, and there was a constant hum and buzz in your ears, and you had to listen very sharply to hear at all. But that was the least of your troubles. It was, of course, a party line, and invariably when you wanted to use the phone, someone else was on the line and you hung up. Even supposing you could use it, what could you use it for? You could call up the immediate neighbors or the village stores. If you wanted to talk and "visit" over the telephone, you simply had the whole countryside listening in. No, there wasn't very much to get excited about in the rural telephone, valuable as it was in emergencies. Nor was mail communication more exciting; there were few good magazines or newspapers, and not even lively advertising as there is today!

Mrs. Christine Frederick reaches about 5,000,000 readers through her various syndicate features. Her experience as Household Editor for various leading women's magazines has taught her many practical lessons in the handling of household problems. She now wants "The Wireless Age" readers to write her on any home *radio* problem—artistic arrangement of sets—broadcast programs for women—anything to do with *radio*. Address your questions to the HOME RADIO BUREAU, "The Wireless Age.

The farm people of those days went to bed at about 8 o'clock. They were bored to death, and sleepy. They couldn't go to the village without great effort and consumption of valuable horse-energy, to say nothing of needed human energy. There was little to enjoy in fact, at the village when they got there.

The coming of the moving picture and the auto did bring about some big rural changes—but I am of the opinion that neither of them, and certainly not telephones and rural free delivery, have had anything like the importance of radio for the farm.

Radio has been slow in coming to the farm, and the effects of radio on farm life also are slow in evidencing themselves, for they are inner, not outer changes. Farmers driving autos are outward changes; farmers listening to grand opera, lectures, and jazz are inward changes. They take longer to show their effects.

The slowness of farmers in taking up radio is explainable precisely in the same manner as his slowness to take up automobiles. The expense and the technical complications are the reasons. A city man can get his radio set installed by someone around the corner from his house; and it doesn't cost much to take the set downtown to have it looked over if something goes wrong. The farmer hasn't such a simple problem. He has had to learn a lot of things about mechanics that his grandfather never knew, but radio is sheer mystical wizardry to him, and he probably never will get the real technical hang of it. Radio must be made exceedingly simple for him. He must be sold the counterpart of Ford cars in radio. Cheapness and sturdiness are his main requirements. He will get them—is getting them now.

So begins the farm radio era! And I assure you it is some era! I lecture considerably before State agricultural colleges and "grange" meetings, on home economics, and I am familiar with what is going on. You should see how the van-guard of farmers who already have radio are using it! Down in Illinois a farmer comes to my mind. He is far from a "bearded hayseed." I'll tell the world! He lives in a very modern home indeed—two bathrooms, electric toasters at breakfast (and using electricity generated on his own farm, too!) and he has an *office!* Ever hear of a farmer with an office? Well, there are a lot of them. He has a roll-top desk, a typewriter, and a filing cabinet.

And on his desk is a radio set. It is a business proposition, pure and simple. My friend, you will gasp as I gasped when you learn that *it is his stock ticker!* He is a raiser of live stock, and he studies the Chicago quotations with the acumen of a Joseph

Leiter. He is more than a producer, for he also sells cattle he doesn't raise. He buys and sells *on margin*, please be informed!

In the evening, he lifts his radio set into the living room, and he and his family get the entertainment that is on the air. His son is in college, his daughter goes to a music school in the next town (driving her own car), and altogether he's some farmer! Jonas Hayseed of the 1880's would swallow his whiskers in astonishment if he saw this man of today who wears the title of farmer!

I'm not saying he is at all typical, but merely that he is an augury of more cosmopolitan farmers to come. Our farmers, we are told, must be better business men. They are certainly learning, via radio. As I have a country home 35 miles out on Long Island, I know the farmers roundabout, and I hear them discussing La Follette's promises of farm relief (cabbages this year bring the farmers only one cent each!)—as heard direct from his lips by radio. They listen for their politics via radio, instead of around the stove in the village store, as of yore. The village store, alas, has now a steam heating system. They hear the prices of every kind of commodity broadcast every day. They hear all the new music, and they are up on all the news. I broadcast from New York one day, and Farmer L—— of whom I buy my potatoes, stopped me on the road and complimented me the next day on my excellent diction!

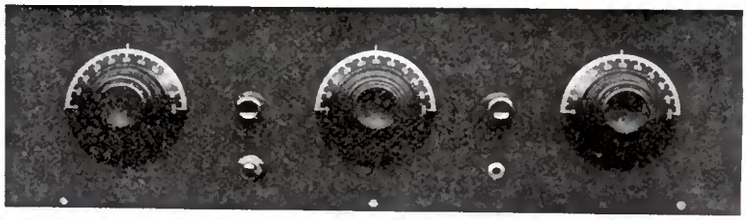
Of course there are farmers and farmers. There is one old man (old since I first saw him 15 years ago!) who lives near me. He'll never buy a radio set, because he's an old widower and a crank. He belongs to the degenerating days of native stock, thinned out by the live farm boys going to town, leaving all the poorer types behind. But the new farmers, new foreign blood coming out on Long Island and making good on truck farms, have children who are live and alert. They are putting in radio sets and Americanizing themselves and their families thereby as nothing else could do. Imagine the educative effect of a loud speaker going daily in a farmhouse of foreigners! The parents never talk English, but now they learn English by the phonetic method merely by listening to radio entertainment.

The really basic effect of radio on the farm is that it makes farm life more livable by scotching the old snake in the agricultural Eden—*isolation*. You have heard how alarming numbers of farmers in isolated sections, and especially their wives, have become insane. The loneliness of some types of farm life is a terrible cross to bear. The rural free delivery, rural telephone, the phonograph, the auto, the movie have all hacked away at this farm isolation cross, but radio is the first real smashing blow it has had.

(*Turn to page 60*)

"The really basic effect of radio on the farm is that it makes farm life more livable by scotching the old snake in the agricultural Eden—"

THE Family Receiver



Designed for the family, for the family's use—believing the family wants a receiver with tone quality above all else

By R. A. BRADLEY

THERE are two kinds of radio enthusiasts. One kind buys their means of entertainment complete, the other buys the parts and puts them together. Of those sets which are put together some work fine, others fair and some not at all. Now this receiver is designed for those who "buy the parts and put them together" that they may be assured that the finished set will work and that it will work well. Keeping this in mind we used parts which will insure success, provided they are used correctly. These parts are also electrically and mechanically good, which of course is essential in a successful receiver. We called this the family set, because of its simplicity of operation. Nothing could be simpler than to turn three dials to previously determined and charted numbers. There is but one phone jack—Why? Because only one is necessary. Volume can be entirely and instantly controlled by the rheostat on the resistance coupled stages of audio frequency. This not only further simplifies the operation, but also renders the construction easier. If the receiver is constructed properly it will be found

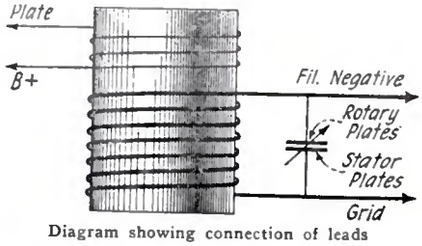
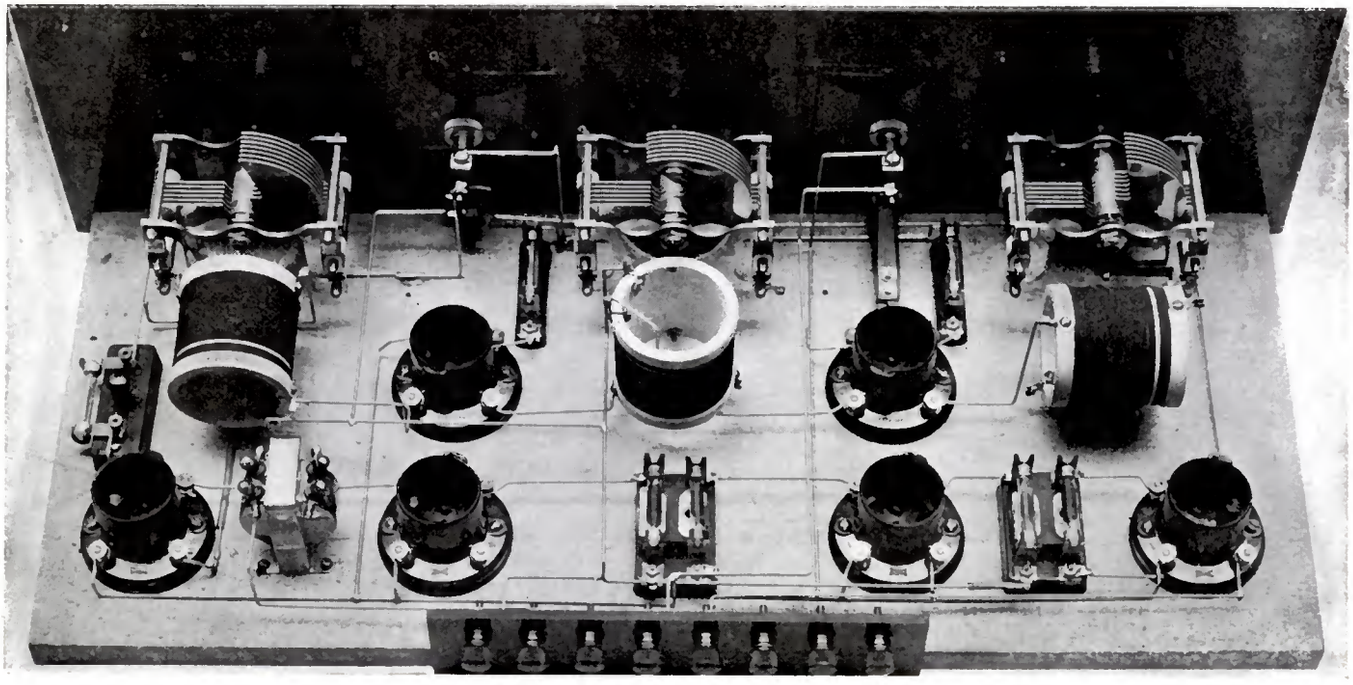


Diagram showing connection of leads

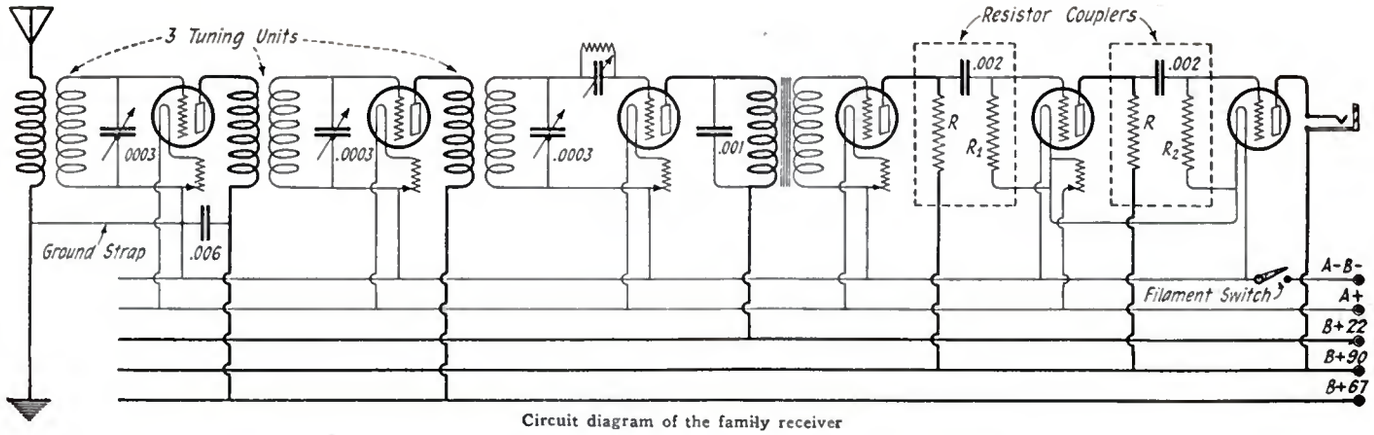
to give loud speaker reception in the early Fall of stations 1,500 miles distant. This distance should be doubled on a clear winter evening. We logged KFKX and WFAA from New York City—tuned in and held on the loud speaker—so it is truly a DX receiver.

The main tuning units consist of three General Instrument .000006—.0003 mfds. variable condensers and three special radio frequency transformers wound on the very efficient Isolantite tubing. The merits of this form of insulation were discussed in the last issue of THE WIRELESS AGE. By actual test the resistance at 1,000 cycles of an R.F. transformer wound on Isolantite was but 1.5 ohms compared with 4.3 for one similar in size, wound on ordinary tubing. These three units are obtainable in a kit and sold complete. There is no necessity for mounting the coils or condensers at the usual angle of 54 degrees as will be shown later on.

The condensers are all mounted hori-



Rear view of the six-tube family receiver



Circuit diagram of the family receiver

zontally while the three coils are fastened to their respective condensers so that each is at a 90 degree angle with respect to the other two. This alone prevents inter-stage coupling, and no neutralizing condensers nor resistances are needed when using the standard UV-201A or C-301A.

We recommend this receiver to our readers as one which will deliver the quality and distance which they expect from a WIRELESS AGE receiver.

CONSTRUCTION DETAILS

Secure a 7" x 24" Radion panel and mark with a lead pencil a line three and one-half inches from the edge. This center line furnishes the basis for drilling the holes for the condensers and rheostats which are to be mounted on the panel. Divide this center line into six sections of four inches each. Four inches from the left hand end drill the holes for the first condenser, making use of the template furnished with each condenser. The variable condensers are all mounted in a horizontal position instead of in an angular fashion such as is done on the average tuned R.F. receiver. The coils are mounted on the condenser in such a fashion that this angular mounting of condensers is rendered unnecessary.

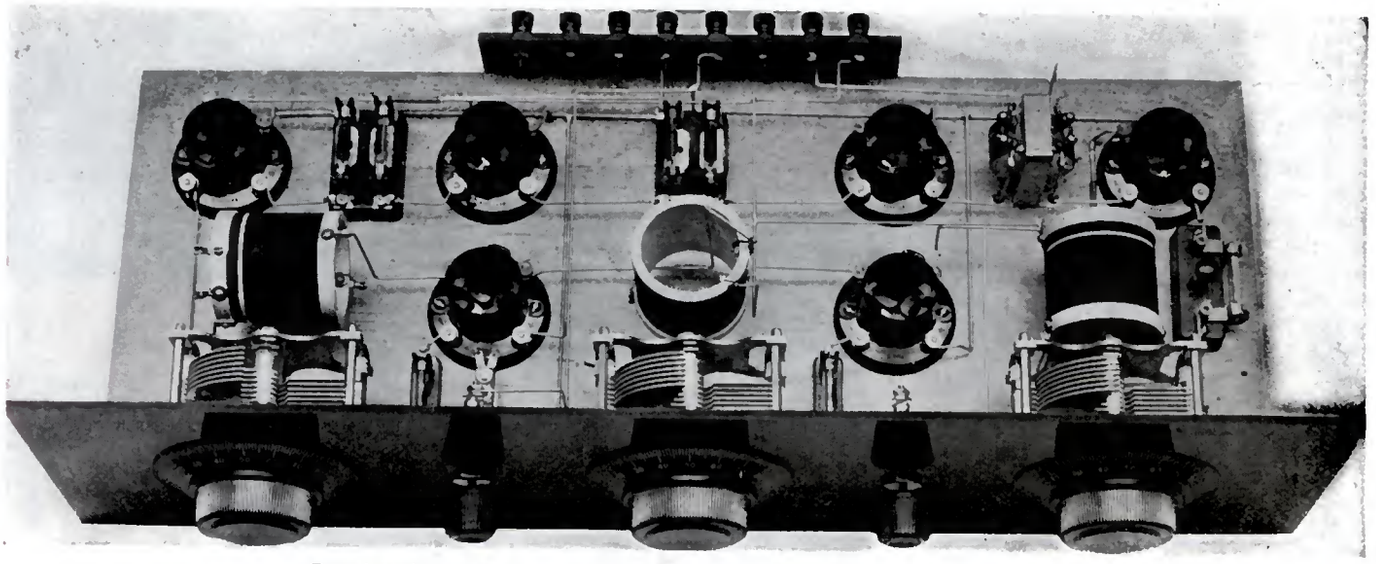
LIST OF MATERIALS

One General Instrument Co. tuned radio frequency kit including three transformers and three .0003 mfd. variable condensers.
Six Na-Ald Standard sockets.
One 7x24 Mahoganite panel
Two Daven Resisto-Couplers including
  two 100,000 ohm resistances
  two .002 mfd. Dubilier fixed condensers
  one 1½ megohm gridleak
  one 1 megohm gridleak
One .006 Dubilier fixed condenser
One Carter Filament Switch
One General Instrument audio frequency transformer, turn ratio 1 to 3.75
One Radjo single circuit jack
Two Marshallstats
One Amplex gridenser
One 2 megohm Daven gridleak
Three Ballast resistances for ¼ ampere tubes Daven
Eight Eby Binding posts
One 9x2 Radion binding post strip
Three Na-Ald Dials

The first coil is placed horizontally, the second vertically and the third horizontally and at right angles to the panel. Thus we have three coils mounted in 90 degree relation to each other. Eight inches from the left end drill a hole for the first Marshallstat. and eight inches from this the second Marshallstat. Directly below the first Marshallstat is mounted the filament switch, which is a Carter single closed circuit jack-switch. Directly below the second Marshallstat and one and one-half inches up from the lower edge of the panel mount the Radjo phonejack. This type of jack was used because of the small amount of space which it occupied behind the panel. Next, drill the necessary holes for supporting the panel on the baseboard. There should be at least three screws to fasten this securely. When this is done mount the instruments on the panel and lay it aside until the baseboard arrangements are completed. Next secure for a baseboard a piece of soft white pine, nine and one-half inches wide by twenty-three inches long by three quarters of an iach thick. Two and one-quarter inches from the rear edge draw a line parallel to it. This will be a center line for the four sockets, audio frequency transformer and two resisto-couplers.

The two radio frequency tube sockets are mounted in a line, five and one-half inches from the rear of the baseboard and between the radio frequency transformers. Looking at the baseboard

(Turn to page 62)



Top view shows clearly the relative position of all the parts of the family receiver

The gigantic cabin of the ZR-3, America's German built Zeppelin, and the radio receiver to be used in guiding her across the Atlantic watched over by Aro-G, a prize German police dog

World Wide News

Cape Town and Greenland Stations—Morse Code in Bengali—Transatlantic Broadcasting—R.C.A. Stocks Listed—Thirteen Thousand Seek Patents—Radio Interest World Wide

By C. S. ANDERSON

Managing Editor of the "Wireless Age"

Radio Interest Is World Wide

WHILE the activity in amateur radio work and in broadcasting is still greater in the United States than in any other nation, the past year has brought about marked changes in the situation in many foreign countries. Today, few are the nations which have not recognized the popular and growing interest in radio by the enactment or revision of regulations of one sort or another.

Naturally, the development abroad has had its greatest growth in Europe. In the British Isles, France, Germany, Sweden, Switzerland, Holland, Belgium, Denmark and Czechoslovakia, the broadcasting of programs of entertainment and news is on a rather regular basis, while in Italy, Finland, Spain and Austria, programs are sent out at irregular periods, with a decided likelihood of regular schedules being adopted in the no great distant future. In other countries of Europe, there has been some sale of long range sets to pick up British and French stations.

In South America, Argentina stands out as having made the greatest progress in the dissemination of music and other entertainment by radio telephony, with Chile also maintaining regular broadcasting service. For a time, regular services were also maintained in Brazil, and will, undoubtedly, be re-established in the course of time. Uruguay, as a result of broadcasting from Buenos Aires, has shown a considerable interest in radio, and in Peru arrangements are going forward looking toward the establishment of regular service.

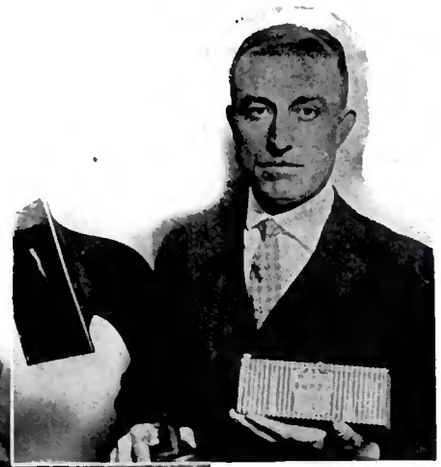
Australia and New Zealand have each displayed much interest in the new art, and in view of the recent lifting of hampering regulations in Australia, a marked expansion in radio interest in that country may be looked for. In the Orient, little has as yet taken place, though India and Ceylon are opening up, and intermittent broadcasting is being provided. In Japan, adequate legislation has been enacted, making provision for the establishment of broadcasting stations, but little progress has taken place. In China, radio is technically barred under an embargo forbidding the entry of anything usable as war material, though in the British port of Hong Kong and in the international settlement of Shanghai, some broadcasting has been done. In no country is the use of radio receiving sets as free and unrestricted as in the United States.

Future Arctic Exploration

SOME day soon, Donald B. MacMillan says, a dirigible will leave New York, sail over the Arctic, reveal to the eye of the camera a heretofore unseen continent at the North Pole, and return without ever having lost communication by radio with the world The voyagers would come back knowing all that had happened while they were gone, and humming the latest jazz tunes of Broadway, he said.

The explorer says that contrary to the impression had by many, the aurora has no effect on radio. In fact, the best transmission he was able to obtain occurred in the midst of the most vivid displays.

"We could get stations in western United States and in Honolulu, but the East was 'dead' to us," he said.



A loudspeaker and high voltage "B" battery of Japanese manufacture and the military corps sending Tokyo news by radio to the rulers of Japan while at Nikko

"It was a phenomenon we could not explain." The only theory for this he could evolve was that snow, blowing constantly over the intervening fields, had something to do with it, the flakes generating some sort of electricity.

Transatlantic Broadcasting

ONE of the many interesting features of the international broadcasting tests scheduled for the week of November 24-30 is the probable rebroadcasting of French, Dutch, German and Swiss radio programs by the stations of the British Broadcasting Company.

Nine stations of the British Broadcasting Company will have special programs arranged for the benefit of American radio listeners during the tests, but Captain West, assistant chief engineer of the British radio concern, plans to give the American listeners additional thrills by rebroadcasting Continental programs.

Such special tests are necessary because it is not possible to hear the British and Continental radio stations ordinarily, since they operate on practically the same wave length as the American stations. Allowing for that and the difference in time, it is not possible to hear the English stations when the American broadcasters are on the air.

Among the most recent broadcasters in this country to lend their co-operation to the international tests is the Westinghouse Electric and Manufacturing Company, whose stations WBZ, Springfield, Mass.; KDKA, East Pittsburg, Pa.; KFKX, Hastings, Neb., and KYW, Chicago, will join in sending special features across the water.

Morse Code in Bengali

K. C. PURKAYASTA, scoutmaster of the Kurmagunj High School troop, is reported to have designed a Morse code for the transmission of Bengali messages. It is also suitable for any language of the Indo-Aryan group, such as Assamese, Hindi, Marathi and Gujrathi.

