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Trouble Finding; Superheterodyne; Neutrodyne

Radio Digest

EVERY WEEK **Illustrated** TEN CENTS

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CUT OUT INTERFERENCE

FOLLIES BEAUTIES HELP OPEN STUDIO

ZIEGFELD'S STARS MAKE RADIO DEBUT

Five Hour Novelty Program from Chicago Station Wins Wide Praise

CHICAGO.—Appearing for the first and only time on a Radio program, a brilliant array of stellar entertainers from Florenz Ziegfeld's "Follies" recently initiated into the broadcasting field the new branch of Station KYW studio fostered and operated by the Chicago Evening American. The "Follies" cast performed through the courtesy of Mr. Ziegfeld.

Thousands of Radiophans from coast to coast, from far into Canada to the southern extremity of Dixie, stayed at the receivers until the wee hours while the program of the new studio, operated in conjunction with Westinghouse Station KYW, breezed through five hours of musical and theatrical features.

Reports Pour In during Program

Even while the program was in progress reports by telegram and telephone poured in from points far distant, praising the clarity of reception of the first entertainment sent over the equipment in the American quarters. Station KYW han-

(Continued on page 2)

WAVE TRAPS GET DISTANT BROADCASTS

Shut Out City Stations

Tested Methods Shut Off Bothersome Phones and Codes—Fans Can Hear Nation

CHICAGO.—Powerful commercial code and local broadcasting stations need not be stumbling blocks in the path of the Radiophan who wants to hear the out-of-town stations, providing the directions for the making and using af wave traps outlined by Radio Digest are followed. It's the easiest thing in the world to get through the blanketing waves of the near-by transmitting plants if any one of the more effective designs of these devices is employed as here directed.

Wave traps are not indeed new to the

(Continued on page 2)

Just to tell the world that Ziegfeld's Follies can be heard as well as seen (and still be appreciated), the three ladies here shown helped initiate and dedicate the microphone of the new studio of KYW at the Chicago Evening American. And 'twas the first time the Follies have ever gone before "mike," but Flo wanted to help Mr. Hearst open his studio right. He helped. Left to right are a few of the beautiful helpers, Evelyn Law, Gilda Gray and Elsa Peterson.

WPAL Placed in Hands of Receiver by Court

COLUMBUS, OHIO.—Station WPAL, the Superior Radio & Telephone Equipment company here, has been placed in the hands of a receiver by Judge E. B. Kinkead upon application of Isaac M. Garfinkel. In the petition of the latter for a receiver for the company, it was alleged that this company, which announces itself by Radio as WPAL, has fixtures and stock of the value of $50,000. It also alleges that the company is indebted on notes in the amount of $13,000 and on accounts in excess of $10,000.

AIRPHONE STARS GET GOOD HAND ON STAGE

NEW YORK.—Broadcasting has made the music publishing combination of Breau and Tobias so popular in the United States that a vaudeville circuit has booked the team for a tour of all its theaters. The two songsters open their act with an announcement connecting their appearance with Radio, and the applause greeting them as they step onto the stage indicates that "at least three-quarters of the audience consists of Radiophans."

TESTS SHOW HOW TO SHUT OUT CITY BROADCASTERS

(Continued from page 1)

Radio world, but their use has been limited chiefly because of little experimentation and because the "air" has not been crowded so badly heretofore. But every distant station hunter, or "DX hound" as Radio slangsters have named him, will tell you that the ether is crowded to the utmost now.

Classes of Wave Traps in Use

Not so with proper wave traps! The broadest tuning (least selective) set can plunge right through troublesome interference when equipped with any of the more effective devices as the experiments of Radio Digest's technicians have proven.

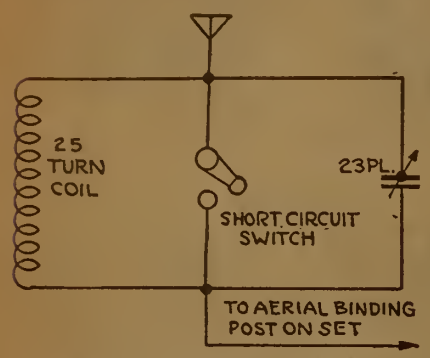

Figure 1—Series type of wave trap.