Greenland Stations

GREENLAND is to have a complete wireless system, and in a country where communications are hampered by blizzards and snow it should prove of enormous value. Four stations will be erected, at Godthaab, Godhaven, Angmagsalik and Julianehaab, the latter keeping the others in touch with the Iceland station at Reykjavik.

Owen D. Young, Mediator on German Reparations and Chairman of the R.C.A. Board of Directors listens-in while sojourning in Berlin

R. C. A. Stocks Are Listed

THE common and preferred stocks of the Radio Corporation of America were admitted to trading on the New York Stock Exchange by the Board of Governors recently. This is the first stock of a radio company ever admitted to the big board. A total of $19,779,870 of the company's Class A preferred stock and 1,155,400 shares of Class A common stock were listed.

13,000 Seek Radio Patents

SECRETARY WORK of the Patent Bureau has called his committee together to submit suggestions necessary for changes in practice that will result in bringing the work of the bureau to a current basis.

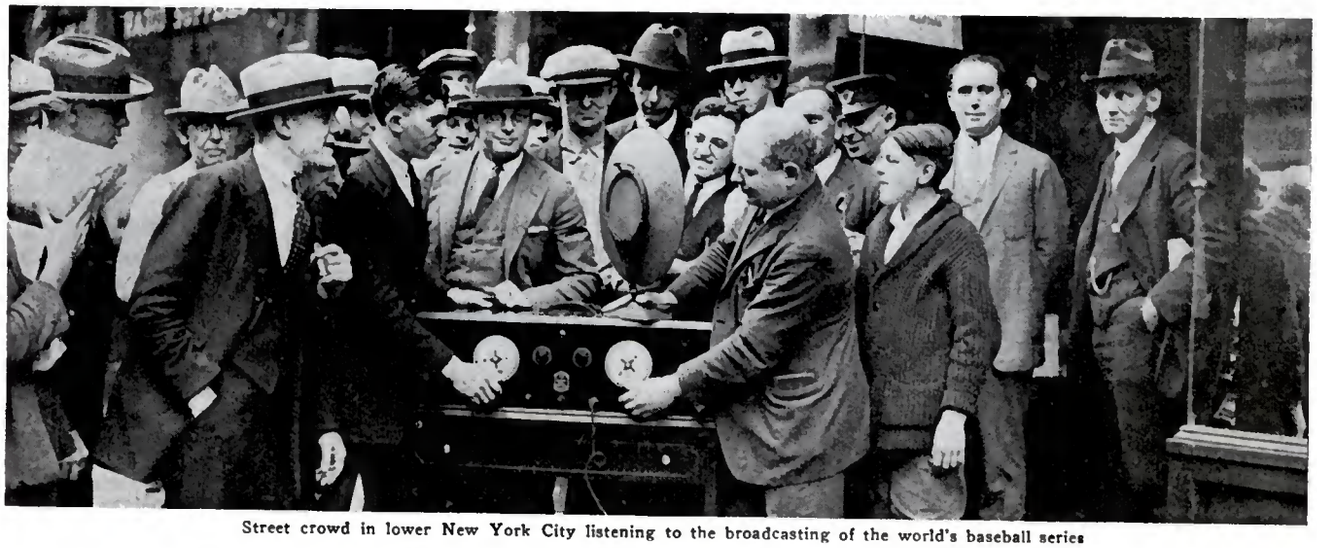
What this will mean to the radio inventors may be realized when it is learned that to date 3,000 radio patents have been granted and the eleven examiners under the very competent head of that division, C. E. Backus, have handled over 10,000 intended improvements in the science which could not be patented.

Radiograms From India

THE Eastern Telegraph Company's westward radioletter service from India is being extended to New York via Marconi-Radio. Service eastward from New York is not yet available.

Cape Town Station

THE Cape Town broadcasting station was opened on Monday, September 15th. It transmits on a wave length of 375 meters, the call sign being "WAMG." The installation consists of a Marconi 6 K.W. broadcasting transmitter and microphone, such as are used in six of the British main stations, and such as have been installed at Belfast, Brussels, Durban, Rome, Rio de Janeiro and Lima.



Street crowd in lower New York City listening to the broadcasting of the world's baseball series

The Physical Nature of Speech and Musical Sounds

Peculiar combinations of pure tones—Analysis of vowel sounds and consonants — Sound spectra or typical musical sounds

By JOHN P. MINTON, B.S., Ph.D.

IN the Sept. issue of THE WIRELESS AGE we published our paper on "Speech and Music in the World of Sound." In that paper we described in a popular way and in some detail how all speech and musical sounds are made up of definite combinations of pure tones. These combinations make up the whole world of the beautiful sounds which give us so much pleasure and on which our very existence today depends.

So much of the beauty in art lies in the artist's conception that we are apt to find ourselves admiring the conception almost to the exclusion of the artistic rendition or execution itself. So it is in this world of speech and musical sounds. We are, perhaps, likely to find ourselves admiring the conceptions of speech and musical sounds as explained in the paper already referred to. In order to avoid this possibility, we should, I think, give a whole article to the physical nature of these special kinds of sounds. Such is the purpose of the present paper.

While the author was engaged for several years in acoustical research in the research laboratories of the Western Electric Co. he had occasion to study in great detail the reproduction and distortion of speech sounds by certain telephone apparatus. He devised and introduced a method of speech analysis which yielded most valuable information about speech and telephone apparatus and which has since become the standard method of testing not only by the Western Electric Co. and the American Telephone and Telegraph Co., but by all the workers in this field.

One of the results of these investigations was to demonstrate with certainty that speech sounds were peculiar combinations of pure tones. Each speech sound in all languages was shown to be a definite combination of the fundamental tone with a certain group of overtones. This combination of fundamental (lowest tone) and overtones remained practically the same for all persons. I say "practical" for two reasons. First, it is "practical" because we can all recognize and understand the combination, let us say, for example, the sound of *o* in the word *hot*, no matter who says the word.

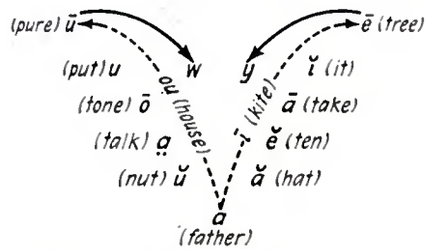


Figure 1. The pure and transitional vowel sounds used in the English language

Second, it is "practical" because the combination does change to a slight extent with various individuals and we are assisted, therefore, in distinguishing one person's voice from another. It is "practical" then for the reason of "understandableness" and for the purpose of "distinguishableness." What we have said about the letter *o* in *hot* is true about all the other vowel and consonant sounds.

The reason, then, that we fail at times to understand a spoken word is pretty largely due to the carelessness of the speaker in forming the correct cavities of the mouth for the different speech sounds. As explained in the last portion of the preceding paper, the various mouth cavities during the process of speech determine entirely the particular groups of overtones for the speech sounds.

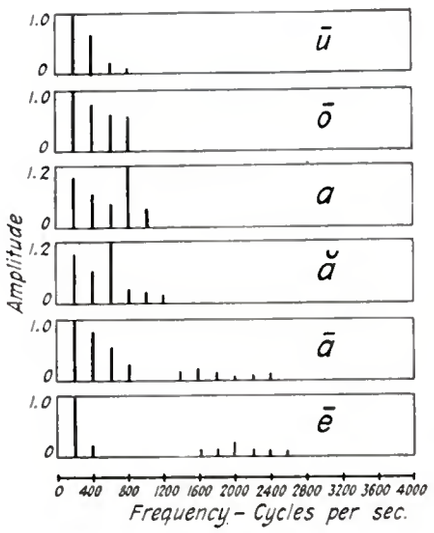


Figure 2. Sound spectrum for six of the pure vowel sounds

In connection with this phase of our subject it will be of much interest to describe briefly the relative shapes of these mouth cavities required to form the various speech sounds. The pure and transitional vowel sounds used in the English language may be arranged in a triangular arrangement shown in figure 1.

The vowel ū at the top, left hand side, of the figure is formed by rounding the lips, drawing back the tip of the tongue and placing it as low as possible while the back portion of the tongue is raised to practically close off the throat. The mouth cavity is thus formed into one single large chamber. This chamber forms a resonating cavity principally for those vibrations of the vocal cords in the region of 300 cycles, and thus form the characteristics of the vowel ū.

As we pronounce the vowel sounds, in the order indicated, on the left hand side of the figure beginning with ū and ending with *a* the lips open wider and wider and the lower jaw becomes lower and lower. The tongue remains raised at the back until *a* is reached when it is only slightly raised and the lips are wide open. In this formation of the mouth, lips and tongue those overtones in the region of 1,000 cycles are greatly reinforced and we have the characteristics of the *a* sound thus formed. As we proceed up the right hand side of the figure the lips come closer and closer together as though we were proceeding up the left hand side of the figure, except that the lips take on more and more the form of a slit as we proceed from ă to ē. At the same time the tongue, instead of being raised at the back, is now raised at the center to form a ridge across the roof of the mouth. As we proceed up the left hand side of the figure this

ridge advances farther and farther toward the front of the mouth. There is thus a fundamental difference between the vowels on the left and right hand sides of the figure. For the former the mouth with the tongue is formed into a single cavity, while for the latter the position of the tongue is such that two cavities in the mouth are formed. The former vowel sounds are called singly resonant vowels while the latter are called doubly resonant vowels. In the case of the ă sound the forward and rear cavities are nearly equal in volume. The rear one including the throat cause the overtones of the vocal cords in the region of 800 cycles to be considerably reinforced. The forward one causes those overtones in the region of 1200 cycles to be amplified. When we finally reach the ē sound the forward cavity is quite small and this one causes amplification of the overtones in the region of 2,500 to 3,000 cycles. The rear one, which has now become quite large, causes the overtones of the vocal cords in the region of 300 cycles to be greatly increased in magnitude. The difference, then, between the ū and ē sounds is caused by single and double cavities, both of which give a resonance at about 300 cycles and the latter of which, but not the former, give a resonance around 2,500 to 3,000 cycles. The vowel ē can be made to sound like ū, merely by eliminating the increased energy around 2,500 to 3,000 cycles and in an analogous manner the vowel ū can be made to sound like ē merely by introducing a suitable energy increase of those overtones in the region of 2,500 to 3,000 cycles. These remarks indicate quite clearly in a qualitative manner the distinguishing features amongst the various vowel sounds. Below we shall discuss the quantitative differences that exist amongst them.

In addition to the pure vowel sounds, we have the transitional vowel sounds ī and ou, w and y. Ordinarily one thinks of the two former being pure vowel sounds while the two latter are consonants. However, both the long i and the ou (also ow as in how) sounds begin with the *a* sound as in far. The former sound ends with the long e sound while the latter ends with the long u sound. This explains why they are called transitional vowel sounds. In the case of w (as in will) the mouth, lips and tongue are formed to pronounce the long u sound and then one passes suddenly to any of the other pure vowel sounds. In the case of y, the initial formation of the mouth, lips and tongue are for the long e sound and they suddenly pass to any of the other pure vowel sounds. If w or y are followed by either of the transitional vowels ī or ou, then there is a rapid succession of three pure vowel sounds instead of two as in the four transitional vowel sounds. It may be pointed out, however, that there is a difference between the transitional vowels ī and ou on the one hand and w and y on the other. The two former are sufficient unto themselves, so to

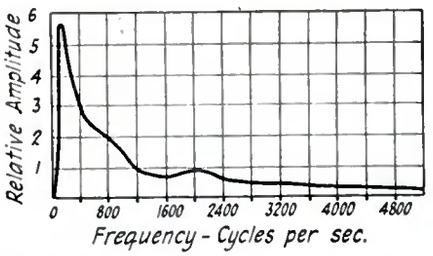


Figure 3. A composite curve for the English language

speak, and are followed by the consonant sounds, while the two latter are followed by pure vowel sounds.

The sound h has been classified as a transitional vowel, while l, r, m, n, ng have been classified as semi-vowels. Then, the consonants have been divided into two classifications as illustrated in the table below:

This classification and description of the various vowel and consonant sounds will be found very helpful and interesting. It will be worth one's time to take a half hour or so to go through this description again, pronouncing each letter carefully and observing closely the formation of the mouth, tongue and lips for each of the sounds. One will then be able to more fully appreciate how well nature has endowed us in the art of communication by speech sounds.

It is of much interest from a quantitative viewpoint to study the distribution of the voice energy in speech sounds. By this means we get a sort of a sound spectrum of the energy in the various sounds. In figure 2 is shown such a sound spectrum for six of the pure vowel sounds.

STOP CONSONANTS

Voiced	*Unvoiced*	*Nasalized*	*Formation of Stop*
b	p	m	lip against lip
d	t	n	tongue against teeth
j	ch	....	tongue against hard palate
g	k	ng	tongue against soft palate

The sounds m, n, ng have been classified both as semi-vowels and stop consonants.

FRICATIVE CONSONANTS

Voiced	*Unvoiced*	*Formation of Air Outlet*
v	f	lip to teeth
z	s	teeth to teeth
th (then)	th (thin)	tongue to teeth
zh (azure)	sh	tongue to hard palate

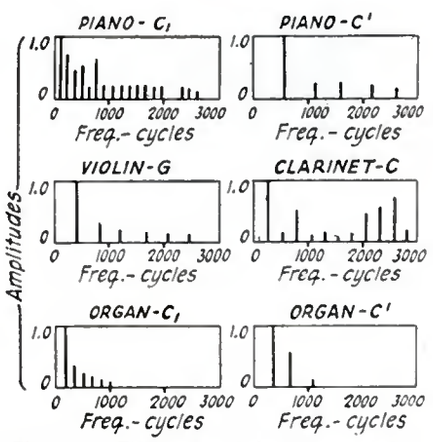


Figure 4. The curves or sound spectra for musical tones

ANALYSIS OF VOWEL SOUNDS

The lowest tone in each of the various vowel sounds shown in the figure is in the region of 200 cycles. The magnitude of this tone, called its amplitude, shows how intensely it impresses the ear. These acoustical energies are impressed on the brain by means of the ear as explained in our July paper. Hence, the acoustical sensation registered on the brain is also determined by the ear characteristics. Consequently, these acoustic spectra of the sounds themselves do not represent the relative intensities of the fundamental and its overtones as recognized by the brain itself. If we call the amplitude of this lowest tone unity (1.0) and represent it by a vertical line one

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How and Why I Designed the 5½ Oz. Head Set

Without Headband Thin as a Watch—Yet 2200 Ohms

Large volume of tone and pure musical quality

By DURYEA BENSEL

IT has been repeatedly attempted to increase the sensibility of the telephone receiver, either by altering the membrane which is the diaphragm, or by modifying the magnet system, or by adopting fundamentally new principles of construction. It has also been attempted to lighten the units. These desirable improvements, however, have not been accomplished to any marked degree up to the present. Most of the telephone receivers now in use are practically the same in construction. They have the same type of pole pieces measuring anywhere from ¼ inch to ½ inch off center of the diaphragm.

Some time ago I came to the conclusion that head set reception had some advantages over loud speaker reception, and that conclusion has remained with me. The great drawback to telephone head sets of the present day is the head band and the weight which causes discomfort. Three years ago I began thinking about designing a head set without the uncomfortable head band. It seemed a worth while thing to experiment upon, and I felt sure the desired result could be accomplished. However, three years ago I had no idea of the seemingly unsurmountable difficulties I would encounter, nor the amount of good material, to say nothing of the time and money that would be used before the practically perfect set could be made.

After considerable experimenting, I finally made a unit which weighed 3½ ounces. This unit was 1¼ inches thick by 2½ inches in diameter. The next thing was how to hold it to the ears without the head band. I realized that such a contrivance must be simple, not alone to operate, but to manufacture, and also that it must be adjustable to fit any size or shape of ear. At last I perfected an ear clasp that was both simple to operate and cheap to manufacture, but when I attached them to my 3½ ounce unit, my troubles began. The units sagged away from the head and let in all the outside sound. This was caused by the greater part of the unit being fully an inch away from the side of the head, which acted as a leverage and pulled the ears down. To hold the unit firmly and securely to the ears in such a way as to exclude outside noises, they had to be lighter than 3½ ounces, and all the weight had to be close to the side of the head when they were on the ears to overcome the leverage.

With the present construction of telephone units, such a thing was an impossibility, and it was necessary to

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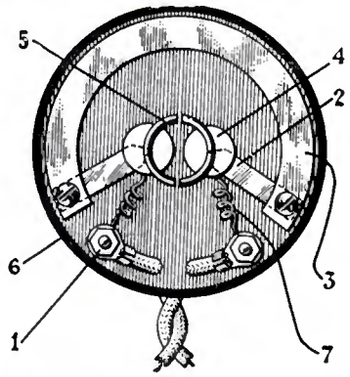
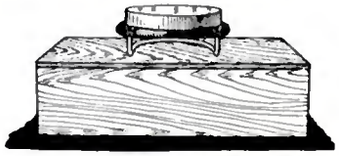
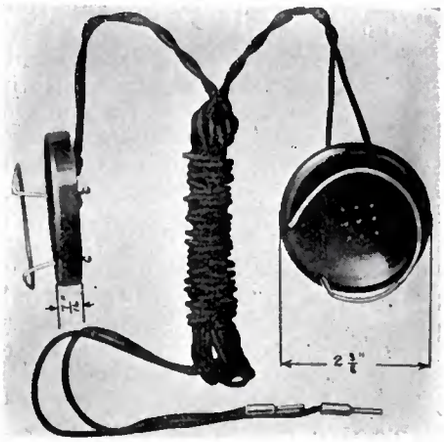
The receiver attached to the ear



The inside works—1, terminal; 2, pole shoe; 3, magnet; 4, coils; 5, face of poles; 6, case; 7, terminal connections



A unit resting on a cigar box makes a loudspeaker



The complete headset

Third National Radio Conference

Secretary Hoover's opening address points out that Radio has passed from the field of adventure to that of public utility

"In the whole field of scientific discovery, there has never been a translation into popular use so rapid as in radio telephony"

IT is a pleasure for me to open the Third Annual Radio Conference at this Department and to welcome you to its sessions. Your willingness to leave your usual business and give your time and attention to this conference bears witness both to the importance of radio in the lives of our people and to your desire to perform a public service.

Radio has passed from the field of an adventure to that of a public utility. Nor among the utilities is there one whose activities may yet come more closely to the life of each and every one of our citizens, nor which holds out greater possibilities of future influence, nor which is of more potential public concern. It must now be considered as a great agency of public service, and it is from that viewpoint that I hope the difficult problems coming befor this conference will be discussed and solved.

At the first radio conference I hazarded some modest anticipations as to its development and use. Some thought them visionary—yet we passed every point of these anticipations within eighteen months. We have, in fact, established an entirely new communication system, national in scope.

In the whole history of scientific discovery there has never been a translation into popular use so rapid as in radio telephony. So late as the year before I became Secretary of Commerce there were no broadcasting stations. At the end of four years 530 are in operation, making radio available to every home in the country. The sales of radio apparatus have increased from a million dollars a year to a million dollars a day. It is estimated that over 200,000 men are now employed in the industry, and the radio audience probably exceeds 20 millions of people.

We may well be proud of this wonderful development, but in our self-congratulation let us not forget that the value of this great system does not lie primarily in its extent or even in its efficiency. Its worth depends on the use that is made of it. It is not the ability to transmit, but the character of what is transmitted that really counts. Our telephone and telegraph systems are valuable only in so far as the messages sent from them contribute to the business and social intercourse of our people. For the first time in human history we have available to us the ability to communicate simultaneously with millions of our fellow men, to furnish entertainment, instruction, widening vision of national problems and national events. An obligation rests upon us to see that it is devoted to real service and to develop the material that is transmitted into that which is really worth while. For it is only by this that the mission of this latest blessing of science to humanity may be rightfully fulfilled.

The conferences of the past three years have been called in the belief that it was by your coöperation that the requirement of the law could best be met which declares it to be the duty of the Secretary of Commerce to "foster and promote the commerce of the United States."

Beyond this, certain minimum regulatory powers rest in the Department. I have been convinced that development could only be accomplished by organized coöperation of the industry itself; and the industry is unique in that unless it has stringent rules of conduct to which all elements adhere it will die of its own confusion.

At each succeeding conference we have had more difficult problems to solve, and those which we present today are of a complexity greater than ever before. In a large sense the purpose of this conference is to enable the listeners, the broadcasters, the manufacturers, and the marine and other services to agree among themselves as to the manner in which radio activities are to be conducted.

Like the two previous occasions, this may be called an experiment in industrial self-government. Radio activities, so long as they remain within the legislative restriction which holds for the government the fundamental control of the ether, are largely free. The industry's future conduct with a single view to public interest, a voluntary imposition of its own rules and a high sense of service would go far to make further new legislative or administrative intervention unnecessary. The two past conferences have been successful in these purposes. With only slight modifications made necessary by changing conditions, the Department has been able to follow their recommendations in the performance of its duties. The industry has supported and conformed to these recommendations cheerfully and uncomplainingly, although at some self-sacrifice. I congratulate you on this spirit, and know

that you will enter upon your new deliberations in the same attitude.

BROADCASTING PROGRAMS

When broadcasting first started, the phonograph was a sufficient attraction to the radio telephone listeners, who were swayed chiefly by curiosity and marvel at the new discovery. Public interest has long since passed this stage. The radio telephone would now die in 24 hours if it were limited to transmission of phonograph records. We have made great improvements in material transmitted. Original music, speeches, instruction, religion, political exhortation, all travel regularly by radio today. Program directing has become one of the skilled professions. I have indeed a great feeling for the troubles of the director in his efforts to find talent and to give to his audience the best that lies at his command. He has done extraordinarily well.

But we require a still further advance in the character of material beyond the capacity of local station directors if the art is to emerge entirely from the curio and entertainment stage to that of fundamental service.

Experimental broadcasting upon a national scale during the past year has now brought us to the stage where we know it can be done. The local material available for the local program is not in my view enough to maintain assured interest, and therefore the industry, or to adequately fulfill the broadcasting mission. So far as the art has developed, I think we all agree that for accuracy and regularity of reception we can depend only upon the local broadcasting stations. My proposition is that the local stations must be able to deliver every important national event with regularity. The local station must be able to bring to its listeners the greatest music and entertainment of the nation, but far beyond this it must be able to deliver important pronouncements of public men, it must bring instantly to our people a hundred and one matters of national interest. To this it must add its matters of local interest. This can only be accomplished by regularly organized interconnection on a national basis with nationally organized and directed programs for some part of the day in supplement to more local material.

It may be stated with assurance that the greatest advance in radio since our last conference is the complete demonstration of the feasibility of interconnection. We owe a debt of gratitude to those who have blazed the way. The pioneers have been the American Telephone & Telegraph Company in wire interconnection, and the Westinghouse Electric & Manufacturing Company in radio interconnection through the use of short wavelengths. Their experiments have involved technical skill of the highest character which could be found or contributed by few other organizations in the world. Their expenditures, running into the hundreds of thousands of dollars, have been made without direct consequential return. It has been possible to broadcast many national events over three-quarters of the United States during the past year, and the whole country has been covered twice. The service deserves the appreciation of the public, for it has demonstrated this great thing to be practicable.

It is our duty to consider the possibilities and potentialities of interconnection as a regular daily routine of the nation. Unless it be systematically organized we cannot expect its continuation. I realize that this matter, except in so far as it may be fostered and encouraged, does not lie in the Government. It would be unfortunate indeed if such an important function as the distribution of information should ever fall into the hands of the Government. It would be still more unfortunate if its control should come under the arbitrary power of any person or group of persons. It is inconceivable that such a situation could be allowed to exist. But I am not now dealing with monopoly. Nor is this a question where any one lays claim to a monopoly. Interconnection is going on to local extent and over the wires of the telegraph companies, the telephone companies, and by radio itself. We have promises of super radio and we have promises of interconnection of wired wireless. If there are several methods, it means that we might have several alternative programs always available. But whatever the method of interconnection may be, we are lacking in a definite organization of a national system of programs and a basis of support.

I believe that the quickest way to kill broadcasting would be to use it for direct advertising. The reader of the newspaper has an option whether he will read an ad or not, but if a speech by the President is to be used as the meat in a sandwich of two patent medicine advertisements, there will be no radio left. To what extent it may be employed for what we now call indirect advertising I do not know and only experience with the reactions of the listeners can tell. I do not believe there is any practical method of payment from the receivers. I wish to suggest for consideration the possibility of mutual organization by broadcasters of a service for themselves similar to that which the newspapers have for their use in the press associations, which would furnish programs of national events and arrange for their transmission and distribution on some sort of a financial basis just as the press associations gather and distribute news among their members.

It may be that we cannot find a solution at this moment, but I believe that one result of this conference should be not only the consideration of this question but the establishment of a continuing committee for its further consideration.

There are other matters to which I hope the conference will give its attention.

THE PROBLEM OF WAVE LENGTHS

One of the most important subjects for your consideration is the providing of operating channels for broadcasting stations. Of the present 530 stations, 57 are Class B, operating on from 500 to 1,000 watts and having a wide range, and 387 are Class A, many using small power and covering small areas. There are still 86 Class C stations, most of which have low power, all on a wave length of 360 meters. Our chief trouble is with the Class B situation. They are all assigned within the band of 288 to 545 meters, within which there are, under the present system of allocation and excluding the Class C band, only 44 available channels, and only 33 that seem desirable at present. To assign these among the 57 stations necessarily means duplication, although it was the theory of the last conference that individual wave lengths could be assigned to each. At present, 23 stations either have exclusive wave lengths or are sharing with stations so distant that both may operate simultaneously, while the remaining 34 are compelled to divide time. The greatest congestion is in the large cities, New York and Chicago particularly. A recent survey made by the Supervisors of the various districts shows that 21 new Class B stations are now under construction and that 25 others are contemplated, so that the question of allocation is one of increasing difficulty. It was the recommendation of the last conference, and has been the practice of the Department, to separate stations in the same zone by at least 50 kilocycles, in adjoining zones by at least 20 kilocycles, and in separate zones by at least 10 kilocycles. In the light of scientific and technical development in both transmitting apparatus and receiving sets, it may be that a different plan of zoning or of station separation may now be used, thus creating additional wave lengths for assignment. It has been suggested also that the band now reserved for Class B might be somewhat broadened. Removals of Class C stations from the Class B band would likewise give some

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Getting the Rural Vote

Candidates can reach the rural voter by radio, but in so doing he must limit his speeches to the real issues of the day

By HENRY C. WALLACE

Secretary of Agriculture

RADIO has grown enormously in the last two or three years, but we have yet to experience the important lasting effects which must be brought about by the widespread adoption of such a radical improvement in communication. We know that millions of people daily are making use of receiving sets for business, educational and entertainment purposes, yet we do not know what effects the reactions of these millions will have on the conduct of the Nation's affairs. The preliminary phase is much like the investigation of a scientific problem; the application of the facts will be made by the public after due deliberation.

I know from the experience the Department of Agriculture has had with the use of radio to disseminate agricultural reports and information that the farming population is finding it a welcome convenience which is rapidly becoming a necessity. We have received sufficient comment to convince us that farmers appreciate radio most as a practical help in carrying on their business, but that they also value it greatly for the educational and entertainment features.

Today practically every farmer, without appreciable expense, can receive almost immediately it is available the latest information on market and weather conditions. I do not mean to say that all farmers have receiving outfits, but there is efficient local distribution of information that is sent over the entire country by numerous sending stations. Daily weather forecasts are sent out by 117 stations in practically every State; crop and market reports and comments are put on the air by seven high-powered radio-telegraph stations of the Navy Department and 75 radio telephone stations owned by colleges, newspapers and commercial concerns.

No one knows how many farmers have their own radio receiving sets, but the Department of Agriculture made a preliminary survey about a year ago which gives some indication of the number. It was found that in a large number of counties investigated there were about fifty outfits on farms in each county. If that average held true for the entire country it would mean about 150,000 receiving sets on farms in the United States. Since the time of the survey the number undoubtedly must have increased greatly. The use the farmer makes of this convenience cannot be measured by the number of sets. Many banks in small towns and in some cases county agricultural agents have a practice of relaying information received by radio to the neighboring farmers by telephone. By such a method the number of people benefited by up-to-the-minute information is multiplied enormously.

It is safe enough to forecast that radio will be a permanent factor in entertainment, education, business and politics. Many predictions have been made regarding specific changes. We hear that it promises to do away with the old-time political mass meeting, citizens staying at home and learning about the issues of the day without stirring from their easy chairs. Perhaps some such change may come about, but whether it does or not we can be sure that more voters are going to learn about the real issues than ever before. Neither weather nor stress of work, which might keep people at home, will prevent them from hearing the messages from candidates for office.

It is probable that more attention will be given to the contents of political speeches which will be heard in the calm of the fireside. The radio audience consists of persons of different political beliefs. Therefore, the effective talk will be one that is brief and limited to the real issues of the day. The speaker does not have his audience at his mercy and can lose them with the same ease with which he secured them.

Since no party can ever obtain a monopoly of radio facilities, its use should result in a far larger number of voters becoming informed on the issues under discussion, and it may be instrumental in stimulating a larger vote at the polls. Obviously those candidates who can make the most persuasive arguments in their own behalf will reap the greatest benefit from the radio.

One-Tube Circuits

Analysis of the Copp, Kauffman, Reinartz, Ambassador, Haynes and other regenerative circuits using honeycomb, spider web and other lattice wound as well as tube wound coils

By JOHN R. MEAGHER

WE have selected a topic "near and dear" to a vast number of broadcast listeners; the much talked of and little understood subject of single tube regenerative receiving circuits.

What immediately comes to mind when we say "single tube circuits?" Why of course; all the numberless circuits that have appeared in radio papers. We have the Copp, the Kauffman, the Reinartz, the Ambassador, the Haynes, single, double and triple circuits of all kinds, the British aircraft, the honeycomb, the spider web, the variometer-variocoupler: and so on without end.

There is no reason why each should not have its distinctive name and yet as they are all alike, it is not correct to say they are different from each other.

It has been said that one regenerative circuit should work as well as any other regenerative circuit provided the design of each is equally good. Many readers accepted such a statement without a word, others doubted it and some thought it to be wrong. Among our own acquaintances in the radio field we do not know of a single person who would agree enthusiastically to the correctness of the statement. And yet now, in reaffirmation, we say that of all these circuits not one differs from the standard regenerator; even more, we say there is only one basic circuit and that all the others may be reduced to that simple one (shown in figure 1). Let us look into the matter.

Simple tuning circuits first: In figures A, B and C we have three tuning arrangements that look as though they were different. We can substitute B for A or A for B and, with proper design, cover the same wavelength range. The efficiency of one compared to the other depends upon the design; we are not concerned with that here. We point out merely that in effect A and B are alike. Now C is the same as B. To be sure, the shunt capacity across the coil is made of two condensers in series, and a resistance R as indicated, but the condenser across the coil in B could be represented with its equivalent resistance in series, thus taking care of R. If the condensers VC and C in C are designed properly, they, in combination with the coil in C, will cover the same wavelength range as the arrangement shown at B. Thus C and B are alike, but A and B are also alike so A, B and C are similar to each other. (C is meant to represent a single circuit aerial system with a shunt variable condenser VC; the antenna resistance is represented at R and the antenna-ground capacity at C.)

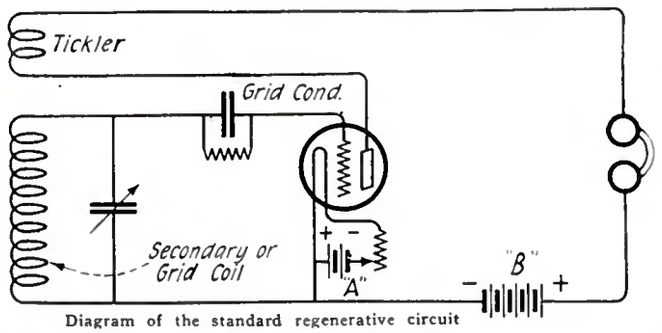

Diagram of the standard regenerative circuit

The fact that the relative efficiencies may be different, as stated above, should permit one to be sufficiently broadminded to accept the similarity of A, B and C.

Glance now at antenna circuits. At D is shown a loose coupled or double circuit arrangement. Note that the secondary is similar to B above and that B is the same as A. Now we know that it does not change the circuit to ground the filament in order to keep that section at ground potential, so the filament or bottom side of the secondary may be connected to the ground as shown in dotted lines. The circuit is not altered. Nor need we represent the primary as being to one side of the secondary; we may easily swing the primary about and without changing a single connection represent D as at E. Or, if we wish, instead of using a separate primary coil we may make dual use of a corresponding part of the secondary as shown at F. Here the primary is from the aerial connection on the coil to the ground.

The secondary is from the top of the coil to the ground. The primary and secondary turns may be the same as in E so that in effect, F is like E and as E is the same as D, all three are alike.

Again we shall say that the effect on efficiency does not concern us here.

Consider for a moment the two main types of regenerative circuits, the tickler feedback as at G and the tuned plate as at H. The antenna circuit does not bother us as we have shown at D, E and F, the similarity of apparently different antenna systems. At G the grid is excited—caused to vary in voltage with changes in plate current—which changes are caused by initial variations of grid voltage—by magnetic coupling with the plate circuit and to some extent by capacity coupling between the grid and plate. At H, the grid is excited partly by magnetic coupling between the grid and plate circuits, but mainly through the grid-plate capacity. The latter is here of more importance than in the tickler feedback because the variometer may be set to offer a higher impedance to the plate current variations than the untuned tickler can offer. Therefore the plate voltage variations in the case of the variometer — or otherwise — tuned plate may be considerably greater than the voltage variations on the plate with tickler feedback. Consequently, the small grid-plate capacity plays a more important rôle with the tuned plate system. However, in both methods both inductive and capacitative coupling is employed to a greater and smaller extent and, as in effect and results there is little actual difference between them, we may say that G is like H. Remember that in place of the variometer in H we may substitute the coil and condenser as from A to B.

Of course in detail we must realize there is a difference in these circuits, but in general principles there is a similarity, which it is worth while to recognize in order to properly classify our knowledge of radio.

Now examine a method of regeneration that appears radically different from either G or H; this is the Weagant X circuit as shown in K. Here the low frequency output is shunted by a series inductance and capacity. We like to think of this circuit as shown in L. Here the headset is represented by the inductance Xp, the resistance Rp and the distributed capacity of the headset, Xc. The total presents some low value of impedance to radio frequency variations, not sufficient however to make the plate voltage variations great enough to excite the grid through the small grid-plate capacity, but when the complete tuned circuit comprised of the headset (Xp, Xc and Rp), the coil and condenser is adjusted to the frequency of the plate

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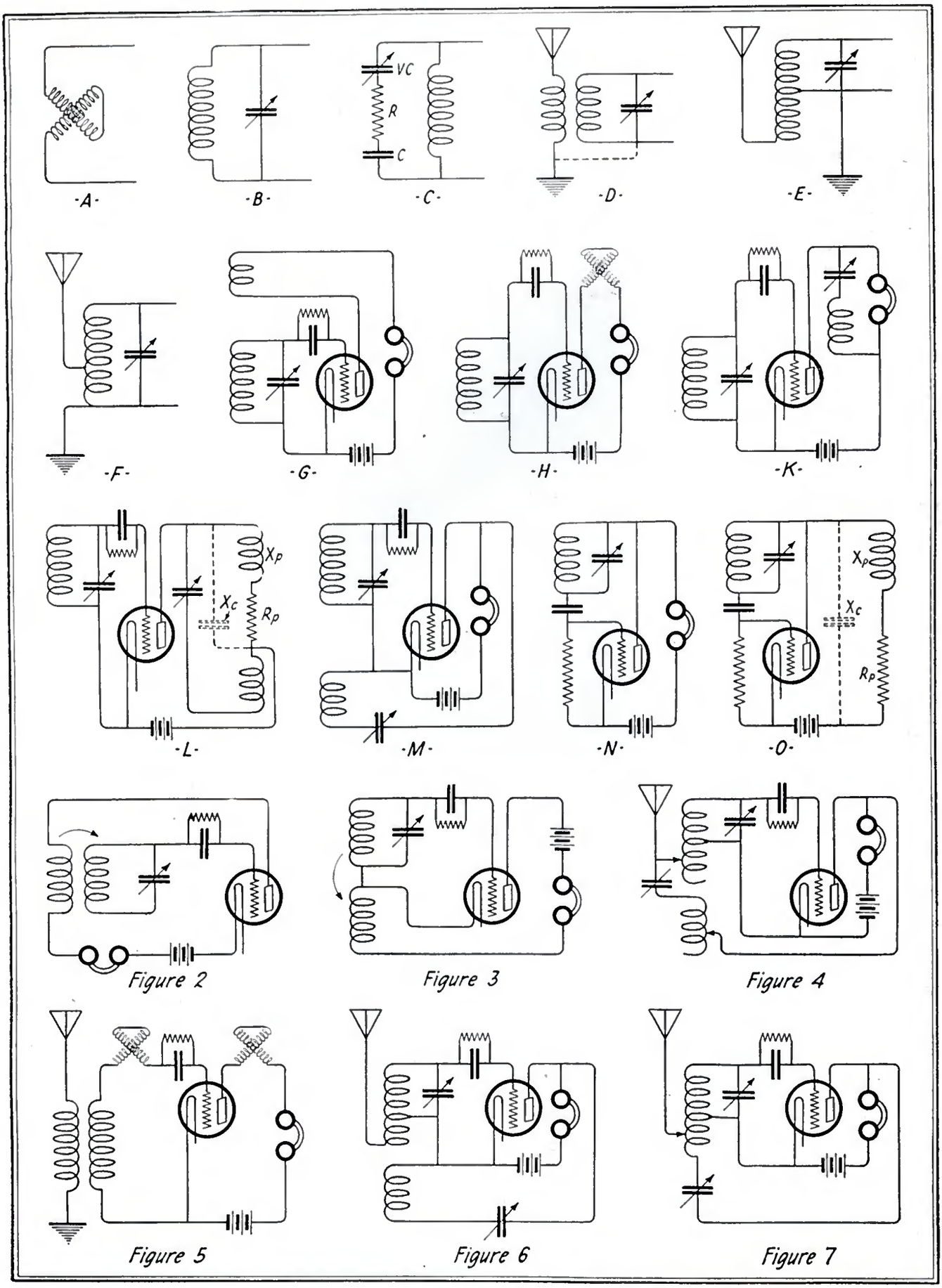


Circuit diagrams of popular one-tube regenerative receivers

AFLOAT AND ASHORE WITH THE OPERATOR

By W. S. Fitzpatrick

WONDER now, did you miss this page last month? How did you like the Marconi article instead? But, wait, you don't know what happened! After weeks of delving through old records, magazines and newspaper clippings, a chronologic record of fifty-one first events in radio was prepared—but the Ed sayeth he is running a magazine and not an almanac, so after wielding ye old blue pencil he called for something to take its place—hence the Marconi account!

You are not, however—and the determination is here—going to be the loser. Retaining the authentic dates and historic values, the different events are to be incorporated in a more readable article, offsetting the objectionable "dryness"—and you'll get it in the near future.

△ △ △

JUDGING from the response to this page during the past year, it seems evident that the greatest interest lies in the old time marine radio operators and their subsequent successes.

Through the courtesy of Mr. Arthur A. Isbell, manager of the activities of the Radio Corporation on the Pacific coast—including the sales, transoceanic and marine services—who is, himself, one of the original old timers, it has been learned that L. W. Sturdevant is now manager of the radio department of Sherman-Clay & Company, San Francisco, one of the largest distributors of musical instruments in the Pacific states and fast becoming equally prominent as radio jobbers. Sig. Goskey is still in Alaska with the Alaska-Packer Association.

△ △ △

A COINCIDENCE that has been brought to light through this page is that no less than eight well known old time radio operators were schoolmates at the same New York City public school—No. 29, in the Bronx—and all lived within two squares of the school.

They are Axel G. Berg, Donald J. Pieri, Richard G. Cuthbert, Nathan J. Ribler, Frank Rosenquist, R. J. Dean, W. W. Jablonsky and Herold McCormick.

△ △ △

AXEL G. BERG is quite prominent among the old timers and has had greatly varied experiences since his advent into the radio field much over a decade ago. He has been in more than a hundred ports, visiting practically every country of importance, which must be of value to him in connection with the post he now holds in the Radio Corporation's export division.

Axel G. Berg, old time radio operator now holding important position in RCA export department

"My experiences would fill a good sized book," commented Mr. Berg when asked to relate some of them. "I've been around some, in fact Africa is the only continent I have not been on.

"Aside from the thrill of sending out SOS calls, which has been my lot, what comes foremost to my mind just now is the two times that I was left ashore in foreign countries; once in far away Australia and another time in Mexico. I might laugh now, but it was no fun at the time. How did I get back? Well, in Australia I managed to convince the steamship agents that I was not at fault and that they should advance expenses to the ship's next port of call. I had to travel a considerable distance to the other port where I caught the ship a week later. In Mexico my ship was taken over by the government during the height of one of their rebellions. The days I spent there were most ticklish ones. I finally managed to connect with a passenger steamer which brought me to New York where quite a controversy was started as to who should pay my fare. I believe the company operating the ship which brought me to Mexico eventually paid it—I know I didn't.

"I was rather ambitious when I went to sea. I studied navigation until I mastered it and on two occasions put my knowledge to use. Once on a sailing vessel when the third mate deserted I acted in his stead for the voyage. On a steamer at another time the second mate was taken sick, the third was promoted and I took his place.

"I also studied marine engineering and spent eight months in the engine room of a ship. Later I took up structural engineering."

Mr. Berg was urged to continue, but without avail.

During the war Mr. Berg wore a U. S. Naval uniform. He was at the Sea Gate station, then transferred to Sayville, where he was placed in charge of a watch. Later he was made an inspector under the District Communication Superintendent of New York.

Following his release from the navy at the end of the war he took an interesting trip on a ship to Russia.

Returning to New York Mr. Berg decided to give up the sea. He became a motion picture actor and it was not long before he was playing important rôles, although never attaining the rank of star.

Seven months as a movie actor and we find him back with his old love, Radio.

He was appointed by the Radio Corporation to the position of traveling representative out of Chicago, covering the entire middle western territory from Duluth to New Orleans. It was a difficult task to open up new territory but Mr. Berg was found equal to it.

Some time later he was transferred to New York and when the new service division was organized by the Radio Corporation he was placed in charge of the New York office of that division.

Starting with a force of less than a dozen it was soon increased five fold. Here his earnest work and ability again showed itself and he was transferred to the head offices of the company in the Woolworth Building and later appointed to his present post.

Mr. Berg is keenly interested in old timers and finds great pleasure in recalling names of his former associates and their deeds. He has made the suggestion that an old time radio organization be formed along the lines of the Old Time Telegraphers Association.