Wave traps have numerous forms and applications. Some are directly connected in series with the antenna or even the ground lead, others are inductively coupled to some portion of the primary circuit, and then again a few traps are integral parts of the tuning unit of the receiving set.

The Series Wave Trap

One form of wave trap which is connected in series with the antenna or ground lead, is shown in Figure 1. This consists merely of a 25-turn honeycomb coil with a 23-plate (.0005 mfd.) variable condenser connected across it. The cost is low even though the most expensive type of condenser is purchased.

A switch is provided so that the trap may be short-circuited when its use is not desirable. This is a very simple and inexpensive form and therefore presents the most attraction for the average fan.

Parallel Type of Trap

In the second illustration, Figure 2, is shown the style of wave trap in which the honeycomb coil or other coil inductance and condenser are connected in series, but with the resultant unit connected as a whole in parallel with the primary circuit of the receiving set.

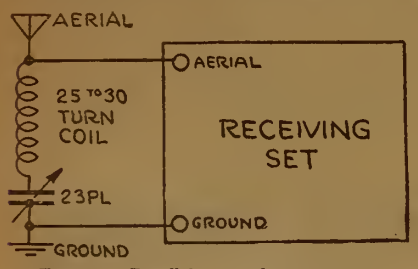

Figure 2—Parallel type of wave trap.

In this type, the tuned circuit acts as a by-pass to the ground for those wave lengths which interfere and are therefore to be eliminated. In this style of trap, as with the first type considered, all that is needed is a good variable condenser and an inductance coil of the sizes specified before.

Inductively Coupled Trap

Undoubtedly the most efficient form of wave trap today is the inductively coupled type. In this style, Figure 3, a small inductance of about 10 turns of wire, number 18 or 16 preferred, is connected in series with the antenna lead of the set. On each side of this coil are two 20-turn coils connected in series with one another and a .0005 mfd. variable condenser, the two larger coils being inductively coupled with the smaller, 10-turn coil. The two 20-turn coils, wound also with number 18 or 16 wire, are really but one 40-turn coil which has been separated in the center to allow room for the winding of the 10-turn coil.

How to Make Inductive Type

Procure a piece of cardboard, fiber or hard rubber tubing 3 inches in diameter by 3 inches long. On this, beginning ¼-inch from the center, wind 10 turns of number 18 double cotton or silk covered wire. On each side of the center coil (winding in the same direction) wind 20 turns of the same kind of wire.

Now connect the two outside coils in series, using one end of each of the two windings, and being sure to see that the turns all run in the same direction. Across the remaining two ends of these coils connect the .0005 mfd. variable condenser.

The center winding should also run in the same direction as the outside windings, but its two terminals are connected respectively to the aerial lead-in itself and to the aerial binding post of the receiving set as shown in Figure 3.

Influence in Tuning

When, after having constructed and connected in one of the forms of wave traps described, the set is to be tuned, adjust your set as before but leave the trap variable condenser set at zero (no plates interleaving). In comes the favorite noisemaker, the one for which you've been "baiting your trap." Just turn the trap variable condenser over slowly from zero toward full capacity until you "catch" the offender. You will know this point by the absence of his interference.

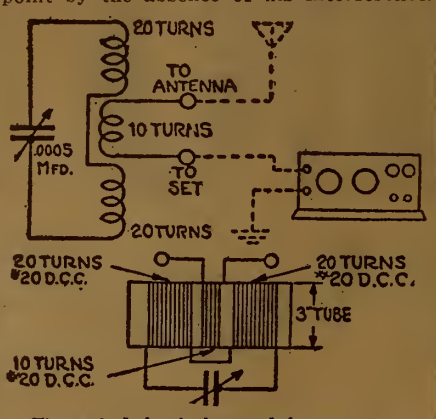

Figure 3—Inductively coupled wave trap.

Now tune your set for distance. The dials will not all register the familiar readings, but will be a little different on account of the influence of the added capacity and inductance of the wave trap.