BROADCASTING STATION DIRECTORY

The Most Authentic, Up-to-the-Minute List of Stations Broadcasting in the United States, Canada, England, France and Cuba

KDKA	Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.	326
KDPM	Westinghouse Elec. & Mfg. Co., Cleveland, O.	270
KDPT	Southern Electrical Co.....San Diego, Calif.	244
KDYL	Newhouse Hotel.....Salt Lake City, Utah	360
KDYM	Savoy Theater.....San Diego, Calif.	280
KDYQ	Oregon Institute of Technology....Portland, Ore.	360
KDZB	Frank E. Siefert.....Bakersfield, Calif.	240
KDZE	Rhodes Department Store.....Seattle, Wash.	270
KDZR	Bellingham Publishing Co...Bellingham, Wash.	261
KFAD	McArthur Bros. Mercantile Co., Phoenix, Ariz.	360
KFAE	State College of Washington...Pullman, Wash.	330
KFAF	Western Radio Corp.....Denver, Colo.	278
KFAJ	University of Colorado.....Boulder, Colo.	261
KFAR	Studio Lighting Service Co....Hollywood, Calif.	280
KFAW	The Radio Den.....Santa Ana, Calif.	280
KFAY	Virgin's Radio Service.....Medford, Ore.	283
KFBB	F. A. Buttrey & Co.....Havre, Mont.	360
KFBC	W. K. Azbill.....San Diego, Calif.	278
KFBE	Reuben H. Horn.....San Luis Obispo, Calif.	242
KFBG	First Presbyterian Church.....Tacoma, Wash.	360
KFBK	Kimball-Upson Co.....Sacramento, Calif.	283
KFBL	Leese Bros. .....Everett, Wash.	224
KFBS	Trinidad Gas & Electric Supply Co. and The Chronicle News, Trinidad, Colo.	280
KFBU	The Cathedral .....Laramie, Wyo.	283
KFCB	Nielsen Radio Supply Co.....Phoenix, Ariz.	238
KFCF	Frank A. Moore.....Walla Walla, Wash.	360
KFCP	Ralph W. Flygare.....Ogden, Utah	360
KFCV	Fred Mahaffey, Jr.....Houston, Tex.	360
KFCZ	Omaha Central High School.....Omaha, Nebr.	258
KFDD	St. Michaels Cathedral.....Boise, Idaho	252
KFDH	University of Arizona.....Tucson, Ariz.	268
KFDJ	Oregon Agricultural College.....Corvallis, Ore.	360
KFDL	Knight Campbell Music Co.....Denver, Colo.	360
KFDX	First Baptist Church.....Shreveport, La.	360
KFDY	South Dakota State College of Agriculture, Brookings, S. D.	273
KFDZ	Harry O. Iverson.....Minneapolis, Minn.	231
KFEC	Meier & Frank Co.....Portland, Ore.	248
KFEL	Winner Radio Corp.....Denver, Colo.	254
KFEQ	Scroggin & Co. Bank.....Oak, Nebr.	268
KFER	Auto Electric Service Co.....Fort Dodge, Iowa	231
KFEX	Augsburg Seminary .....Minneapolis, Minn.	261
KFEY	Bunker Hill & Sullivan Mining & Concentrating Co., Kellogg, Idaho	360
KFFB	Jenkins Furniture Co.....Boise, Idaho	240
KFFE	Eastern Oregon Radio Co.....Pendleton, Ore.	360
KFFP	First Baptist Church.....Moberly, Mo.	266
KFFR	Nevada State Journal.....Sparks, Nev.	226
KFFV	Graceland College .....Lamoni, Iowa	280
KFFY	Pincus & Murphey.....Alexandria, La.	275
KFGC	Louisiana State University...Baton Rouge, La.	254
KFGD	Chickasha Radio & Electric Co., Chickasha, Okla.	248
KFGH	Leland Stanford Junior University, Stanford University, Calif.	273
KFGL	Snell & Irby.....Arlington, Ore.	234
KFGQ	Crary Hardware Co.....Boone, Iowa	226
KFGX	First Presbyterian Church.....Orange, Tex.	250
KFGZ	Emmanuel Missionary College, Berrien Springs, Mich.	286
KFHA	Western State College of Colo., Gunnison, Colo.	252
KFHD	Utz Electric Shop Co.....St. Joseph, Mo.	226
KFHH	Ambrose A. McCue.....Neah Bay, Wis.	261
KFHJ	Fallon & Co.....Santa Barbara, Calif.	360
KFHR	Star Electric & Radio Co.....Seattle, Wash.	283
KFI	Earle C. Anthony (Inc.)....Los Angeles, Calif.	469
KFIF	Benson Polytechnic Institute.....Portland, Ore.	360
KFIO	North Central High School.....Spokane, Wash.	252
KFIQ	First Methodist Church.....Yakima, Wash.	242
KFIU	Alaska Elec. Light & Power Co., Juneau, Alaska	226
KFIX	Reorganized Church of Jesus Christ of Latter Day Saints, Independence, Mo.	240
KFIZ	Daily Commonwealth and Oscar A. Huelsman, Fond du Lac, Wis.	273
KFJB	Marshall Electric Co.....Marshalltown, Iowa	248
KFJC	Seattle Post Intelligencer.....Seattle, Wash.	270
KFJF	National Radio Mfg. Co.....Oklahoma, Okla.	252
KFJI	Liberty Theater .....Astoria, Ore.	252
KFJK	Delano Radio & Electric Co....Bristow, Okla.	233
KFJL	Hardisaeg Mfg. Co.....Ottumwa, Iowa	242
KFJM	University of North Dakota, Grand Forks, N. D.	280
KFJQ	Electric Construction Co., Valley Radio Division, Grand Forks, N. D.	280
KFJR	Ashley C. Dixon & Son.....Stevensville, Mont.	258
KFJX	Iowa State Teachers' College, Cedar Falls, Iowa	280
KFJY	Tunwall Radio Co.....Fort Dodge, Iowa	246
KFJZ	Texas National Guard, 112th Cavalry, Fort Worth, Tex.	254
KFKA	Colorado State Teachers College, Greeley, Colo.	273
KFKB	Brinkley-Jones Hospital Assn....Milford, Kans.	286
KFKQ	Conway Radio Laboratories.....Conway, Ark.	250
KFKV	F. F. Gray.....Butte, Mont.	283
KFKX	Westinghouse Elec. & Mfg. Co., Hastings, Nebr.	341
KFKZ	Nassour Bros. Radio Co., Colorado Springs, Colo.	234
KFLA	Abner R. Willson.....Butte, Mont.	283
KFLB	Signal Electric Mfg. Co.....Menominee Mich.	248
KFLD	Paul E. Greenlaw.....Franklinton, La.	234
KFLE	National Educational Service.....Denver, Colo.	268
KFLQ	Bizzell Radio Shop.....Little Rock, Ark.	261
KFLU	Rio Grande Radio Supply House, San Benito, Tex.	236
KFLV	Swedish Evangelical Mission Church, Rockford, Ill.	229
KFLX	George R. Clough.....Galveston, Tex.	240
KFLZ	Atlantic Automobile Co.....Atlantic, Iowa	273
KFMB	Christian Churches of Little Rock, Little Rock, Ark.	254
KFMQ	University of Arkansas.....Fayetteville, Ark.	263
KFMR	Morningside College .....Sioux City, Iowa	261
KFMT	George W. Young.....Minneapolis, Minn.	231
KFMW	M. G. Sateren.....Houghton, Mich.	266
KFMX	Carleton College .....Northfield, Minn.	283
KFNF	Henry Field Seed Co.....Shenandoah, Iowa	266
KFNG	Wooten's Radio Shop.....Coldwater, Miss.	254
KFNJ	Warrensburg Electric Shop...Warrensburg, Mo.	234
KFNL	Radio Broadcast Assn.....Paso Robles, Calif.	240
KFNV	L. A. Drake.....Santa Rosa, Calif.	234
KFNY	Montana Phonograph Co.....Helena, Mont.	261
KFNZ	Royal Radio Co.....Burlingame, Calif.	231
KFOA	Rhodes Co. .....Seattle, Wash.	455
KFOC	First Christian Church.....Whittier, Calif.	236
KFOD	The Radio Shop.....Wallace, Idaho	224
KFOF	Rohrer Elec. Co.....Marshfield, Ore.	360
KFOJ	Moberly High School Radio Club, Moberly, Mo.	246
KFOL	Leslie M. Schafbuch.....Marengo, Iowa	234
KFON	Echophone Radio Shop.....Long Beach, Calif.	234
KFOO	Latter Day Saints University, Salt Lake City, Utah	261
KFOQ	Ora W. Chancellor.....Galveston, Tex.	240
KFOR	David City Tire & Elec. Co., David City, Nebr.	226
KFOT	College Hill Radio Club.....Wichita, Kans.	231
KFOU	Hommel Mfg. Co.....Richmond, Calif.	254
KFOX	Technical High School.....Omaha, Nebr.	248
KFOY	Beacon Radio Service.....St. Paul Minn.	226
KFOZ	Leon Hudson Real Estate Co..Fort Smith, Ark.	233
KFPB	Edwin J. Brown.....Seattle Wash.	224
KFPG	Garretson & Dennis.....Los Angeles. Calif.	238
KFPH	Harold C. Mallander.....Salt Lake City, Utah	242
KFPL	C. C. Baxter.....Dublin, Tex.	242
KFPM	New Furniture Co.....Greenville, Tex.	242
KFPN	Missouri National Guard, 70th Infantry Brigade, Jefferson City, Mo.	242
KFPO	Colorado National Guard, 45th Divisional Tank Co., Denver, Colo.	231
KFPP	G. & G. Radio & Electric Shop, Olympia, Wash.	236
KFPR	Los Angeles County Forestry Department, Los Angeles, Calif.	231
KFPT	Cope & Johnson.....Salt Lake City, Utah	268
KFPV	Heintz & Kohlmoos.....San Francisco, Calif.	236
KFPW	St. Johns Church.....Carterville, Mo.	268
KFPX	First Presbyterian Church.....Pine Bluff, Ark.	242
KFPY	Symons Investment Co.....Spokane, Wash.	283
KFQA	The Principia .....St. Louis, Mo.	261
KFQB	Searchlight Publishing Co....Fort Worth, Tex.	254
KFQC	Kidd Brothers Radio Shop.....Taft, Calif.	227
KFQD	Chovin Supply Co.....Anchorage, Alaska	280
KFQE	Dickenson-Henry Radio Laboratories, Colorado Springs, Colo.	224
KFQF	Donald A. Boult.....Minneapolis, Minn.	224
KFQG	Southern California Radio Assn, Los Angeles, Calif.	226
KFQH	Radio Service Co.....Burlingame, Calif.	360
KFQI	Thomas H. Ince Corp.....Culver City, Calif.	234
KFQJ	Harbour-Longmire Co. .....Oklahoma, Okla.	226
KFQK	Democrat Leader .....Fayette, Mo.	236
KFQL	Oklahoma Free State Fair Assn., Muskogee, Okla.	252
KFQM	Texas Highway Bulletin.....Austin, Tex.	268
KFQN	Third Baptist Church.....Portland, Ore.	283
KFQO	Meier Radio Shop.....Russell, Kans.	261
KFQP	George S. Carson, Jr.....Iowa City, Iowa	224
KFQR	Walter L. Ellis.....Oklahoma, Okla.	250
KFQS	Dickenson-Henry Radio Laboratories, Manitou, Colo.	246
KFQT	Texas National Guard, 36th Signal Company, Denison, Tex.	252
KFQZ	Taft Radio Co.....Hollywood, Calif.	360
KFRC	Radicart Studio .....San Francisco, Calif.	280
KFSG	Echo Park Evangelistic Assn, Los Angeles, Calif.	278
KFSY	Van Blaricom Co.....Helena, Mont.	360
KGB	Tacoma Daily Ledger.....Tacoma, Wash.	252
KGG	Hallock & Watson Radio Service, Portland, Ore.	360
KGO	General Electric Co.....Oakland, Calif.	312
KGU	Marion A. Mulrony.....Honolulu, Hawaii	360
KGW	Portland Morning Oregonian....Portland, Ore.	492
KGY	St. Martins College.....Lacey, Wash.	258
KHJ	Times-Mirror Co. .....Los Angeles, Calif.	395
KHQ	Louis Wasmer (Excelsior Motorcycle & Bicycle Co.), Seattle, Wash.	360
KJQ	C. O. Gould.....Stockton, Calif.	273
KJR	Northwest Radio Service Co....Seattle, Wash.	283
KJS	Bible Inst. of Los Angeles, Los Angeles, Calif.	360
KLS	Warner Brothers Radio Supplies Co., Oakland, Calif.	360
KLX	Tribune Publishing Co.....Oakland, Calif.	509
KLZ	Reynolds Radio Co.....Denver, Colo.	283
KMJ	San Joaquin Light & Power Corp., Fresno, Calif.	248
KMO	Love Electric Co.....Tacoma, Wash.	360
KNT	Walter Hemrich .....Kukak Bay, Alaska	263
KNX	Electric Lighting Supply Co..Los Angeles, Calif.	360
KOB	New Mexico College of Agriculture and Mechanic Arts, State College, N. Mex.	360
KOP	Detroit Police Department.....Detroit, Mich.	286
KPO	Hale Bros. .....San Francisco, Calif.	423
KQP	Apple City Radio Club.....Hood River, Ore.	360
KQV	Doubleday-Hill Electric Co.....Pittsburgh, Pa.	270
KQW	Charles D. Herrold.....San Jose, Calif.	360
KRE	Berkeley Daily Gazette.....Berkeley, Calif.	275
KSD	Post Dispatch .....St. Louis, Mo.	546
KTW	First Presbyterian Church.....Seattle, Wash.	360
KUO	Examiner Printing Co.....San Francisco, Calif.	360
KUY	Coast Radio Co.....El Monte, Calif.	256
KWG	Portable Wireless Telephone Co...Stockton, Calif.	360
KWH	Los Angeles Examiner.....Los Angeles, Calif.	360
KYQ	The Electric Shop.....Honolulu, Hawaii	270
KYW	Westinghouse Elec. & Mfg. Co....Chicago, Ill.	536
KZM	Preston D. Allen.....Oakland, Calif.	360
WAAB	Valdemar Jensen .....New Orleans, La.	268
WAAC	Tulane University .....New Orleans, La.	360
WAAD	Ohio Mechanics Institute.....Cincinnati, Ohio	360
WAAF	Chicago Daily Drovers Journal.....Chicago, Ill.	266
WAAM	I. R. Nelson Co.....Newark, N. J.	263
WAAN	University of Missouri.....Columbia, Mo.	254
WAAW	Omaha Grain Exchange.....Omaha, Nebr.	286
WABB	Harrisburg Sporting Goods Co...Harrisburg, Pa.	266
WABD	Parker High School.....Dayton, Ohio	283
WABE	Young Men's Christian Assn..Washington, D. C.	283
WABH	Lake Shore Tire Co.....Sandusky, Ohio	240
WABI	Bangor Railway & Electric Co....Bangor, Me.	240
WABL	Connecticut Agricultural College...Storrs, Conn.	283
WABM	F. E. Doherty Automotive & Radio Equipment Co., Saginaw, Mich.	254
WABO	Lake Avenue Baptist Church....Rochester, N. Y.	283
WABP	Robert F. Weinig.....Dover, Ohio	256
WABQ	Haverford College Radio Club....Haverford, Pa.	254
WABR	Scott High School.....Toledo, Ohio	270
WABU	Victor Talking Machine Co.....Camden, N. J.	226
WABW	College of Wooster.....Wooster, Ohio	231
WABX	Henry B. Joy.....Mount Clemens, Mich.	270
WABY	John Magaldi, Jr.....Philadelphia, Pa.	272
WABZ	Coliseum Place Baptist Church, New Orleans, La.	253
WBAA	Purdue University .....West Lafayette, Ind.	283
WBAH	The Dayton Co.....Minneapolis, Minn.	417
WBAN	Wireless Phone Corporation.....Paterson, N. J.	214
WBAO	James Millikin University.....Decatur, Ill.	275
WBAP	Wortham-Carter Publishing Co. (Star-Telegram), Fort Worth, Tex.	476
WBAV	Erner & Hopkins Co.....Columbus, Ohio	423
WBAX	John H. Stenger, Jr.....Wilkes-Barre, Pa.	360
WBAY	Western Electric Co.....New York, N. Y.	492
WBBD	Barbey Battery Service.....Reading, Pa.	234
WBBG	Irving Vermilya .....Mattapoisett, Mass.	248
WBBH	J. Irving Bell.....Port Huron, Mich.	246
WBBL	Grace Covenant Church.....Richmond, Va.	283
WBBM	Frank Atlass Produce Co.....Lincoln, Ill.	226
WBBN	A. B. Blake.....Wilmington, N. C.	275
WBBP	Petoskey High School.....Petoskey, Mich.	246
WBBR	Peoples Pulpit Association.....Rossville, N. Y.	273
WBBT	Lloyd Brothers .....Philadelphia, Pa.	234
WBBU	Jenks Motor Sales Co.....Monmouth, Ill.	224
WBBV	Johnstown Radio Co.....Johnstown, Pa.	248
WBBW	Ruffner Junior High School.....Norfolk, Va.	222
WBBY	Washington Light Infantry....Charleston, S. C.	268
WBBZ	Noble B. Watson.....Indianapolis, Ind.	227
WBL	T & H Radio Co.....Anthony, Kans.	254
WBS	D. W. May, Inc.....Newark, N. J.	360
WBT	Southern Radio Corporation....Charlotte, N. C.	360
WBZ	Westinghouse Elec. & Mfg. Co., Springfield, Mass.	337
WCAD	St. Lawrence University .....Canton, N. Y.	280
WCAE	Kaufmann & Baer Co.....Pittsburgh, Pa.	462
WCAG	Clyde R. Randall.....New Orleans, La.	268

WCAH	Entrekin Electric Co.	Columbus, Ohio 286
WCAJ	Menrasia Wesleyan University,	University Place, Nebr. 283
WCAK	Alfred P. Daniel	Houston, Tex. 263
WCAL	St. Olaf College	Northfield, Minn. 360
WCAO	Sanders & Stayman Co.	Baltimore, Md. 360
WCAP	Chesapeake & Potomac Telephone Co.,	Washington, D. C. 469
WCAR	Southern Radio Corporation of Texas,	San Antonio, Tex. 360
WCAS	William Hood Dunwoody Industrial Institute,	Minneapolis, Minn. 280
WCAT	South Dakota State School of Mines,	Rapid City, S. Dak. 240
WCAU	Durham & Co.	Philadelphia, Pa. 226
WCAV	J. C. Dice Electric Co.	Little Rock, Ark. 360
WCAX	University of Vermont	Burlington, Vt. 360
WCAY	Milwaukee Civic Broadcasting Station,	Milwaukee Wis. 266
WCAZ	Carthage College	Carthage, Ill. 246
WCBA	Charles W. Helmbach	Allentown, Pa. 280
WCBC	University of Michigan	Ann Arbor, Mich. 280
WCBD	Wilbur G. Voliva	Zion, Ill. 345
WCBE	Uhalt Radio Co.	New Orleans, La. 263
WCBF	Paul J. Miller	Pittsburgh, Pa. 236
WCBG	Howard S. Williams	Pascagoula, Miss. 268
WCBH	University of Mississippi	Oxford, Miss. 242
WCBI	Nicoll, Duncan & Rush	Bemis, Tenn. 240
WCBJ	J. C. Mans	Jennings, La. 244
WCBK	E. Richard Hall	St. Petersburg, Fla. 266
WCBL	Northern Radio Mfg. Co.	Houlton, Me. 280
WCBM	Charles Schwarz	Baltimore, Md. 229
WCBN	James P. Boland, Lieut. U. S. A.,	Fort Benjamin Harrison, Ind. 266
WCBO	Radio Shop, Inc.	Memphis, Tenn. 250
WCBQ	First Baptist Church	Nashville, Tenn. 236
WCBR	Charles H. Messter	Providence, R. I. 246
WCBT	Clark University	Worcester, Mass. 238
WCBU	Arnold Wireless Supply Co.	Arnold, Pa. 254
WCBV	Tullahoma Radio Club	Tullahoma, Tenn. 252
WCBW	George P. Rankin, Jr., and Mitland Soloman,	Macon, Ga. 226
WCBX	Radio Shop of Newark	Newark, N. J. 233
WCBY	Forks Electrical Shop	Buck Hill Falls, Pa. 268
WCBZ	Coppotelli Bros. Music House,	Chicago Heights, Ill. 248
WCK	Stix-Baer & Fuller Dry Goods Co.,	St. Louis, Mo. 360
WCX	Detroit Free Press	Detroit, Mich. 517
WDAE	Tampa Daily Times	Tampa, Fla. 360
WDAF	Kansas City Star	Kansas City, Mo. 411
WDAG	J. Laurance Martin	Amarilla, Tex. 263
WDAH	Trinity Methodist Church (South),	El Paso, Tex. 268
WDAR	Lit Brothers	Philadelphia, Pa. 395
WDAS	Sam Waite's Radio Shop	Worcester, Mass. 360
WDAU	Slocum & Kilburn	New Bedford, Mass. 360
WDAY	Radio Equipment Corporation,	Fargo, N. Dak. 244
WDBB	A. H. Waite & Co.	Taunton, Mass. 229
WDBC	Kirk, Johnson & Co.	Lancaster, Pa. 258
WDBD	Herman E. Burns	Martinsburg W. Va. 268
WDBF	Robert G. Phillips	Youngstown, Ohio 246
WDBH	C. T. Sherer Co.	Worcester, Mass. 268
WDBI	Radio Specialty Co.	St. Petersburg, Fla. 226
WDBJ	Richardson-Wayland Elec'l Corp.,	Roanoke, Va. 229
WDBK	M. F. Broz Furniture, Hardware & Radio Co.,	Cleveland, Ohio 248
WDBN	Maine Electric Light & Power Co.,	Bangor, Me. 252
WDBO	Rollins College	Winter Park, Fla. 240
WDBP	Superior State Normal School	Superior, Wis. 261
WDBQ	Morton Radio Supply Co.	Salem, N. J. 234
WDBR	Tremont Temple Baptist Church	Boston, Mass. 256
WDBS	S. M. K. Radio Corp.	Dayton, Ohio 233
WDBT	Taylor's Book Store	Hattiesburg, Miss. 236
WDBU	Somerset Radio Co.	Skowhegan, Me. 258
WDBV	Strand Theater	Fort Wayne, Ind. 258
WDBW	The Radio Den	Columbia, Tenn. 268
WDBX	Otto Baur	New York, N. Y. 233
WDBY	North Shore Congregational Church	Chicago, Ill. 258
WDBZ	Boy Scouts of America (Ulster County Council),	Kingston, N. Y. 233
WDM	Church of the Covenant	Washington, D. C. 234
WDZ	James L. Bush	Tuscola, Ill. 278
WEAA	Frank D. Fallain	Flint, Mich. 280
WEAF	American Tel. & Tel. Co.	New York, N. Y. 492
WEAH	Wichita Board of Trade	Wichita, Kans. 280
WEAI	Cornell University	Ithaca, N. Y. 286
WEAJ	University of South Dakota	Vermillion, S. Dak. 283
WEAM	Borough of North Plainfield,	North Plainfield, N. J. 286
WEAN	Shepard Co.	Providence, R. I. 273
WEAO	Ohio State University	Columbus, Ohio 360
WEAP	Mobile Radio Co.	Mobile, Ala. 360
WEAR	Evening News Publishing Co.	Baltimore, Md. 261
WEAU	Davidson Bros. Co.	Sioux City, Iowa 275
WEAY	Iris Theater	Houston, Tex. 360
WEB	Benwood Co.	St. Louis, Mo. 273
WEBA	The Electric Shop	Highland Park, N. J. 233
WEBC	Walter C. Bridges	Superior, Wis. 242
WEBD	Electrical Equipment & Service Co.,	Anderson, Ind. 246
WEBH	Edgewater Beach Hotel Co.	Chicago, Ill. 370
WEBK	Grand Rapids Radio Co.	Grand Rapids, Mich. 360
WEBP	Spanish Fort Amusement Park,	New Orleans, La. 280
WEV	Hurlburt-Still Electrical Co.	Houston, Tex. 263
WEW	St. Louis University	St. Louis, Mo. 280
WFAA	Dallas News and Dallas Journal	Dallas, Tex. 476
WFAB	Carl F. Woese	Syracuse, N. Y. 234
WFAM	Times Publishing Co.	St. Cloud, Minn. 273
WFAN	Hutchinson Electric Service Co.,	Hutchinson, Minn. 286
WFAV	University of Nebraska	Lincoln, Nebr. 275
WFBI	Galvin Radio Supply Co.	Camden, N. J. 236
WFI	Strawbridge & Clothier	Philadelphia, Pa. 395
WGAL	Lancaster Electric Supply & Construction Co.,	Lancaster, Pa. 248
WGAN	Cecil E. Lloyd	Pensacola, Fla. 360
WGAQ	Yauree Hotel	Shreveport, La. 252
WGAZ	South Bend Tribune	South Bend, Ind. 275
WGI	American Radio & Research Corp.	Medford Hillside, Mass. 360
WGL	Thomas F. J. Howlett	Philadelphia, Pa. 360
WGN	Tribune	Chicago, Ill. 370
WGR	Federal Tel. & Tel. Co.	Buffalo, N. Y. 319
WGY	General Electric Co.	Schenectady, N. Y. 380
WHA	University of Wisconsin	Madison, Wis. 360
WHAA	State University of Iowa	Iowa City, Iowa 484
WHAD	Marquette University	Milwaukee, Wis. 280
WHAG	University of Cincinnati	Cincinnati, Ohio 222
WHAH	Hafer Supply Co.	Joplin, Mo. 283
WHAK	Roberts Hardware Co.	Clarksburg, W. Va. 258
WHAM	University of Rochester	Rochester, N. Y. 283
WHAR	Seaside Hotel	Atlantic City, N. J. 275
WHAS	Courier-Journal and Louisville Times,	Louisville, Ky. 400
WHAV	Wilmington Electrical Specialty Co.,	Wilmington, Del. 60
WHAZ	Rensselaer Polytechnic Institute,	Troy, N. Y. 380
WHB	Sweeney School Co.	Kansas City, Mo. 411
WHK	Radiovox Co.	Cleveland, Ohio 283
WHN	George Schubel	New York, N. Y. 360
WHO	Bankers Life Co.	Des Moines, Iowa 526
WIAB	Art. A. Jonnson Garage	Rockford, Ill. 254
WIAC	Galveston Tribune	Galveston, Tex. 360
WIAD	Howard R. Miller	Philadelphia, Pa. 254
WIAK	Journal-Stockman Co.	Omaha, Nebr. 270
WIAQ	Chronicle Publishing Co.	Marion, Ind. 226
WIAS	Home Electric Co.	Burlington, Iowa 250
WIK	K. & L. Electric Co.	McKeesport, Pa. 234
WIL	Continental Electrical Supply Co.,	Washington, D. C. 360
WIP	Gimbel Brothers	Philadelphia, Pa. 509
WJAB	American Electric Co.	Lincoln, Nebr. 229
WJAD	Jackson's Radio Engineering Laboratories,	Waco, Tex. 360
WJAG	Norfolk Daily News	Norfolk, Nebr. 283
WJAK	Clifford L. White	Greentown, Ind. 254
WJAM	D. M. Perham	Cedar Rapids, Iowa 268
WJAN	Peoria Star	Peoria, Ill. 280
WJAR	The Outlet Co.	Providence, R. I. 360
WJAS	Pittsburgh Radio Supply House,	Pittsburgh, Pa. 285
WJAX	Union Trust Co.	Cleveland, Ohio 390
WJAZ	Chicago Radio Laboratory	Chicago, Ill. 268
WJD	Denison University	Granville, Ohio 229
WJY	R. C. A.	New York, N. Y. 405
WJZ	R. C. A.	New York, N. Y. 455
WKAA	H. F. Paar	Cedar Rapids, Iowa 278
WKAD	Charles Looff (Crescent Park),	East Providence, R. I. 240
WKAF	W. S. Radio Supply Co.	Wichita Falls, Tex. 360
WKAN	United Battery Service Co.	Montgomery, Ala. 226
WKAP	Dutee W. Flint	Cranston, R. I. 360
WKAQ	Radio Corp. of Porto Rico	San Juan, P. R. 360
WKAR	Michigan Agricultural College,	E. Lansing Mich. 280
WKAV	Laconia Radio Club	Laconia, N. H. 254
WKBF	Dutee W. Flint	Cranston, R. I. 236
WKY	WKY Radio Shop	Oklahoma, Okla. 360
WLAG	Cutting & Washington Radio Corp.,	Minneapolis, Minn. 417
WLAH	Samuel Woodworth	Syracuse, N. Y. 234
WLAL	Naylor Electrical Co.	Tulsa, Okla. 360
WLAP	W. V. Jordon	Louisville, Ky. 286
WLAQ	Arthur E. Schilling	Kalamazoo, Mich. 283
WLAX	Putnam Electric Co. (Greencastle community broadcasting station),	Greencastle, Ind. 231
WLB	University of Minnesota	Minneapolis, Minn. 360
WLBL	Wisconsin Department of Markets,	Stevens Point, Wis. 278
WLS	Sears, Roebuck & Co.	Chicago, Ill. 345
WLW	Crosley Radio Corp.	Cincinnati, Ohio 423
WMAC	Clive B. Meredith	Cazenovia, N. Y. 261
WMAF	Round Hills Radio Corp.	Dartmouth, Mass. 360
WMAH	General Supply Co.	Lincoln, Nebr. 254
WMAK	Lockport Board of Commerce	Lockport, N. Y. 273
WMAL	Trenton Hardware Co.	Trenton, N. J. 256
WMAN	First Baptist Church	Columbus, Ohio 286
WMAQ	Chicago Daily News	Chicago, Ill. 448
WMAV	Alabama Polytechnic Institute	Auburn, Ala. 250
WMAY	Kingshighway Presby. Church	St. Louis, Mo. 280
WMAZ	Mercer University	Macon, Ga. 261
WMC	"Commercial Appeal"	Memphis, Tenn. 500
WMH	Ainsworth-Gates Radio Co.	Cincinnati, Ohio 309
WMU	Doubleday-Hill Electric Co.	Washington, D. C. 261
WNAC	Shepard Stores	Boston, Mass. 278
WNAD	University of Oklahoma	Norman, Okla. 360
WNAP	Wittenberg College	Springfield, Ohio 275
WNAR	First Christian Church	Butler, Mo. 231
WNAT	Lenning Brothers	Philadelphia, Pa. 360
WNAW	Henry Kunzmann	Fort Monroe, Va. 360
WNAX	Dakota Radio Apparatus Co.	Yankton, S. Dak. 244
WOAC	Page Organ Co.	Lima, Ohio 266
WOAE	Midland College	Fremont, Nebr. 280
WOAF	Tyler Commercial College	Tyler, Tex. 360
WOAG	Apollo Theater	Belvidere, Ill. 273
WOAI	Southern Equipment Co.	San Antonio, Tex. 385
WOAJ	Ervins Electrical Co.	Parsons, Kans. 258
WOAN	James D. Vaughn	Lawrenceburg, Tenn. 360
WOAO	Lyradion Mfg. Co.	Mishawaka, Ind. 360
WOAT	Boyd M. Hamp	Wilmington, Del. 360
WOAV	Pennsylvania National Guard, 112th Infantry,	Erie, Pa. 242
WOAW	Woodmen of the World	Omaha, Nebr. 526
WOAX	Franklyn J. Wolff	Trenton, N. J. 240
WOC	Palmer School of Chiropractic	Davenport, Iowa 484
WOI	Iowa State College	Ames, Iowa 360
WOO	John Wanamaker	Philadelphia, Pa. 509
WOQ	Western Radio Co.	Kansas City, Mo. 360
WOR	L. Bamberger & Co.	Newark, N. J. 405
WOS	Missouri State Marketing Bureau,	Jefferson City, Mo. 441
WPAB	Pennsylvania State College	State College, Pa. 283
WPAC	Donaldson Radio Co.	Okmulgee, Okla. 360
WPAJ	Doolittle Radio Corp.	New Haven, Conn. 268
WPAK	North Dakota Agricultural College,	Agricultural College, N. Dak. 283
WPAL	Avery & Loeb Electric Co.	Columbus, Ohio 286
WPAM	Auerbach & Guettel	Topeka, Kans. 273
WPAR	Ward Battery & Radio Co.	Beloit, Kans. 236
WPAU	Concordia College	Moorehead, Minn. 286
WPAZ	John R. Koch (Dr.)	Charleston, W. Va. 273
WQAA	Horace A. Beale, Jr.	Parkesburg, Pa. 360
WQAC	Glish Radio Service	Amarillo, Tex. 231
WQAE	Moore Radio News Station	Springfield, Vt. 275
WQAF	Sandusky Register	Sandusky, Ohio 240
WQAM	Electrical Equipment Co.	Miami, Fla. 283
WQAN	Scranton Times	Scranton, Pa. 280
WQAO	Calvary Baptist Church	New York, N. Y. 360
WQAQ	West Texas Radio Co. (Abilene Daily Reporter),	Abilene, Tex. 360
WQAS	Prince-Walter Co.	Lowell, Mass. 266
WQAX	Radio Equipment Co.	Peoria, Ill. 248
WQJ	Calumet Rainbow Broadcasting Co.	Chicago, Ill. 448
WRAF	The Radio Club	Laporte, Ind. 224
WRAL	Northern States Power Co.,	St. Croix Falls, Wis. 248
WRAM	Lombard College	Galesburg, Ill. 244
WRAN	Black Hawk Electrical Co.	Waterloo, Iowa 236
WRAO	St. Louis Radio Service Co.	St. Louis, Mo. 360
WRAV	Antioch College	Yellow Springs, Ohio 242
WRAW	Avenue Radio Shop	Reading, Pa. 238
WRAX	Flexon's Garage	Gloucester City, N. J. 268
WRBC	Immanuel Lutheran Church	Valparaiso, Ind. 278
WRC	Radio Corp. of America	Washington, D. C. 469
WRK	Doron Bros. Electrical Co.	Hamilton, Ohio 360
WRL	Union College	Schenectady, N. Y. 360
WRM	University of Illinois	Urbana, Ill. 360
WRR	City of Dallas, Police and Fire Signal Department,	Dallas, Tex. 360
WRW	Tarrytown Radio Research Laboratory,	Tarrytown, N. Y. 273
WSAB	Southeast Missouri State Teachers College,	Cape Girardeau, Mo. 360
WSAC	Clemson Agricultural Col.,	Clemson College, S. C. 360
WSAD	J. A. Foster Co.	Providence, R. I. 261
WSAI	United States Playing Card Co.	Cincinnati, Ohio 309
WSAJ	Grove City College	Grove City, Pa. 258
WSAP	Seventh Day Adventist Church,	New York, N. Y. 263
WSAR	Doughty & Welch Electrical Co.,	Fall River, Mass. 254
WSAU	Camp Marienfeld	Chesham, N. H. 229
WSAV	Clifford W. Vick Radio Construction Co.,	Houston, Tex. 360
WSAY	Irving Austin (Port Chester Chamber of Commerce),	Port Chester, N. Y. 233
WSAZ	Chase Electric Shop	Pomeroy, Ohio 258
WSB	Atlanta Journal	Atlanta, Ga. 429
WSL	J. & M. Electric Co.	Utica, N. Y. 273
WSOE	School of Engineering of Milwaukee,	Milwaukee, Wis. 246
WSY	Alabama Power Co.	Birmingham, Ala. 360
WTAB	Fall River Daily Herald Publishing Co.,	Fall River, Mass. 266
WTAC	Penn. Traffic Co.	Johnstown, Pa. 275
WTAF	Louis J. Gallo	New Orleans, La. 268
WTAJ	The Radio Shop	Portland, Me. 236
WTAL	Toledo Radio & Electric Co.	Toledo, Ohio 252
WTAM	Willard Storage Battery Co.	Cleveland, Ohio 390
WTAP	Cambridge Radio & Electric Co.	Cambridge, Ill. 242
WTAQ	S. H. Van Gorden & Son	Osseo, Wis. 254
WTAR	Reliance Electric Co.	Norfolk, Va. 280
WTAS	Charles E. Erbstein	Elgin, Ill. 286
WTAT	Edison Electric Illuminating Co,	Boston, Mass. 244
WTAU	Ruegg Battery & Electric Co.	Tecumseh, Nebr. 242
WTAW	Agricultural & Mechanical College of Texas,	College Station, Tex. 280
WTAX	Williams Hardware Co.	Streator, Ill. 231
WTAY	Oak Leaves Broadcasting Station,	Oak Park, Ill. 283
WTAZ	Thomas J. McGuire	Lambertville, N. J. 283
WTG	Kansas State Agricultural College,	Manhattan, Kans. 273
WTL	H. G. Saal Co.	Chicago, Ill. 268
WWAD	Wright & Wright, Inc.	Philadelphia, Pa. 360
WWI	Ford Motor Co.	Dearborn, Mich. 273
WWJ	Detroit News	Detroit, Mich. 517
WWL	Loyola University	New Orleans, La. 280

Canadian Stations

CKLC	Wilkinson Electric Co., Ltd.	Calgary, Alta. 400
CJCD	T. Eaton Co., Ltd.	Toronto, Ont. 410
CFCU	Jack V. Elliot, Ltd.	Hamilton, Ont. 410
CFLC	Chas. Guy Hunter	London, Ont. 430
CHCS	The Hamilton Spectator	Hamilton, Ont. 410
CHYC	Northern Electric Co., Ltd.	Montreal, P. Q. 341
CFCF	Marconi W. T. Co. of Can., Ltd.,	Montreal, P. Q. 440
CKCO	Dr. G. M. Geldert	Ottawa, Ont. 400
CHNC	Toronto Radio Research Society,	Toronto, Ont. 350
CKCH	Canadian National Railways	Ottawa, Ont. 435
CJCM	J. L. Philippe Landry	Mont Joli, P. Q. 312
CHXC	J. R. Booth, Jr.	Ottawa, Ont. 435
CHCE	Western Canada Radio Supply,	Victoria, B. C. 400
CKY	Manitoba Telephone System	Winnipeg, Man. 450
CKCD	Vancouver Daily Province	Vancouver, B. C. 410
CFCA	Star Publishing & Printing Co.,	Toronto, Ont. 400
CFAC	The Calgary Herald	Calgary, Alta. 430
CKAC	La Presse Publishing Co., Ltd.,	Montreal, P. Q. 430
CFCH	Abitibi Power & Paper Co., Ltd.,	Iroquois Falls, Ont. 400
CJCF	The News Record	Kitchener, Ont. 295
CJGC	London Free Press Printing Co., Ltd.,	London, Ont. 430
CFRF	Queen's University	Kingston, Ont. 450
CFCQ	Radio Specialties, Ltd.	Vancouver, B. C. 450
CFDQ	Sparks Company	Nanaimo, B. C. 430
CJCA	The Edmonton Journal, Ltd.	Edmonton, Alta. 450
CFCK	Radio Supply Co., Ltd.	Edmonton, Alta. 410
CJCE	Sprott Shaw Radio Co.	Vancouver, B. C. 400
CFCL	Centennial Methodist Church	Victoria, B. C. 400
CJSC	The Evening Telegram	Toronto, Ont. 430
CFYC	Victor Wentworth Odlum	Vancouver, B. C. 400
CFXC	Westminster Trust Co.	New Westminster, B. C. 440
CKCI	Le "Soliel" Limitee	Quebec, P. Q. 295
CFQC	The Electric Shop, Ltd.	Saskatoon, Sask. 400
CHBC	The Albertan Publishing Co.	Calgary, Alta. 410

British Stations

2LO	London	365
5IT	Birmingham	475
5WA	Cardiff	350
6BM	Bournemouth	385
2ZY	Manchester	375
5NO	Newcastle	400
5SC	Glasgow	420
2BD	Aberdeen	495
6SL	Sheffield (relay station)	303

French Stations

YN	Lyon	740
FL	Paris (Eiffel Tower)	2,600
ESP	Paris	450
8AJ	Paris	1,780

Cuban Stations

PWX	Cuban Telephone Co.	Habana 400
2DW	Pedro Zayas	Habana 300
2AB	Alberto S. de Rustamante	Habana 240
2OK	Mario Garcia Vélez	Habana 360
2BY	Frederick W. Borton	Habana 260
2CX	Frederick K. Borton	Habana 320
2EV	Westinghouse Elec. Co.	Habana 220
2TW	Roberto E. Ramirez	Habana 230
2HC	Heraldo de Cuba	Habana 275
2LC	Luis Casas	Habana 250
2KD	E. Sanchez de Fuentes	Habana 350
2MN	Fausto Simon	Habana 270
2MG	Manuel G. Salas	Habana 280
2JQ	Raul Pérez Falcon	Habana 150
2KP	Alvaro Daza	Habana 200
2HS	Julio Power	Habana 180
2OL	Oscar Collado	Habana 290
2WW	Amadeo Saenz	Habana 210
5EV	Leopold V. Figueroa	Colon 360
6KW	Frank H. Jones	Tuinucu 340
6KJ	Frank H. Jones	Tuinucu 275
5EV	Leopoldo V. Figueroa	Colon 360
6DW	Eduardo Terry	Cienfuegos 225
6BY	José Ganduxe	Cienfuegos 300
6AZ	Valentin Ulivarri	Cienfuegos 200
6EV	Josefa Alvarez	Caibarién 225
7AZ	Pedro Nogueras	Camaguey 225
7BY	Salvador Dionda	Camaguey 350
8AZ	Alfredo Brooeks	Santiago de Cuba 240
8BY	Alberto Ravelo	Santiago de Cuba 250
8FU	Andrés Vinnet	Santiago de Cuba 225
8DW	Pedro C. Anduz	Santiago de Cuba 275
8EV	Eduardo Mateos	Santiago de Cuba 180
8GT	Juan F. Chibas	Santiago de Cuba 260

The radio industries banquet at the Waldorf-Astoria Hotel, New York City

Close-Ups in the Industry

CONSIDERABLE interest has centered in the recent acquisition by The Crosley Radio Corporation of the controlling interest in the De Forest Radio Corp., Ltd., of Canada. This line opens a large field to the Crosley Products as the De Forest-Crosley receiving equipment will be of the type now manufactured by the present Crosley Radio Corp. of Cincinnati, Ohio.

ONE of the finest contributions to radio merchandising in the form of a book was recently made by the Music Master Corporation of Philadelphia, manufacturers of the Music Master Loud Speaker. It deals with advice of a special benefit to the dealer concerning the advisability of carrying only reputable well advertised stock and the effect on the buyer of sustained advertising. There is a full explanation on why a good loud speaker is necessary and why poor ones are harmful to the entire radio business. Detailed figures on advertising together with reproduction in colors of the covers of the magazines to be used in advertising are given so that the dealer knows exactly what sort of backing he is receiving. A very fine book and a welcome mile post in the radio merchandising field.

THE Carter Radio Co. has moved into its new large Chicago factory at 300 Racine Ave., Chicago. There are now plants at Bristol, Conn. and Hamilton, Canada, and at Chicago endeavoring to supply the ever increasing demand for Carter Radio Products. Mr. A. J. Carter, president of the company has been endeavoring to get manufacturers to standardize on radio equipment in the same way that manufacturers of automobile parts and other equipment manufacturers have done. Some of the most welcome suggestions coming from Mr. Carter are the standardization of mounting screws to 6-32 plug and jack dimensions, condenser ratings, and color scheme for circuit diagrams to differentiate between plate, filament and grid circuits.

THE DX Instrument Co. recently inaugurated what we believe to be the first guarantee of its kind in the field of radio merchandising. One of their products the Fil-Ko Lightning Arrestor is guaranteed to such an extent that the DX Instrument Co. agrees to pay the owner of the Fil-Ko Arrestor, $100 or repair the set if it is damaged by lightning when used with a properly installed instrument. This sort of business makes a friend of the dealer and the retail buyer and makes for better radio.

WORD comes from the Bel-Canto Manufacturing Co., manufacturers of the well known Bel-Canto Loud Speaker, that they have moved to a new location at 872 Broadway, N. Y. C. For the last three years they have been located at 34th Street which their great increase in business has rendered inadequate for their needs. The Bel-Canto Mfg. Co. will shortly bring out one of the most unique developments in headsets that has so far been developed.

"THE How and Why of Resistance Coupled Amplification" is the title of a new bulletin prepared by the Engineering Department of the Daven Radio Corporation, specialists in resistor manufacturing. This very complete bulletin covers the work of considerable research on the part of the engineering department of this company. It is in the form of questions and answers which include every possible uncertainty which the average home builder would encounter. It is very interesting reading and is worded simply so that it presents a valuable addition to the layman's library. Copies may be secured by writing the Daven Radio Corporation, Newark, N. J.

THE following changes have been made in the Eisemann organization: O. S. Stanley has been placed in charge of the Middlewestern territory, with headquarters at 2005 So. Michigan Avenue, Chicago, Vice P. G. Sedley, resigned. Stanley has acted as Pacific Coast representative for the past year.

Irving W. Edwards, for a number of years connected with the National Carbon Company, has assumed the duties of District Manager, with headquarters at 85 Second Street, San Francisco.

THE latest report on the First Radio World's Fair which was held in Madison Square Garden and the 69th Regiment Armory recently indicates that it was without doubt one of the most successful radio trade expositions staged in America. The patronage exceeded that of previous radio exhibitions and the amount of business transacted by the concerns participating broke some records.

Figures compiled show an attendance of 175,000 people during the week and thousands were turned away daily. On a dozen or more occasions Fire Department officials temporarily closed the doors because of the fact that both huge auditoriums were packed to the rafters.

The exhibits were installed by 180 nationally known American manufacturers and 20 of the most prominent wireless laboratories of England, France, Germany and Japan.

Managers James F. Kerr and U. J. Herrmann have already completed arrangements for their 1925 Radio World's Fair which will be held in the new Garden soon to be erected. In spite of the fact that the new building will be twice the size of the present structure, Manager Kerr reports that eighty per cent of the available exhibiting space has already been contracted for.

NEW APPLIANCES AND DEVICES

The New Paragon Line of Receivers

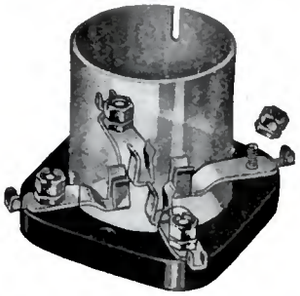
THE new Paragon two-tube radio receiver is capable of giving loud speaker volume from stations within a moderate radius and head phone reception over an almost unlimited range. Major dial control. Simple mahogany finished cabinet. 10½ inches long by 6⅜ high by 6¼ wide.

The new Paragon three is an exceptionally sensitive three-tube set. Major dial control. Amazing loud speaker volume. Solid mahogany cabinet. 16¼ inches long by 7¼ high by 8⅛ wide.

The new Paragon four is a four-tube set capable of loud speaker reception of practically unlimited range. New Paradyne circuit. Major dial control. Handsome mahogany cabinet. 20⅞ inches long by 8 high by 6¾ wide.

Cutler-Hammer Tube Socket

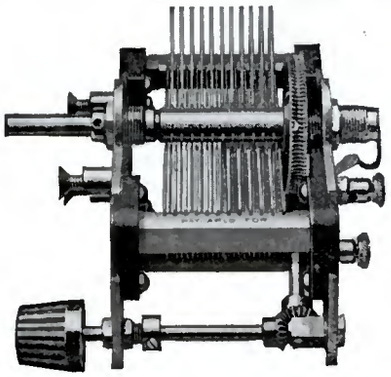
THE Cutler-Hammer Mfg. Co., have recently put on the market a new and distinctly designed socket which provides a perfect contact for radio reception. The



tube is simply pushed down—not twisted—into the socket, thereby preventing any chance of severing the bond between glass and base of tube. Each contact is a spring clip that clinches the tube prong without strain, and cleans it bright whenever the tube is inserted or removed. The contacts are silver plated so that their contact resistance does not increase even after years of operation.

American Brand Condenser

RADIO experimenters and set builders are appreciating the importance of a good low loss condenser which should be built so that the path of resistance set up by friction bearings is cut to a minimum.

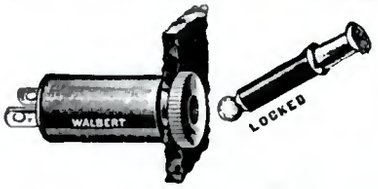


This is accomplished in the American Brand condenser by the use of a special "pig tail" which is directly connected to the rotor plates and the binding post for connecting purposes. Insulated with hard rubber and having the plates perfectly flat with their natural finish radio frequency losses are kept at a minimum. A hundred to one worm drive ratio geared vernier adjustment is a special feature of one type.

The phase angle difference of this condenser is less than 20 inches and the insulation resistance is 6 ohms at 1,000 cycles.

The Walbert Filament Lock Switch

THE Walbert Filament Lock Switch provides ordinary filament control as does any other switch. It has the added feature,



however, of permitting the operator to lock his set in such a way that no one can operate it without the key or plug of the switch.

This switch is attached in a few minutes. It is very compact and takes little room on panel or behind it. The key is smaller than a standard plug. Sturdy interior springs of phosphor bronze assure positive contact. The shell and key handle, unlike all other switches, are insulated from the circuit.