The information here given on the subject of wave traps will be supplemented next issue by H. J. Marx, who will give working drawings and detailed data on the making and operation of a most effective trap.

FOLLIES DEBUT ON AIR

(Continued from page 1)

dled the program from the studio by means of a special sealed wire running from the newspaper plant.

Taking part in the main feature of the evening—the offerings of the "Follies" stars—were Miss Patricia Salmon, the cowgirl yodeler "found" by newspapermen at the Dempsey-Gibbons fight in Shelby; Gilda Gray, principal of the "Follies;" Elsa Peterson, Alexander Gray, Evelyn Law, singers; Virginia King, violinist; Jimmy Hussey, comedian, and Andre Tomes.

Yvette and her New York Syncopators, playing at a third theater in the city, furnished further pep for the program, the early part of which was made up by such stars as Wendell Hall, Herbie Mintz, the Melodians and a score of others. William J. Clark, Radio editor of the American, closed the long program with a word of appreciation to the followers of the new studio.

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Looking Ahead

Neutrodyne Sounds Difficult, but It Will Be Easy to make the five-tube Hazeltine Neutrodyne H. J. Marx will begin to describe next issue. The instructions are simplified but very detailed and should permit the greenest novice to understand clearly. The article will be in two parts, the second coming week after next.

Dr. A. Meissner, the World Known Authority, Knows Static.—If you knew where it was "made" and how, would it help you? Read Dr. Meissner's article next week.

Superheterodynes Are the Latest Step in Radio—Do you want to take the last step? Read the information H. J. Marx will give next week on oscillators and super audible transformers. Another circuit will be given, too. The articles this week and next are breaking the ground, so to speak, for Mr. Marx' real Superheterodyne construction series.

How to Operate Your Set and Find Trouble, that is, when trouble arises, is clearly described in the new feature, "Operating and Trouble Shooting." See pages 11, 12 and 13. Two more sets will be given next issue.

Cutting Out Locals and Getting Distance isn't half as hard as you think. Build a wave trap—a real one. How? H. J. Marx will give complete details next week so you can put one together.

What Else to Expect Next Week—M. W. Thompson will continue his discussion of audio frequency amplifiers; Fred Grill will do a Presto Chango—showing how to turn your set into a Grill Hook-Up; Lots of other well-known Radio writers will tell you lots of other valuable things.

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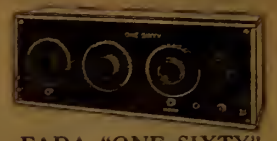

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DOCTORS OF NATION TO DISCUSS RADIO

DATA TO SHOW ITS VALUE AS HEALTH GUARDIAN

Secretary of American Medical Association to Cite Growing Use of Airphone

CHICAGO.—There will be only a handful of delegates to the annual session, March 5-7 in Chicago, of the council on medical education and hospitals, American Medical association, the most powerful organization of its kind, but in their minds and hearts will rest, it is said, the physical and mental welfare of more than 100,000,000 persons in the United States excluding its possessions. As one of the most important means toward protecting or conserving the health of the people Radio will be considered by the greatest experts in the medical profession.

For on the standards or practices approved by the 400 or 500 delegates, representatives of the 80,000 or more physicians in this country who are members of the association, on the deliberations of a concomitant body—the Federation of State Medical Boards of the United States—on the co-operation of the American Public Health association, numbering more than 3,000 health officers, and on that of the United States Public Health service, depend the lives not only of millions of men, women and children now under the flag but of their posterity. More than 12,000 doctors are expected to attend the annual congress of the American Medical association in Chicago, June 9-13, inclusively.

Executive Praises Radio

In his report to the medical congress Dr. John M. Dodson of Chicago, secretary of the bureau of health and public instruction, American Medical association, will praise, he said recently, the use of Radio as a national agency for the welfare of the people. "The use of Radio to educate the public, to warn and guide it in relation to health or hygiene, is now of vast importance," he declared. "Many cities have already officially employed Radio in relation to the public health. The various states, especially New York and Pennsylvania, have adopted like measures, as has the United States Public Ilealth service.