E-Z-Toon Radio Company

THE E-Z-Toon Radio Company have taken over the manufacture and sale of the Eztoon Dial, which was formerly manufactured by the Butler Mfg. Co. of Indianapolis, Ind.

Mr. Charles Sparks, formerly General Manager of the Kellogg Company, has joined the organization as General Manager.

Clear-O-Dyne Receivers

A NEW line of four and five tube sets has been designed and offered by the Cleartone Radio Company of Cincinnati under the name Clear-O-Dyne. These sets employ tuned radio frequency amplification which is adjusted and stabilized for use on all antennas before the sets leave the factory.

The Super Clear-O-Dyne consists of two stages of tuned radio frequency amplification, a detector and two stages of audio frequency amplification. It has the selectivity that is characteristic of this construction, is capable of producing loud speaker volume

on distant stations, and is free from oscillation and distortion on all wave-lengths.

The Goldcrest Clear-O-Dyne—as the four tube set is called—consists of one stage of radio frequency amplification with detector and two stages of audio frequency amplification.

Jewett Reproducer and Loud Speaker

THE Jewett Radio and Phonograph Co. in their adaptation of their phonographs to radio found the need for a substitute for

the phonograph diaphragm. Their search for such equipment led them into the devel-

(*Turn to page* 58)

TITLE CONTEST WINNERS

C. A. Reberger, 325 Central Ave., Newark, N. J., won the prize for the best letter on why "The Wireless Age" should retain its present name.

De Lyle Davis, 201 Cockerville Ave., Takoma Park, Ind., won the prize for the best letter on why "The Wireles Age" should change its name to "The Radio Magazine."

Of the great volume of letters, in response to the "What's In a Name?" contest, only a few were in favor of changing the name, and the consensus of opinion nearly approached a unanimous vote for "Wireless Age—The Radio Magazine."

And "Wireless Age"—The Radio Magazine, remains—the name you have known, identified for those who are less familiar with "wireless."

Third National Radio Conference

(*Continued from page 44*)

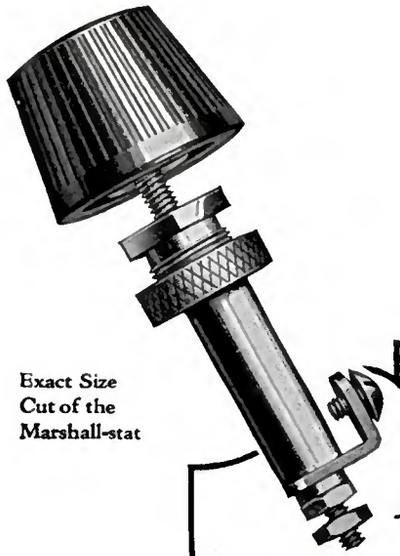
relief, depending on what proportion of the present Class C stations qualify for Class B licenses. I am not advising any particular method of solution, but recommend the entire subject to your careful consideration.

Power of Broadcasting Stations

Another question of importance is the limit of power to be used in broadcasting. Most Class B stations are now operating on 500 watts. A limitation of 1,000 watts is imposed in the license. I understand that there are several stations erected or in course of construction which contemplate the use of power up to 5,000 watts, and I am aware of the suggestions of those who would go beyond even this. There is opposition to the plan. Its advocates tell us of the great advantages in the way of louder signals and more distant transmission, while opponents complain of interference and the drowning out of other stations. The latter fear is particularly acute when the powerful station is located in a congested receiving center. From the viewpoint of nation-wide broadcasting, the question becomes as to whether we should aim to cover a large territory through a single powerful station, or through a number of interconnected smaller ones. We must not stifle progress in any direction. We must not do anything that will interfere with the programs of local stations on which many of our people depend, nor with the wide selective range which they now have. It may be that both purposes may be accomplished without loss to either. I recommend the subject for your most careful consideration.

General Tendencies in Development of Broadcasting

There seems at present some tendency towards a decrease in the total number of broadcasting stations. September 1, 1923, there were 563 licensed stations. On the same date this year,



Exact Size Cut of the Marshall-stat

Marshall-stat

Do You Want to Hear More Stations?

Getting more stations with the equipment which you have is largely a matter of adjustment on your tubes.

Then why not use the smoothest accurate-adjustment rheostat you can get—the Marshall-stat?

You will find in the Marshall-stat a means of obtaining any desired adjustment with absolute precision. The Marshall-stat varies the resistance, not step by step, but smoothly, continuously, and uninterruptedly from zero to maximum.

The Marshall-stat provides vernier precision throughout its entire range. Yet, there is only one knob to manipulate—no troublesome double adjustment to make.

It brings new stations to your receiving set and clears up for you the stations which you hear only occasionally and at those times indistinctly.

Without having to drill additional holes, any one can install Marshall-stats in his receiving set, whether it is home-made or factory made. And wherever Marshall-stats are used, the pleasure and fun of radio are enormously increased.

ADVANTAGES of the Marshall-Stat

Requires only one hole in panel. Can be inserted in hole from which old rheostat is removed.

Vernier all the way—but only one adjustment to make.

Only two terminals. Connections cannot be made incorrectly.

Can be used with any tube or combination of tubes.

Compact in size. (Note full size cut above). Takes up very little space. Can be fitted anywhere.

Working parts entirely enclosed in nickel-plated chamber.

Knob can be replaced with the knob of your set. Only one special screw (furnished at nominal extra charge) needed to make change.

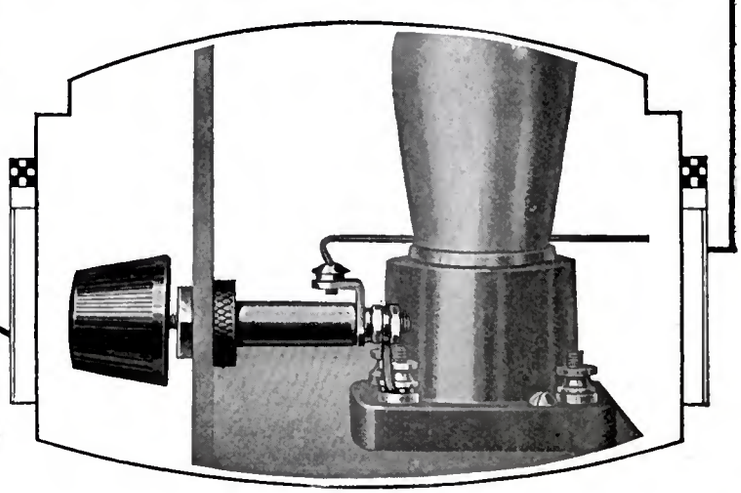
Discs made of specially-treated material which is the result of years of experimental and research work by radio and electrical engineers. Are absolutely uniform throughout.

Mechanical construction and proportions of discs are such that breakage is impossible.

Price $1.75

MARSHALL ELECTRIC COMPANY

3239 Locust Boulevard **Saint Louis, Missouri**



Send for Old Man Ohm's descriptive folder on the Marshall-stat.

THE IDEAL RHEOSTAT FOR ALL TUBES

"Quality Goods for Quality Readers"

the number had fallen to 533, a loss of 30. This decrease, however, has occurred entirely among the smaller stations in Classes A and C. The more important stations, those of Class B, have substantially increased, the number then having been 44 as against 56 at present, with 46 others either under construction or proposed. As to whether this shows a permanent trend toward an abandonment of the smaller stations, with a corresponding additional reliance upon the larger ones even though more distant, it is too early to determine.

It is of some interest to classify and study the ownership of the stations, to know the probable motives that impel their owners to expend the large sums of money which are necessary for their construction and operation, and for which there is usually no direct return. So far as is known to the Department, of the present stations, 196, or over one-third, are owned and operated by manufacturers of or dealers in radio apparatus, whose interest is of course apparent. Department stores and similar mercantile concerns add 39 to this number, and publishers 41, making a grand total of 276 known stations, of which 44 are Class B, which may be said to have a direct interest in the publicity legitimately resulting from their own broadcasting. On the other side we have 85 educational institutions, 35 churches, 12 city and state agencies, 12 clubs, of which 7 are Class B (4 schools, 2 state or city agencies, and 1 church), all of which may be said to operate from more altruistic motives.

MARINE SERVICE

Those who are engaged in the use of radio for marine services between ship and shore and ship and ship feel that the present band devoted to their use is too narrow. We must not forget that what is a convenience or a pleasure for us is a necessity for them and that life may depend on the efficiency of their communication service. There is undoubtedly congestion along our coasts particularly in the vicinity of such harbors as New York, Boston, and San Francisco. There are two fundamental troubles in the situation, and they are interdependent; first, the character of the apparatus used; and second, the fact that most ships operate on only two wave lengths, 600 and 706 meters. Practically all marine radio equipment is of the spark type. There can be no economical use of wave lengths until this condition is remedied.

The London Convention of 1912 contemplated that ship communication would be conducted either on 300 or 600 meters, an alternative of 1,800 meters being allowed under certain conditions. However advisable it may then have been to have all ships on two wave lengths, it is certainly not practicable now. We have here an example, and it is not the only one, of the folly of putting a strait-jacket on such a rapidly growing art.

CO-OPERATION OF THE DEPARTMENT

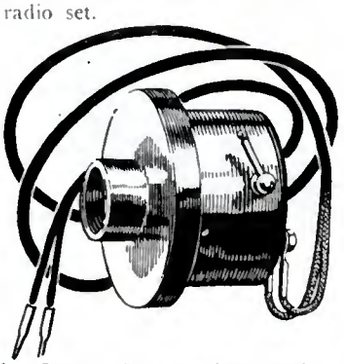
The officials of the Bureau of Navigation, which has direct charge of administrative features and full familiarity with the entire situation, are ready to give you the benefit of their information and advice.

The Bureau of Standards has prepared a report on many of the technical phases which will come before you, and its personnel and facilities are at your disposal. The Interdepartment Radio Committee has done preparatory work, and its members will, I am sure, be glad to co-operate with you in the consideration of all matters which have a governmental bearing. The Radio Supervisors from all districts of the country are in attendance, with first-hand information as to conditions, and their knowledge, based on actual experience in the field. In short, the Department of Commerce is at your command. I believe that your membership includes every angle of radio interest. I look forward to your conclusions as a great step in the development and progress of the industry.

Appliances and Devices

(*Continued from page* 52)

opment of the Vemco receiving unit—a phonograph adaptor of unusual qualities. The Vemco unit is sensitive, yet is able to withstand considerable energy without distortion. The adjustable feature regulates the volume of reproduction, enabling distant stations to be accentuated to the limit of the radio set.



The Jewett Superspeaker retains at all times the full limit of reproduction. Harmonic vibrations have long been the nemesis of the musical instrument builder. Unless design has been carefully worked out, the instrument will, when certain notes are struck, develop a vibratory resonance of a most annoying character. By eradicating this nemesis, the Jewett people were able to develop volume to its logical limit. To acquire this result requires a definite minimum of size. The Superspeaker is therefore considerably larger than most devices of its kind. An adjustment in the base permits control of sound volume.

The Manhattan Junior Loud Speaker

THE Manhattan Junior is the outgrowth of a popular demand for a loud speaker at an inexpensive price. It reproduces with excellent musical quality, and has a unit especially and correctly designed to operate the long air column of the horn without batteries.

By means of the "Concert Modulator," the instrument can be satisfactorily accommodated to set, tubes and the strength of "B" battery current, so that the best results can always be obtained.

The Physical Nature of Speech

(*Continued from page* 41)

unit high, then the heights of the other vertical lines show how intense the overtones are compared to the fundamental or lowest tones. These vertical lines, then, give us a graphical picture or spectrum of how the sound energy in these particular speech sounds are distributed throughout the various frequencies. Note that the first two

sounds have all the energy confined to a single lower frequency region and, as already stated, are singly resonant sounds. Note, also, that the ē, ā and ă sounds have their energies confined to two frequency regions, a lower one and a higher one, and are called doubly resonant sounds. Note, further, that every one of the six graphs have characteristics which distinguish them from all the others. These are the reasons, then, why the ear can distinguish each of them and thus the basis for communication by speech sounds is established.

In figure 3 is shown a sort of a composite curve for the English language. It shows the energy distribution at the various frequencies. The curve shows that most of the energy for speech sounds lies below 1,200 cycles and that in the region of the peak of the curve at about 250 cycles one finds most of the energy in speech sounds.

Before closing our discussion it will be in place to discuss some *quantitative data* for musical tones. In our preceding paper we discussed at some length the qualitative composition of musical tones. The curves or sound spectra for musical tones will be readily understood.

This group of curves, figure 4, shows that when a note, for example, lower c (c_1) on the piano is played there are many overtones accompanying the fundamental tone itself. If one compares this note with the corresponding one for the organ shown in the figure, he will observe a very great difference between the number and magnitude of the overtones. The piano note is much richer in overtones than the organ, consequently relatively more of the sound energy resides in the overtones of the piano than in the organ.

One can easily see now the quantitative differences amongst the tones of the various instruments.

Exit 1880

(*Continued from page 35*)

I have sat in a farmhouse in Utah, far up into the beautiful mountain section there, miles upon miles from the city, and heard the splendid broadcasting available and seen the farmers' faces shine with a real human interest and sociability. I sometimes think the stolid, set look upon peasants' faces is cut there by the fearful hand of isolation, the demon of the rural spaces. There farmers' boys and girls are *not* leaving home as farmers' sons and daughters have left for generations past. It is a statistical fact that there has been no increase in agricultural population since 1900. There are no more people on the farms now than in 1900; which in reality means that the rural districts have been greatly slumping in population, for of course there has been heavy increase in urban population. The reason for the alarming desertion of the farm is of course the isolation.

If we really want to make farm life better, we will now need to give closer attention to the radio needs of rural districts. We will need to do as the Extension Division of the University of Kansas, and other western colleges are doing—provide special programs of real value, not only to the farmers, but to farmers' wives. I am strong for the latter, for the farmer's wife has always had the very hardest lot of any woman in America, and has contributed, as a class, a greater share of national

wealth, than any other class of women in America. I want the farm woman to have plenty of entertainment via radio, and plenty of helpful lectures on farm woman problems. For best service such broadcasting must be done, not after 8:30 P. M., but between 7 and 9 P. M.—and particularly on Sundays. Sundays are very good broadcasting days for the farm, and I certainly would not be satisfied with religious programs alone. Nowadays the religion of service is as good as the religion of dogma and sects, and Sunday mornings and afternoons might very well be given over to home problems, many of which have vastly important ethical aspects, too. I stress this matter of Sunday broadcasting because I want to reach the women who most need it, and I know too well what a beast of burden most farm women are during week-days, their conscience or their duties preventing them from taking "time off" to listen in.

A farm is a veritable hall of industry for farm women; they have a thousand tasks which call for more information. The Government has scores of leaflets printed, but they are not usually read. Women learn better *by ear*. The productivity, happiness and livability of farmers and farm life are very dependent upon radio, and we must somehow turn the tide of population back toward the farm again.

The Family Receiver

(*Continued from page 37*)

from the rear, the detector tube socket is placed on the left and the first audio frequency tube socket is placed directly behind the second radio frequency tube socket as will be seen in the accompanying illustrations. The first resistance-coupled tube socket is placed directly behind the first radio frequency tube socket and the last resistance-coupled tube socket at the extreme right of the panel.

In connecting up the receiver connect all grid and plate leads first. The connections for the radio frequency transformers are shown in the accompanying diagram. The grid is connected to the end of the large winding and the plate to the beginning of the small winding. That leaves the two ends of the two coils which come closest together to be connected to the B plus for the small winding and the F minus on the large winding. A reversal of these connections will render the set inoperative so use care in hooking them up. Leads should be run from the R.F. transformer solder lugs directly over to the tube socket terminals and the leads from the condenser should then be bridged across these. After all the grid and plate connections are made start the filament circuit. On the two radio frequency tubes and first audio tube three Daven ballast resistances are used to control the filament. These provide automatic control of the filament temperature and require no adjustment. The first Marshallstat on the left of the panel controls the two resistance-coupled stages in parallel and the second Marshallstat controls the filament on the detector tube. These Marshallstats provide critical filament control where fine adjustment is needed. The UV-201A when operating with a resistance-coupled amplifier requires slightly higher temperature and a critical adjustment. This is not the case, however, with the radio frequency tubes nor the transformer coupled audio tube. Insert in the resisto-couplers the proper leaks which are furnished with each unit—one-tenth megohm leak in the plate side in each stage, a one-and-one-half megohm leak in the grid side of the first stage and a one-megohm leak in the second stage. Be careful in mounting the resisto-couplers to follow the letters stamped on the base and run plate to plate and grid to grid, etc. A reversal of this will cost you some tubes. The Amplex Gridenser is mounted between the third variable condenser and the detector tube socket so that your grid leads may be kept as short as possible. The ballast resistances are placed in the negative lead of the R.F. tubes and the return lead from the transformer connected after the rheostat that

is between the rheostat and the A minus source. The Marshallstat on the detector tube is connected in a similar fashion in the negative lead. Likewise ballast resistances in the first stage of audio. In the resistance-coupled stages the return lead from the gridleak is connected directly to the tube socket terminals on the positive side and the second Marshallstat is connected after the return lead instead of before as in the R.F. stage. If these distinctions are taken note of before starting the connections, they will be easier to remember and there will be greater certainty of correct leads. The full 90 volts B battery is used on both the R.F. tubes and audio frequency amplification while only 22 volts is used on the detector tube.

OPERATION

To put the set in operation turn the Carter jack-switch on and adjust the two Marshallstats until best results are secured. The three dials are then turned so that their readings are approximately the same and a signal tuned in. After a careful log of the stations is made it will be a simple matter to turn back to these calibrations and locate the station. In case an outside aerial cannot be erected, the antenna lead from the binding post marked short antenna is brought to the grid of the first R.F. tube through a .0005 mfd. fixed condenser.

5½-Oz. Head Set

(*Continued from page* 42)

develop a new idea so far as the inside working parts were concerned. It is necessary, as you know, in the telephone receivers, to have two pole pieces, a steel magnet, and many thousand feet of magnet wire. True, magnet wire is made in very small sizes, and when tightly wound does not take up a great deal of space. I presume that most every one has seen the inside of a receiver and will appreciate what had to be overcome to construct a thin, light unit which would be sensitive to weak signals.

After two and a half years experimenting, I succeeded in making a unit which was only 7/16 of an inch thick by 2⅜ inches in diameter, and when all the working parts were assembled in the case, it weighed exactly 2 ounces. The inside space of this unit, that is, the space where the two pole pieces, magnet and magnet wire are placed, was only 7/32 of an inch deep by 1 13/16 inches in diameter. The case for the unit was made of pure hard rubber. With the case all assembled, it looked like a very thin watch. My experience with the patent lawyer when I called upon him to put through a patent for me was amusing. He said the idea of the ear clamps was very fine, but how about the weight of the units to be held to the ears? He advised me strongly against spending my money. It did not dawn on him, that the sample he held in his hand, contained all the necessary working parts, until I called attention to the fact.

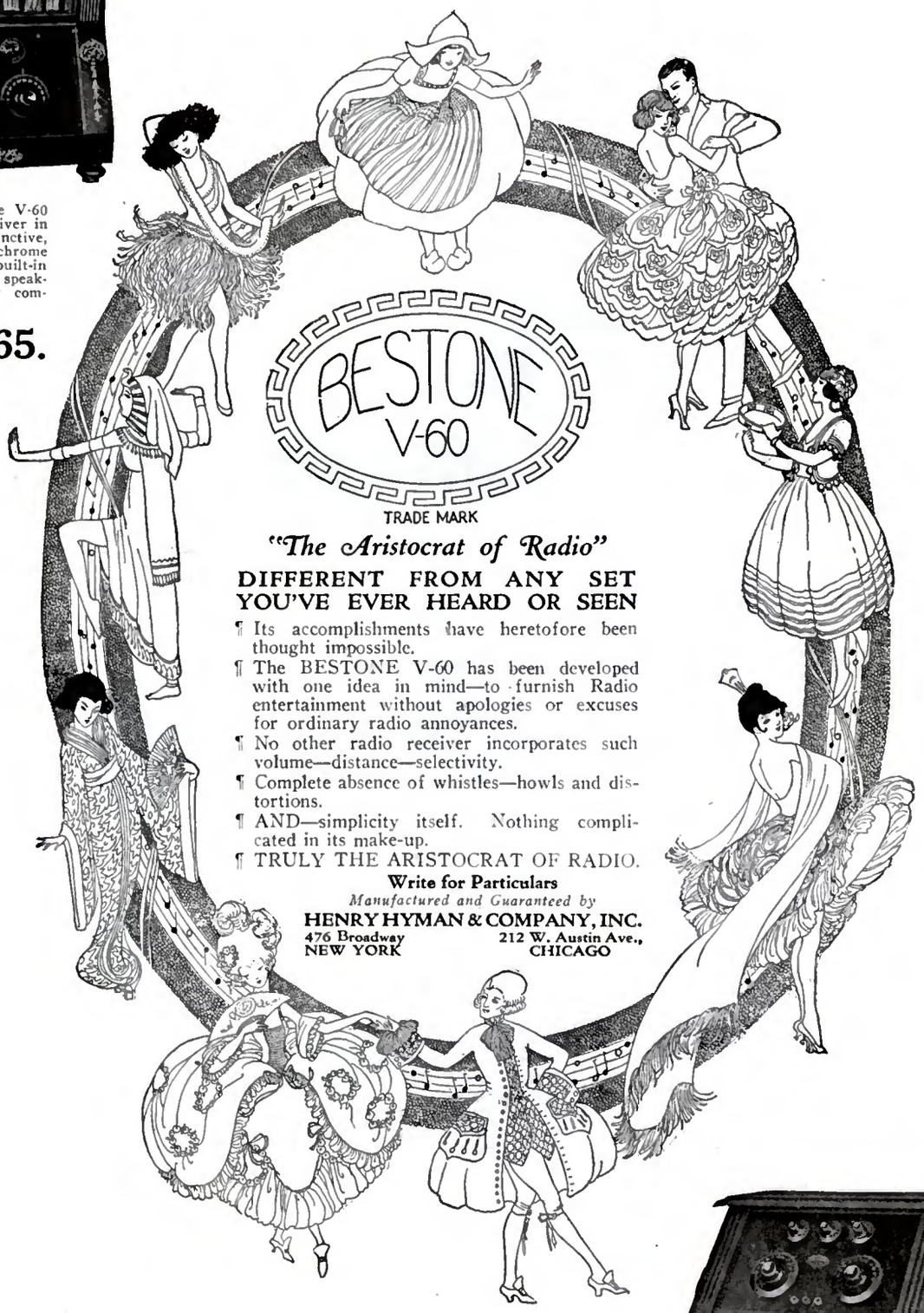
The attachment for the ears is a friction spring, made in such a way that they can be taken off and placed in the proper holes, which are provided for large and small ears, and the entire unit can be put on in less time than it is possible to adjust the old fashioned head band type.

I found it necessary to develop a new type of pole piece, semi-cylindrical in shape, so that when the two were placed together with a gap of 1/32 of an inch between, they formed a perfect circle right in the center of the case. I found by adopting the semi-cylindrical pole pieces, I got a greater volume of tone and a purer musical quality. This increase of volume is due to the pull on the diaphragm around the entire center where it should be, and not off on either side.