"Pittsburgh and Philadelphia are pioneers in the dissemination of health news. New York, Boston, Chicago and New Orleans are among the foremost municipalities who use Radio to protect their inhabitants. At least six more cities are considering the official employment of Radio as physician and health officer."

Dr. Dodson said that he had been authorized by the American Medical association to investigate and to report his conclusions as to the use of Radio in relation to the public health. "It is considered likely," he concluded, "that in the near future 10 or 12 broadcasting stations spanning the United States will diffuse advice as to how to keep well in the mass. Radio is recognized by public health experts as extremely valuable in the spread of information concerning smallpox, diphtheria, scarlet fever, infant welfare, prenatal care of mothers, industrial medicine and like topics."

Public Officials Favor Radio

The American Public Health association, headquarters New York City, of which Dr. H. M. Calver is secretary, is investigating, according to Dr. W. H. Lipman of Chicago, chairman of the association's committee on food and public health, the expansion of the application of Radio. The committee in charge of this work is that on public health and publicity of which Dr. H. E. Kleinschmidt of Toledo, O., is chairman.

Dr. William D. Owen of Chicago, until a few months ago president of the National Education association, which numbers more than 140,000 educators, will address the coming medical congress on the great value of Radio as a public health instructor.

NAA BROADCASTS ADS; TUNE IN AND GET JOB

WASHINGTON. — The Government is advertising by Radio! But, although direct Radio advertising is banned, the results achieved indicate that the public is benefited. Every Wednesday night, Mr. Morgan of the Civil Service Commission broadcasts from NAA, Arlington, openings in government positions and announces examinations to be held for every kind of a job. Some replies indicate direct results.

CYL TELLS MEXICO'S TROUBLES TO FANS

MEXICO CITY.—Station CYL here has been broadcasting to the world war bulletins during the recent crisis, telling the latest moves in the situation. Colonel Ferdinand Ramirez, chief of the Government Radio Service and member of the American Radio Relay League, is in charge of the war communiques, which were being broadcast on Monday, Tuesday and Friday nights, on 500 meters at 9:00 p. m., Central time.

IT'S EASY TO PUT UP AN AERIAL

The modern girl is very much of a Radiophan, even to the point of erecting her own aerial. Few realize that there are about as many girl fans as there are boys, and that many of them build their own sets and put up their own aerials. This photo shows Miss Catherine Moore, who is quite well known amongst the Radio fraternity, at work on the aerial on top of her New York home.

K. & H. Photo

Canaries Sing at WTAM

CLEVELAND.—Radiophans who picked up WTAM recently heard the birdies sing even though it was a dark and stormy night. Eight little yellow Rollers each took a turn before the microphone and "strutted their stuff." The birds were furnished by exhibitors at the International Roller Canary Show, held here. All were prize winners in some branch of Roller Canary-ing.

TWO FIRMS CLAIM SECRET BROADCAST

AIRPHONE NEWS PRINTER ENDS GENIUS' SEARCH

Concerns in Chicago and New York Declare They Send Four Messages at Once

CHICAGO.—Ever since communication by Radio became practicable the world's greatest inventive geniuses, including Marconi, have striven for secrecy in transmission but not until recently, according to the International News Service of New York City and the Morkrum company of Chicago, has this been achieved. These concerns lay claim not only to secrecy in but quadruplication of transmission.

Radio engineers in the employ of the International News, including W. G. H. Finch, aged 28 years, formerly of Birmingham, England, Lieutenant Commander A. M. Stevens, aged 39 years, who constructed and installed the Lafayette Radio station at Bordeaux, France, during the war, and William A. Bruno, have perfected what they call the high speed automatic Radio printer system which enables the simultaneous transmission, they assert, of four different messages or news "stories" to four separate automatic typewriters in as many receiving stations, that is, newspaper offices. The typing machines are operated, it is said, by the same impulse which carries the signals.

Electric Engineers See Test

Demonstrations along similar lines were made recently in Chicago by the Morkrum company before 300 delegates to the annual convention of the Association of Railway Electric Engineers.