In a unit as thin as the one I have developed, and which made it possible to do away with the uncomfortable head band, it would be absolutely impossible to employ the present type of pole pieces, the coils would be at least 2 inches in diameter, making the entire unit over 4 inches in diameter, which would be too large and too heavy in

The Bestone V-60 Five-Tube Receiver in beautiful, distinctive, antique polychrome cabinet, with built-in high-grade loud speaker and battery compartment.

List....**$165.**



BESTONE
V-60

TRADE MARK

"The Aristocrat of Radio"

DIFFERENT FROM ANY SET YOU'VE EVER HEARD OR SEEN

¶ Its accomplishments have heretofore been thought impossible.

¶ The BESTONE V-60 has been developed with one idea in mind—to furnish Radio entertainment without apologies or excuses for ordinary radio annoyances.

¶ No other radio receiver incorporates such volume—distance—selectivity.

¶ Complete absence of whistles—howls and distortions.

¶ AND—simplicity itself. Nothing complicated in its make-up.

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Imperial Model—Bestone V-60 Five-tube Receiver, in beautiful mahogany cabinet.

$115.

any event. With my new type of unit, I can get any ohmage up to 6,000 per unit, making a total of 12,000 ohms per set. However, through many tests covering a period of two years, with the best types of head set, I find that 1,100 ohms is the ideal for all broadcast reception.

My coils are wound with No. 44 B. & S. gauge enameled magnet wire .125 in depth by .425 in diameter. I used the No. 44 simply to keep the coils small and light. For 1,100 ohms I could use No. 38, but the increased weight of the coils would be double. The coils are wound in such a way as to make them uncollapsible. They are then insulated in the core with mica, also the top and bottom of the coils are insulated with the same material.

Two people listening in with my type of head set, with its 72-inch cord, find it very simple to attach one to each person's ear. It has no head-band to unhook or adjust with only one phone on it while the other listener has to hold the unit to his ear.

I believe the wireless operators will welcome this new head set. They will be able to wear them twenty-four hours at a time without any annoyance whatever. Telephone operators in central stations, or anyone in the home or office, can use this head set to advantage. It will no longer be necessary to hold the receiver to the ear with the hand in one case and will do away with the head band in the other case. There is absolutely nothing to catch in a woman's hair, which is a distinct advantage aside from all others over the old fashioned head band type.

The units are absolutely fool proof and cannot be taken apart. I have made them this way because of the extremely delicate construction inside, and so that they cannot be harmed even if they are thrown around though in that case the magnetism may be affected.

The head set is held so securely to the ear with the clamp device, that one can run and jump, stand on one's head and even dive into the water and it will not be displaced. Yet they can be taken off the ears with the slightest pull of the hand.

By extending the ear clamps to their full extent and placing the units on a cigar box with the springs down and plugging in on the second stage of any good set, signals about equal to a horn type of loud speaker can be produced.

To sum up, this featherweight headset has a genuine practical value for the professional operator as well as for the B. C. L.'s when comfort, facility of use, tone quality, sensitivity and volume of signal are considered.

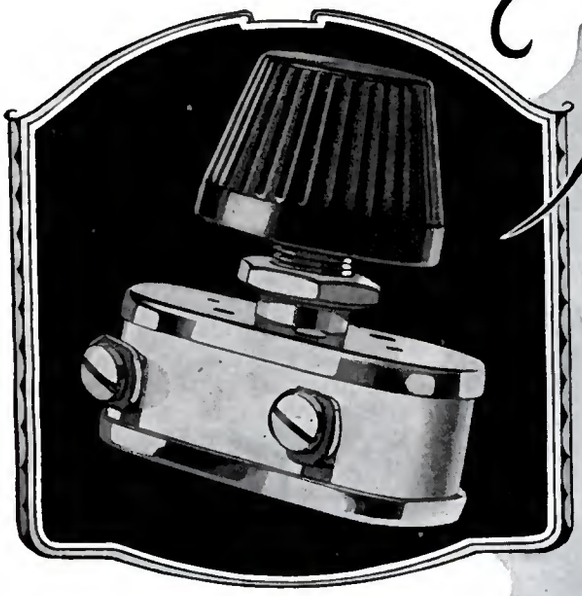
One Tube Circuits

(*Continued from page* 47)

current variations, there is a considerable drop across the headset, or in effect their impedance is increased and the action is similar to a regular tuned circuit such as H. Indeed if we mentally substitute a condenser and coil in place of the variometer of H it will be noted that L is like H. K can also be shown as at M which is in every way identical with K. In M the plate coil may or may not be in inductive relation to the grid coil, if it is coupled to it, we could connect the aerial to a portion of it so the primary would be a section of the plate coil even as it may be a section of the secondary coil as shown at F.

We have to consider still another arrangement. The Ultra-Audion as shown at N. This can be represented as at O where the headset is shown as an inductance in series with a resistance and shunted by a condenser representing the distributed capacity Xp, Rp and Xc, respectively. This has a slight impedance to radio frequency variations so the voltage on the plate will vary as the grid voltage variations affect the filament-plate resistance. Ordinarily the voltage fluctuations, being small because of the small impedance of the headset or external plate circuit compared to the filament-plate resistance, would not be sufficient to excite the grid through the grid-plate ca-

The New Bradleystat



A Remarkable Achievement

Many refinements are embodied in the new Bradleystat. The graphite disc columns are enclosed in a *smaller* container; *two* terminals suffice for ALL tubes; a *new mounting* simplifies installation; the *knob* is of a daintier pattern. And the noiseless, stepless, control of the old Bradleystat remains, unchanged. Such a combination of advantages can be found in no other filament rheostat.

Only One Hole required in Panel

Every radio set can be improved by substituting the new Allen-Bradley radio devices.

Ask your radio dealer about the new Allen-Bradley line.

A DISTINCTLY new and valuable contribution to radio! That is the verdict of all radio engineers and designers who have seen the new Allen-Bradley radio devices and have witnessed their amazing performance. The new "one-hole mounting," which replaces the older clip mounting, makes for marvelous compactness and simplicity of installation. The new Bradleystat, Bradleyleak and Bradleyohm require only a 11/16-inch space behind the panel, and the Bradleyometer only 7/8-inch. Thus, the new models can replace inferior wire rheostats and potentiometers without disturbing the arrangement of the set. Our new literature is ready. Send for it, today!

Allen-Bradley Co.

Electric Controlling Apparatus

283 Greenfield Ave. A-B Milwaukee, Wis.

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pacity so the grid is connected, not to a point (the filament) of constant voltage, but instead to the plate, which varies slightly in voltage. These variations are impressed directly on the grid through the tuned circuit and the grid or stopping condenser. Thus the voltage variations on the plate, even though they are small, serve to excite the grid. In a way, then, O can be compared to H as the grid is excited by the voltage variations on the plate and the plate voltage variations are made to excite the grid partly through the grid-plate capacity, but mostly through the direct connection from plate to grid. If the external plate circuit impedance is below a certain value in comparison with the internal plate impedance or plate-filament resistance, self-oscillation could not be secured. This condition applies also to H.

And now for a second let us look at the standard regenerative circuit of figure 1. We can represent this in two similar diagrams, figure 2 and figure 3. At a casual glance they appear different, and indeed are known by different names, but a close inspection will show that they are alike.

Now to review the comparisons we have made. We have shown:

A equal to B equal to C.
D equal to E equal to F.
G equal to H.
K equal to L equal to H equal to M.

The new Exide six-volt "A" Battery in one-piece case. Price, **$14.60** *up, f. o. b. Philadelphia.*

An even better "A" battery *and at a much lower price*

IF you are one of the thousands who have come to rely on the famous six-volt Exide "A" Battery, you will not recognize the new one when you first see it — but you will know it when you hook it up to your set, for it has the same old rugged power, the same constant efficiency, and the same long life.

You will say of this new battery: "Handsome is *and* handsome does." The composition case (including handles) is moulded in one piece. Beautifully stippled and finished in glossy black, it is an ornament to any room.

Broad inter-cell connectors fit close to the top of the battery. Offset terminal posts make it very easy to hook up. Filling plugs require but a quarter turn to remove. This new Exide is made in five sizes — 50, 75, 100, 125, 150 ampere hour capacity.

Exide
RADIO BATTERIES

A complete line of radio batteries

If you use low-voltage tubes you have your choice of those sturdy midgets, the Exide two- and four-volt "A" batteries, weighing but five and six pounds.

In addition to the compact 24-volt Exide rubber case "B" battery of 4000 milliampere hour capacity there is the new Exide for those who desire visibility as well as capacity. This "B" battery is assembled in glass jars and is made in 24 and 48 volt sizes. Larger plates and greater space for the electrolyte give a capacity of 6000 milliampere hours.

The Exide Rectifier enables you to recharge your "B" battery from your house current at a cost that is insignificant.

Ask to see the Exide line at any Exide Service Station or Radio Dealer's.

For better radio reception use storage batteries

Prices Exide Radio Batteries

Battery	Capacity	Voltage	Price F.O.B. Philadelphia	Battery	Capacity	Voltage	Price F.O.B. Philadelphia
3-LXL-5	50 A.H.	6	$14.60	1-KZR-5	24 A.H.	2	$ 5.40
3-LXL-7	75 A.H.	6	16.90	2-KZR-3	12 A.H.	4	7.30
3-LXL-9	100 A.H.	6	19.15	12-RB-2	4000 M.A.H.	24	10.00
3-LXL-11	125 A.H.	6	22.10	12-LR-2	6000 M.A.H.	24	12.00
3-LXL-13	150 A.H.	6	25.00	24-LR-2	6000 M.A.H.	48	23.30

Exide Rectifier $2.00

THE ELECTRIC STORAGE BATTERY COMPANY, PHILADELPHIA

In Canada, Exide Batteries of Canada, Limited, 153 Dufferin Street, Toronto

"Quality Goods for Quality Readers"

N equal to O equal to H.

1 equal to 2 equal to 3.

And of course it can be seen that G is equal to figure 1 and as G is equal to H it follows that G, H, K, L, M, N, O. 1, 2 and 3 are equal to each other. Very simple, yes?

And now, just for fun, let us compare two circuits in ordinary use that do not look at all like each other. The Reinartz and variometer variocoupler are fairly good extremes. See figures 4 and 5.

First in accordance with (D equal E) change the antenna circuit of the variometer set to the still double circuit of E. In the secondary (figure 5) change the tuned circuit from A to B as we have shown A equal to B. Now for the plate circuit. We have shown M equal to L and H so we can replace H with M in our variometer set of figure 5. This looks like figure 6 now. And of course it is immediately apparent that the antenna coil may be changed as from E to F so the primary is part of the secondary coil, or as mentioned before, we can make the primary part of some other coil coupled to the secondary, in this case, the plate coil, as we have done in figure 7. This looks a whole lot like figure 4 now, doesn't it? Indeed the only difference between 4 and 7 seems to be in the plate coil arrangement. Actually they are alike for obviously it does not matter here whether the condenser is placed between two sections of the plate coil or at either end. As

a matter of fact, in operation, 7 would have a point of advantage over 4 as change of aerial inductance in 7 does not change the plate circuit adjustment as much as an equal variation in 4.

Any one-tube regenerative circuit is like the standard regenerator of figure 1.

As a final word, the writer knows that it is essential to study this talk with an open mind. A great deal of information is presented here, which may enable the student to see circuits as a simple unit, rather than as a mass of unrelated details.

TRF-50
A handsomely carved cabinet—a most efficient 5-tube circuit with Unit Tuner—built-in Magnavox Reproducer. The receiver you have been waiting for; study the details.

MAGNAVOX

Patented in U.S.A. and foreign countries

MAGNAVOX

Receiving Sets which establish an authoritative standard of excellence for the daily enjoyment of radio.

LONG identified with the most efficient radio reproducing and amplifying equipment, Magnavox has developed its new Receiving Sets under conditions insuring superior design, precision of manufacture, and a gratifyingly low cost.

Exacting tests prove that the Magnavox Receiver is not only the simplest to operate but one whose daily performance will satisfy the most discriminating.

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

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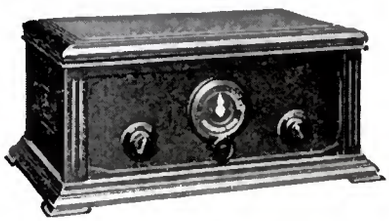
Receiving Sets

TRF-50 (as illustrated above)—is a 5-tube tuned radio frequency receiver with carved doors and built-in Magnavox Reproducer **$150.00**



TRF-5 is identical with TRF-50 but encased in smaller cabinet without built-in Reproducer . **$125.00**

Type A and Type D—Six-volt storage battery amplifier and detector tubes with standard base **$5.00**

Starting With Pick and Shovel

(*Continued from page 33*)

Interviewing Mr. Heising is a pleasure because his answers are clear and direct. He is a successful lecturer at Columbia University; his scientific papers are so written that an expert is not required to decipher their meaning for the layman. His thinking processes bespeak not only an education but antecedents and boyhood circumstances and training fitting him for the career of an inventor. Hence I was surprised to learn that he came from a small North Dakota town and that he swung his way out of it with a pick and shovel, tamping ballast with a railroad section gang. Even in boyhood, the instinct of invention manifested itself.

"A model steam engine was my first venture in experimental work," Mr. Heising said. "When I was fifteen years old, I took an old bicycle pump for the cylinder and cast a steam-chest on it with some babbitt metal. Then I improvised a boiler out of a tin can and after much adjusting the contrivance ran beautifully. One of the 'gang' was so much impressed that he went off and bought some babbitt metal himself, but that was as far as he got. He hadn't thought of the patient, hard work that I had put into my model."

After some years of service as a section hand, Heising became a towerman. As towerman, he set out to learn the Morse code during his long trick, cutting in on a line for the purpose. When the unauthorized connection was discovered, the supervisor of signals yanked it out. But it had already served a purpose. Failing to obtain leave of absence to take college entrance examinations, Mr. Heising braved unemployment and was re-

warded by passing marks. He did well at the state university and went on to the University of Wisconsin for graduate study in physics. Then he became a Western Electric engineer and in six weeks had made his first invention.

During the famous transatlantic radio telephone tests in 1915, Mr. Heising had charge of the transmitting apparatus at Arlington. It was in the course of subsequent tests on experimental radiophone equipments that he devised the scheme of modulation which is used in all Western Electric radio broadcasting transmitters.

All this was still only a fair start for Heising. When the war came, he took radio up in the air. On July 2, 1917, he made the first talk from an airplane in flight to the ground. This followed his experimental work on the first airplane radio telephone.

Six weeks later he took part in the first conversation between airplanes in flight. When the experimental model was ready for production, Mr. Heising went to work on radio telephone sets for submarines, submarine chasers and tanks.

Since that time he has taken part in the development of ship-to-shore radiophone, short wave communication, and single-side-band high power transmission. In 1921, the Institute of Radio Engineers awarded him the Morris Liebmann Prize for his work on modulation in radio telephony.

While an invention needs that always intangible something which we call genius, it needs a mind with some very practical qualities, too. "An open mind, I believe, is one of an inventor's best assets," says Mr. Heising, and no

one is better qualified to speak than he. "By an open mind, I mean one that is receptive to new ideas—one that is in wide and eager contact with the world—not only the world of things, but that of people who are to use what is invented, or fit the new things into systems which now exist. Your traditional inventor, out-at-elbows and often on the ragged edge of starvation, may be correct enough on the technical side, but he isn't in close enough touch with people to be able to produce something that the public will pay for. When I am working out a problem lots of ideas come into my head. Most of them are thrown out because they fail to measure up to one or more of the yardsticks that my experience has set up. The ones that look promising I develop further and then talk them over with my associates. These informal conferences are one of the big advantages of the large engineering organization. Not only do they keep me in touch with developments in adjoining fields, but, by giving me others' points of view, they save one from following leads which others have proved to be blind."

Although it is probable that Heising will be best remembered for his discovery of modulation, his contributions to the radio art are by no means limited to it. He, more than any other man, is responsible for the development of single side band transmission, destined to make commercial transatlantic telephony a possibility.

Briefly, single side band transmission is a method of suppressing the carrier and one of the two side bands which are supplied to the antenna in

ordinary radio telephony. An analysis of a modulated wave shows that we have a central frequency—the carrier—and two side bands, or groups of currents, each the mirror-image of the other. The group below the carrier is known as the lower side band; the other is the upper. By suppressing one of these, a considerable saving in power is effected; only half the wavelength space in the ether is occupied; one of the principal causes of fading is overcome and reliability of transmission considerably improved.

Harvest Time on the Air

(*Continued from page* 21)

Applied Art, Household Furnishings, January 8 to February 26, includes problems involving the selection, construction and care of household furnishings needed in the average home.

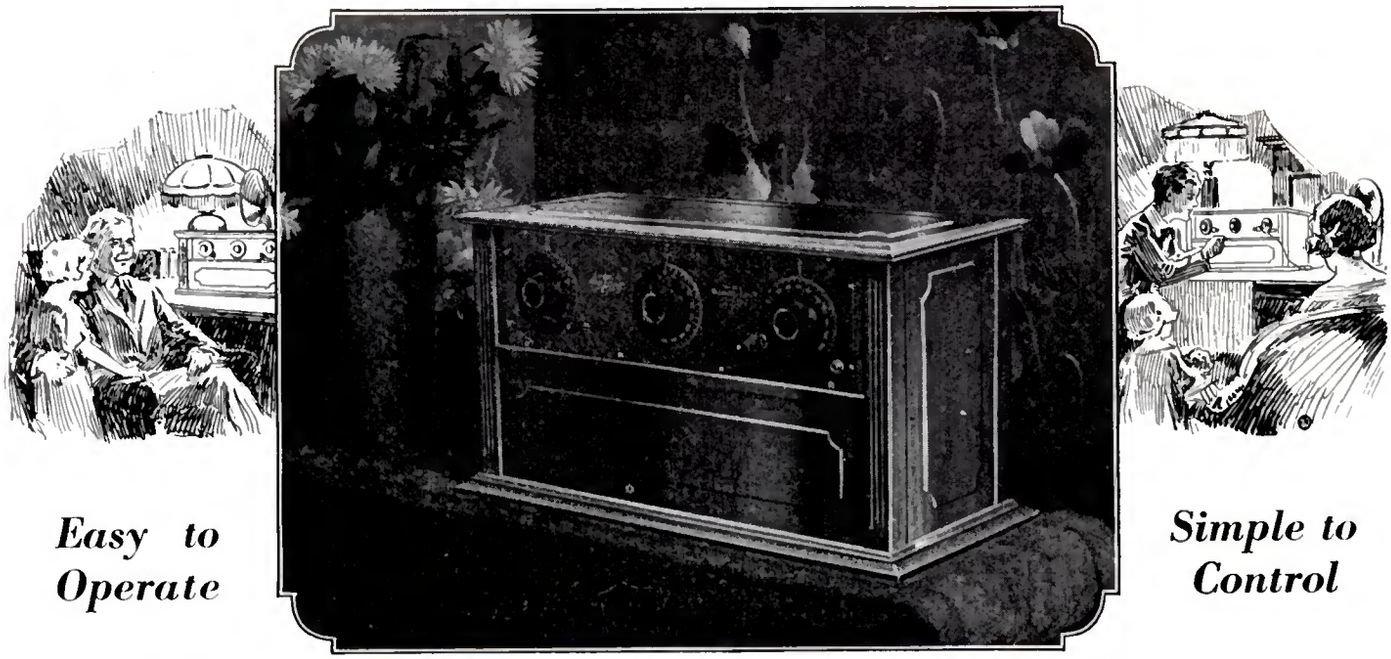
Economic Aspects of Botany, February 6 to February 27. A few of the important phases of botany in relation to agriculture will be outlined.

Entomology, Insects and Their Control, February 6 to February 27, is a discussion of the part insects play in agriculture, the losses due to insects, and the more outstanding reasons for this damage. The course then deals with a summary of the life processes and activities of insects as a group, the fundamentals which form the basis of insect control and the agricultural practices which are of such importance in dealing with cereal crop insects.

Beginning with March the course includes, The Sheep Industry, March 2 to April 20; The Housing of Poultry, March 3 to April 21; Civil Engineering as applied to local road work and the State System, March 4 to April 22; Agricultural Engineering and Farm Tractors, March 4 to April 22; Interior Decoration, March 5 to April 23; Human Nutrition, March 5 to April 23; Bacteriology, Rural Microbiology, March 6 to April 24, Economics and Sociology, the Four Claimants to Great Wealth, March 7 to March 27; and, Practical Phases of Zoology, April 3 to April 25.

These agricultural subjects, each of which extends over a period of from eight to twenty-four weeks are scheduled for broadcasting on Monday and Tuesday nights during the thirty-two weeks radio term.

The radio course of the Kansas State Agricultural College, as outlined here, is but a poor tribute to the really worth while manner in which that institution has laid out their program for common and general education, and forward marching social enlightenment. The writer will gladly furnish any specific information desired, either



Easy to Operate

Simple to Control

WHEN you own a Radiodyne you can tune in on broadcast programs without wasting time tinkering. The Radiodyne shuts out interference from nearby stations. By simply adjusting the dials as indicated on the Radiodyne chart you can select the stations you wish to hear. All batteries are enclosed in the beautiful two-tone mahogany cabinet.

Uses a 25 Foot Lamp Coil for Summer Reception

WL RADIODYNE

Wife Gets Good Results After Two Minutes Instruction

"We are getting constant reception this summer from stations 500 to 1,000 miles away on loud speaker with a 25-foot length of lamp coil. I got Los Angeles, San Francisco and Cuba."

Bernard S. Slay, Minneapolis, Minn.

"I gave my wife two minutes instruction and left her alone with the Radiodyne. When I came back she said that signals had been roaring in all evening and had a log to prove it."

Robert Seldon Rose, Marquette, Mich.

Write for illustrated folder which describes the Radiodyne in detail. If you buy a radio before you have a demonstration of the Radiodyne you will surely regret it.

Western Coil & Electrical Co., 316 Fifth St., Racine, Wis.

"Quality Goods for Quality Readers"

concerning this or other broadcast station schedules for the season just begun.

Broadcast programs of this character will surely promote a contented agriculture. A contented agriculture in America means our individual betterment economically.

Alias Slimmy O'Dyne

(*Continued from page 29*)

sickening seconds, I thought my plan had failed; and then I was delighted to find myself shoved out of the way so violently that I rolled all across the room into a corner, while the voice of Mr. Adolphus St. John, exceedingly thick with cough medicine and fury, roared;

"Combination, eh? You get out the way and let somebody try that knows what's what. My Lord, what's in this darn thing, anyway? Bullion?"

In my corner, I got to my knees.

"You can't do anything with that," I said almost tearfully.

"I was crackin' tougher ones than this when I was fourteen years of age," says Adolphus St. John, putting his ear on the end of one knob and twirling it gently.

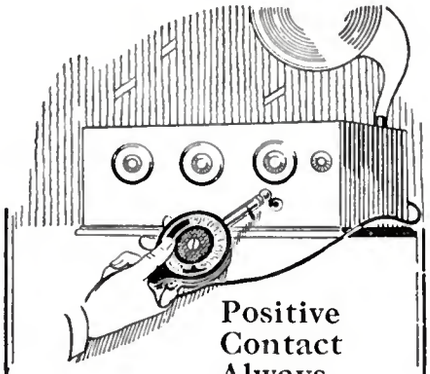
"We're wasting time while you fool around with it!" I shouted, getting to my feet, in which position I could reach my gun more quickly.

The speed with which he reached his, only one hand being at liberty, certainly did make me glad I'd spilled all the cartridges, back at Five Mile.

"You siddown," snarls Mr. St. John. "You siddown an' be quiet, mister. If you think Slimmy Peters is gonna have his girl taken from him, much less let any five cent combination stand in his way—"

Well, this confession that he actually was Slimmy Peters, and not a mere impostor I should get into trouble for arresting, was all I had wanted to know. And it seemed to me that his safe-breaker's tricks, if permitted to proceed, might do damage to the radio set; so I took a good spring, and, as you might say if you were so disposed, fell on Mr. St. John, with my knee on his nose. That should have settled him; it's been enough for many a better man than he was; but either from the effects of the cough medicine, or from suspicion that he was trapped, my prisoner seemed to draw new and unpleasant stamina. I shall never forget, if I live to be a hundred and four, the crisp, snappy way he caught hold of my ears and hammered my head against the leg of the table. I don't know now how I got loose and gained my feet; though the insertion of my thumb in his eye may have had something to do with it; anyhow, he was

blinking his off lamp when he rushed at me again. My idea was to keep him at arm's length, my arms being longer than his; but he wouldn't play that game—endeavoring instead to catch me around the middle and at the same time butt me in the stomach with his head. I thought I'd frustrated this knavish trick by stepping aside and letting him butt the radio table instead; but even this only struck him as an opportunity for further evil. In a fraction of a second, he'd grabbed the whole works off the table—the box, and the aerial, and about half a dozen batteries that clung to it by pieces of wire, swung it around his head twice, and hurled it at me. It was the aerial that came undone and spun a cocoon around me as I dived for Mr. St. John's ankles. If I hadn't ducked just in time, it would have been the receiving set that knocked my brains out. As it was, the machine landed at the head of the stairway with a sickening crash, and then slowly bumped from one step to another, all the way down. I heard a scream of agony, and knew that old Grizzly Chase must be somewhere near at hand; but I was too busy to do any comforting of him just then. Mr. St. John had got a grip on my throat, and was just strangling me over the borderline into unconsciousness, when I grabbed hold of something which I later learned was a battery containing 22½ volts, and hit him behind the ear with it. It wasn't a large battery, but it did the work. Mr. St. John rolled off me and lay perfectly still. Those volts must be mighty heavy things.



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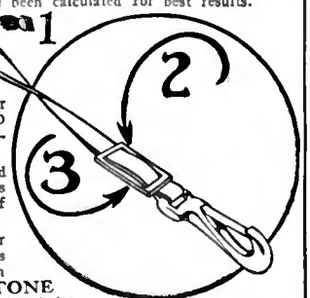
Now *enameled* and weather proofed—will give unlimited service, regardless of time or weather. Not a strip of flat copper, but a Laboratory product in which resistance, capacity and strength have been calculated for best results.



3 New Features

1. Pure Copper ENAMELED and weather-proofed.
2. Improved buckle, permits adjustment of length.
3. No-solder fastening gives greater strength

BETTER TONE Distance, Selectivity

Thousands of letters from users say their reception has been revolutionized by "ACORN" Enameled Copper Ribbon Aerials. Don't blame your set for poor results. Install this wonder-aerial on our positive guarantee to improve tone, distance and selectivity *or money refunded.*

50 ft.	$1.75
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100 ft.	$3.25
150 ft.	$4.75

New Window Lead-In

No. 1—Triple Insulated 35c
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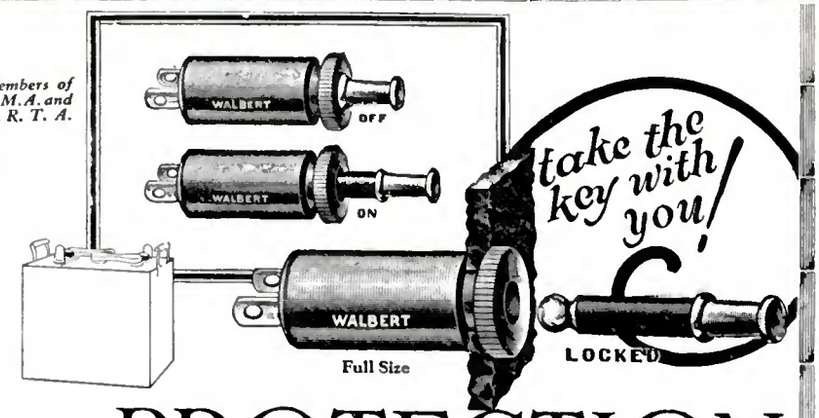

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PROTECTION
for tubes and batteries

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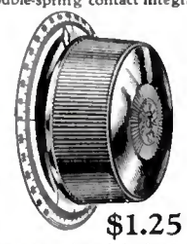
The Walbert Safety Rim Socket is guaranteed *not* to break at the slot. Special heavy bakelite design decreases interelement capacity thereby utilizing all available grid voltage for producing signals. (New tubes have bakelite bases for same reason) Soldering lug and double-spring contact integral.



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Stations unheard before are tuned-in readily with the UNIVERNIER, the original geared tuning dial. Gives 12-to-1 (micro-selective) control of any instrument. (A lower ratio is inefficient; a higher cumbersome and needless.) New "dished" dial and heavier mechanism. Positive vernier—No slippage! Pointer rigid with shaft.

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Safeguards Tubes and Batteries

YOU don't need to worry any more about someone meddling with your radio set while you are away. Simply remove the key (smaller than standard plug) from the Walbert Filament Lock Switch and take it with you just as you'd take the ignition key from an auto. Your tubes and batteries will be fully protected.

Put this combination filament control switch and safeguard on your set today. Attach it in a few minutes. It's very compact—takes little room on panel or behind it. Sturdy interior phosphor bronze springs assure positive contact. Shell and key handle insulated from circuit. Costs no more than an ordinary battery switch.

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At your dealer or sent postpaid on receipt of 50c.
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At Least 1,000 Miles More Distance is the usual reward if you can solder without impairing the insulation of your set.

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Greatest Radio Value Offered the Public
23 PLATE, only $5.00 In Canada $7.00
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New York

I arose to find Grizzly Chase looking at me with the expression of a tiger robbed of its young; while behind him stood McTee, and Pie Face Lammermoor, and Two-Toes Trotter, and several other folks, all staring at me with various degrees of pallor. Amelia Chase was among those present, too. She was bending over the slightly second hand form of Adolphus St. John, carrying on like a looney.

"We have with us tonight," says I, hoping to comfort her, and explain myself slightly. "Mr. Slimmy Peters, wanted in the State of Wyoming for breaking and entering, grand larceny, assault with a deadly weapon, manslaughter upon the person—"

She got to her feet and stared at me more like a hydrophobiac wildcat than anything else I can imagine in my present weak state.

"Was it to expose him you had these men kidnap me and keep me in a dirty tool-shed?" she stormed. "What do I care what he was—criminal or anything else? Look at his beautiful curly hair, all t-t-t-orn out by the r-r-r-oots!"

"Making a fool of me like this—and look at my radio set!" yells her papa.

Well, here we come back to what we started with—the inability to give credit where credit is due; the lack of justice, as you may say. Of course, Slimmy Peters got justice—fourteen years of it; but it's justice from private parties I'm thinking about.

I mean—supposing old man Chase's radio set did get a bit smashed; still, how about me? Wasn't it my brains, and my mescal, and my book, and my play-acting, that saved him from having his daughter marry a criminal?

Yes—but he doesn't see that. All he does see is his machine, with all the microfarads knocked out of it.

Then on the other hand—even if I did have just a little to do with Slimmy Peters' capture, surely any reasonable human being can see that the radio machine was what really made him give himself away, it looking so much like the front of a safe.

But do you think Amelia Chase blames *it?*

No.

It was *my* face she scratched.

The Study of Mars

(*Continued from page* 31)

Mars (4,200 miles), and twice the diameter of Mars does not greatly exceed the earth's diameter (7,920 miles). As to the weights or masses of these bodies, Mars is about one-ninth, and the moon one-eightieth of the earth. The atmospheric envelope of the earth is abundant, the moon has none as far as we can ascertain; so it seems safe to infer that Mars has an atmosphere of slight density; not dense enough to be detected by spectroscopic methods, but yet dense enough to enable us to explain the varying telescopic phenomena of the planet's disk which we should not know how to account for, if there were no atmosphere whatever. One astronomer has, indeed, gone so far as to calculate that in comparison

with our planet Mars is entitled to one-twentieth as much atmosphere as we have, and that the mercurial barometer at "sea level" would run about five and a half inches, as against thirty inches on the earth.

Southern summers on Mars, therefore, must be much hotter, and southern winters colder than the corresponding seasons of his northern hemisphere. Indeed, the length of the southern summer, nearly twice that of the terrestrial season, sometimes amply suffices to melt all the polar ice and snow, as in October, 1894, when the southern polar cap of Mars dwindled rapidly and finally vanished completely.

Conditions on Mars appear to be suitable for radio transmission.

Is Mars inhabited? The probable surface temperature is much lower than the earth's, because Mars receives only half as much solar heat as we do; and more important still, the atmosphere of Mars is neither so dense nor so extensive as our own. Seasons on Mars are established, much the same as here, except that they are nearly twice as long as ours; and alternate shrinking and enlarging of the polar caps keeps even pace with the seasons, thereby indicating a certainty of atmosphere whose equatorial and polar circulation transports the moisture poleward to form the snow and ice of which the polar caps no doubt consist.

There is a variety of evidence pointing to an atmosphere on Mars of one-third to one-half the density of our own; an atmosphere in which free hydrogen could not exist, although other gases might. The spectroscopic evidence of water vapor in the Martian atmosphere is not very strong. It is very doubtful whether water exists on Mars in large bodies: quite certainly not as oceans, though the evidence of many small "lakes" is pretty well made out. If, however, the past development of the planet has progressed in the way usually considered as probable, we may be practically certain that Mars has been inhabited in the past, when water was more abundant, and the atmosphere more dense so as to retain and diffuse the solar heat.

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Sept. 19, 1924

Electric Specialty Company
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Dear Sir:

Upon arrival of your type 80300 generator I immediately coupled it to a Westinghouse 1 Hp. motor. After running it about two hours I connected it to my transmitter which uses three 50 watt tubes. Not only did it work but IT PUT POWERFUL SIGNALS INTO HAMBURG, GERMANY and FLORENCE, ITALY.

I think the above statement shows how much I appreciate the generator.

My card from Italy reads as follows:

Radio 3BTA: Ur sigs hrd hr very very Qsa at 5.27 and 5.35 A.M. Both broad day-light. No Qss, Aug 20 U were one of the loudest of 14 American stns hrd tt A.M.

Sig.
F.S. Huddy
U lii lzs

Since that time I have worked every district in the U.S. in one night, also three Canadian provinces.

Very Truly Yours,
Barrie R. Barker
u3bta

P.S.
You may use this letter in conjunction with any of your advertisments as I stand by and for the ESCO generators.

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who can serve you best
Tie up to him

The 40 Ft. HERCULES Mast in yard.

The HERCULES AERIAL MAST

This mast is made in sizes to get 20 ft., 40 ft. or 60 ft. clearance and is the answer to an efficient aerial system. What is more, this graceful mast is an improvement to any property, whether it is installed on the roof or in the back yard. It can be erected in a few minutes. It is shipped knocked down for convenience in handling. All parts are made of steel and are light and strong.

LONG RANGE RADIO RECEPTION

It has been said time and again that the best results are obtained only by the intelligent use of the best apparatus procurable. This is an oft repeated statement but the more it is propounded the truer it becomes and applies not only to the receiving equipment proper, but also to the antenna system. This applies most emphatically to receivers of the crystal detector type and to non-regenerative audion outfits. THE AERIAL MUST BE EFFICIENT if the reception of long distance stations theoretically within range of the receiver is desired.

20 Ft. HERCULES Mast on roof.

PROPER AERIAL CLEARANCE

Very few novices realize the importance of good aerial installation. The feeble currents from long distance stations will never reach the receiving set if the aerial is strung too close to surrounding objects that tend to absorb the energy. It is with this interference that we have experimented for years—and present the answer—THE HERCULES AERIAL MAST.

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20 Ft. Mast.....$10.
40 Ft Mast.....$25.
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Prepaid
Order from this "Ad" if you wish.

GIVE YOUR SET A CHANCE

Not only will the proper aerial clearance thus obtained give you the supreme pleasure of long distance radio reception but the appearance of this beautiful mast on your property will give you a reputation. This reputation will grow as you bring in stations such as you yourself never dared hope for.

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ADJUSTABLE
GRID LEAK

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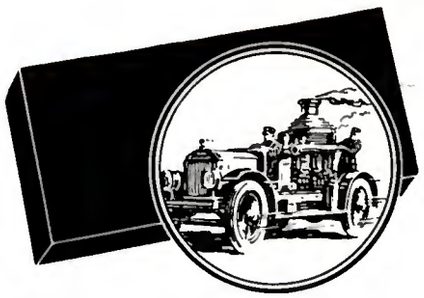

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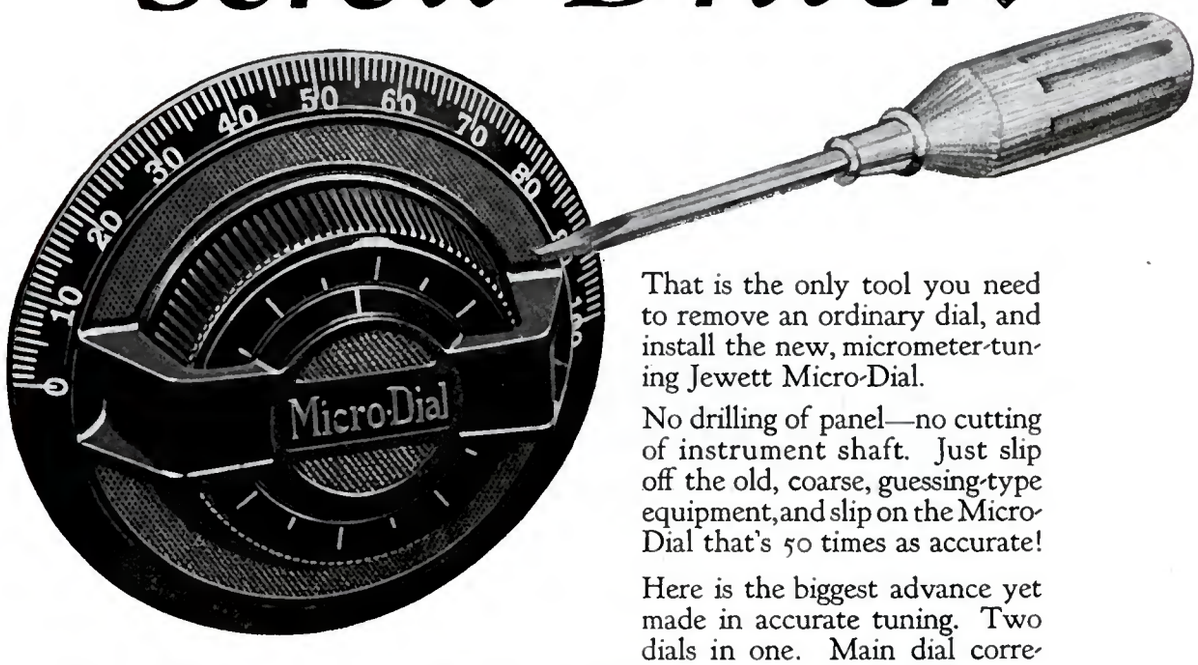

That is the only tool you need to remove an ordinary dial, and install the new, micrometer-tuning Jewett Micro-Dial.

No drilling of panel—no cutting of instrument shaft. Just slip off the old, coarse, guessing-type equipment, and slip on the Micro-Dial that's 50 times as accurate!

Here is the biggest advance yet made in accurate tuning. Two dials in one. Main dial corresponds to your old equipment. Inner dial moves instrument at only one-fiftieth normal speed, permitting accuracy far beyond the former reach of human touch and vision.

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Don't confuse the Micro-Dial with any other device for tuning improvement. Its compact neatness, and its complete freedom from wear or deterioration place it in a class all by itself and remember, you need only a screw driver to install.

Rejuvenate your set by Micro-Dial equipment!

If your dealer cannot supply you, we will ship direct to you, charges prepaid, on receipt of list price $3.50.

EXCLUSIVE!

Mounts where any four-inch dial will mount—Absolutely self-contained—Nothing to be attached to panel—Slight eccentricity or angularity of instrument shaft of no consequence; Micro-Dial will not bind—Absolutely noiseless—Knob mounted on double cone bearing, self-adjusting and self-aligning—No metal to tarnish or cause body effects; no rubber to deteriorate—Micrometer and coarse adjustments turn complete circle—Calibrations clockwise or anti-clockwise—Mechanism lubricated for life—Lasts forever—Improves with use.

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Better-Costs Less Radio

TO COMBINE the two most desirable things in radio—distant clear reception at the lowest possible price—there is only one radio receiver for you. That is a Crosley.

When you listen in on a Crosley—no matter what the price—you wonder, as thousands of others have, that such exceptional results can be obtained, and so reasonably.

The answer is simple—quality radio receivers built in quantity production. During the past twelve months, we believe Crosley made and sold more sets than any other manufacturer in the world. This is self-evident proof of Crosley Quality and Crosley Performance. Combined with Crosley excellence are such additional advantages as selectivity, ease of tuning, simplicity and beauty—all at the lowest radio cost.

Crosley has made it possible for everyone to own a radio receiver. You can start with the one tube Armstrong Regenerative Receiver at $14.50, without accessories—$22.25 with tube and head phones—the lowest priced regenerative set on the market, and equivalent in reception to many two tube receivers. Then as more volume is desired, you can add to it at a very low cost.

Or, you can purchase the three tube Crosley Trirdyn Regular, which has come through the summer period of comparatively poor reception with colors flying—for only $65. In Special Mahogany cabinet to house necessary accessories, $75. The combination of one stage of tuned radio frequency, with regenerative detector and reflexed amplification, has proven beyond a doubt that the features of selectivity, volume and ease of operation can be obtained with three tubes better than heretofore has been possible with five tubes.

We believe that no other set on the market combines these features so well incorporated in the Trirdyn.

In addition there are the Crosley 51, the two tube Armstrong Regenerative Receiver that became the biggest seller in the world in just 21 days, price $18.50. This set will at all times bring in local stations on the loud speaker and distant stations under fair receiving conditions. Distant stations can at all times be heard with ear phones. The three tube Armstrong Regenerative Receiver Crosley 52, that brings in distant stations with loud speaker volume under practically all conditions, price $30; and the Crosley 50 and 51 set in portable cabinets at $18 and $25.

These receivers, each in its own class, though assuring you as good or better reception than any other instrument of the same number of tubes, are by far the least expensive ever offered to the public.

Before You Buy—Compare Your Choice Will Be a Crosley

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Crosley One Tube Model 50, $14.50
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Crosley Two Tube Model 51, $18.50
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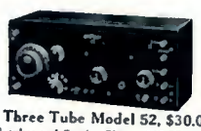

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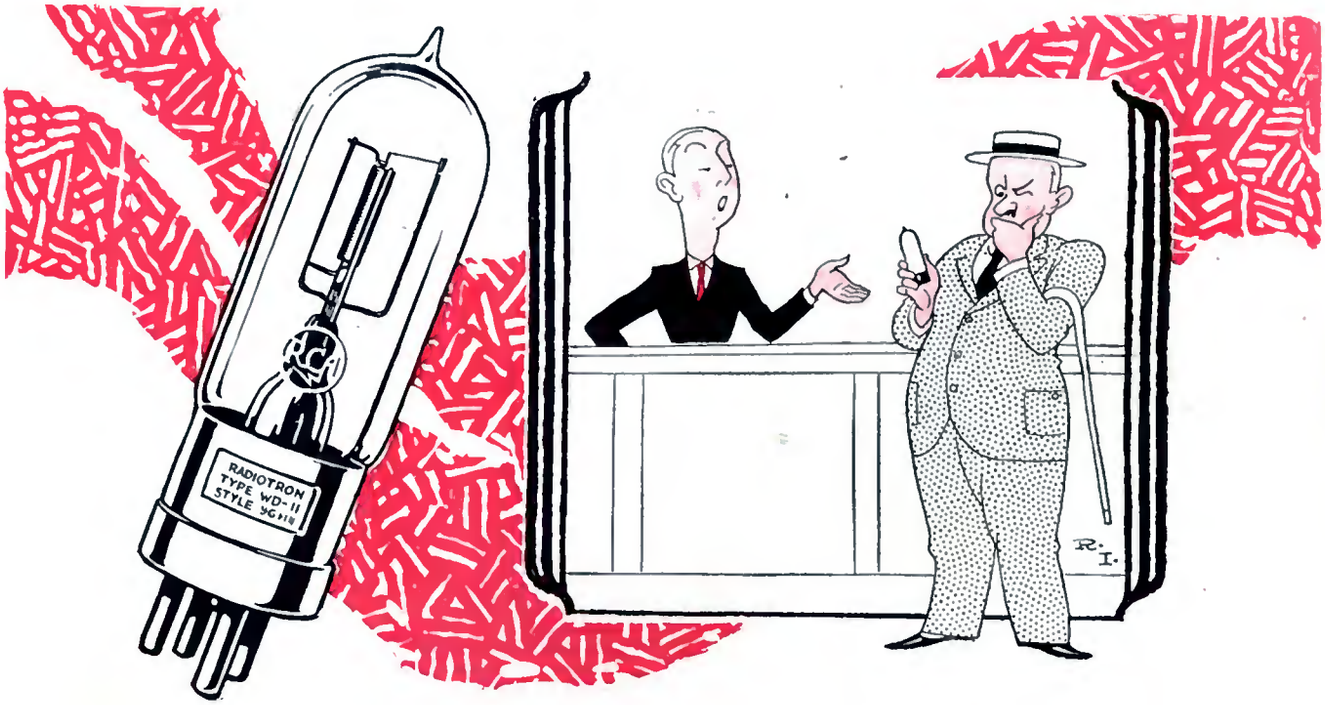

"Are those Tubes Genuine?"

The question is heard at every radio counter: "Is it a genuine Radiotron?" Almost every dependable manufacturer uses genuine Radiotrons in his sets. Everyone who builds his own knows enough about radio to know that nothing else but the genuine will do. And the man who replaces used-up tubes in his set knows that to get the same performance, he must have the same tubes—genuine Radiotrons only. So everybody asks "Is it genuine?" And asks to see the marks that prove it—the name "Radiotron" and the "RCA" mark.

All Radiotrons Now Reduced to $4.00

It isn't a genuine WD-11 unless it's a Radiotron.

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