Secrecy in transmission is effected, according to the International News, by the use of signals which are receivable only by like typewriting mechanisms adjusted in a manner similar to the sending apparatus. Adjustment of the devices used in the transmission and reception of news reports may be changed daily if necessary to insure secrecy.

The device of the Morkrum company was invented by Francis F. Dunmore, staff engineer of the United States bureau of standards, Washington, D. C. It is applicable to the standard laud-line printing telegraph machine now a part of many daily newspaper plants. The instrument relays the Radio impulses of an especial land-line telegraph code which signals are recorded by the automatic printer or typer. The Dunmore contrivance, it is said, also responds to variations in the volume of sound, that is, to different tones. This prevents, it is asserted, interference by sending stations with corresponding wave lengths. Secret transmission is effected by the Dunmore device, it is said, by adjusting the sending keyboard so that opposite or erroneous relationships are obtained with the broadcasting pulsator.

May Serve Small Dailies

Recent tests of the International News' apparatus and that of the Morkrum concern showed, it was declared, that it will be possible soon for small daily newspapers to receive extensive news reports at a very low cost.

The Associated Press recently transmitted news reports by means of the Dunmore machine from Chicago to Milwaukee. The International News report was recently sent as a test by Radio from its offices in New York City to Tarrytown, New York.

8,800 Receivers on Job in Rio Janeiro District

RIO DE JANEIRO.—Operating in the federal district of Rio de Janeiro, Brazil, there are about 8,800 receiving sets. Broadcasting of music and entertainment is taking place regularly from the Government station at Praia Vermelha and the Radio Sociedade de Rio de Janeiro. A line is being put up to connect the former station with the Instituto de Musica to permit the broadcasting of concerts.

THE ANTENNA BROTHERS — Spir L. and Lew P. — When Is a Catalogue?

SAVANTS SAY EARTH IS BEST CONDUCTOR

ROGERS' TESTS OFFERED BY HIM AS PROOF

Noted Radio Scientists' Theory That Air Doesn't Carry Signals Is Demonstrated

BALTIMORE.—Further experiments by Dr. J. Harris Rogers, 74 years old, of Hyattsville, Md., acclaimed a peer by such scientists as Marconi, Tesla and Steinmetz, whose Radio discoveries helped win the war, prove, it was reported here recently, his contention that the earth is a better conductor of the electromagnetic wave than the air.

By means of Dr. Rogers' device, consisting largely of coils, antenna and loop whose assembly resembled a harp, installed in an air-tight copper lined well fifteen feet deep, in the laboratory of his home, he is said to have communicated easily and clearly a few days ago with Villanova college, Philadelphia, Pa.

Sees Earth Best Conductor

"Reception by means of the earth," he is quoted as having said, "has reached almost perfection. Greater distances may be attained with lesser energy. The fading of signals may be obviated and uniform strength of signals during the day or night and a greater reduction of static may thus be attained."

Dr. Rogers' methods were recently substantiated by news messages from London that Marconi had heard London by means of a set 100 feet underground, that is, in the catacombs of Rome.

In the rear of Dr. Rogers' laboratory is a room whose walls and ceiling are sheeted with iron but whose floor is earthen. In this room Dr. Rogers said he has received messages from distant places using the earth as a means of transmission.

How He Helped Win War

All of his tests since 1908 confirm his theory, Dr. Rogers said, that long-distance signals are conducted by the earth and not by the air.

During the war Dr. Rogers constructed a "dugout" near his home. He also supervised the digging of a well 50 feet deep nearby, which well was lined with copper and sealed to exclude air. In these places and under the water of a small lake near his home and in the sea at Piney Point, St. Marys county, Md., Dr. Rogers established his apparatus which enabled the highest officers of the government in Washington and those of the allies to listen in to the messages of German war lords to their soldiers in the field. These experiments were conducted under intense secrecy to prevent the enemy from obtaining knowledge of them.

It was the application of Dr. Rogers' contrivances, it was said, aboard vessels of the United States navy during the war that enabled them to operate virtually without risk of attack by enemy submarines.

Additional revelations as to the possibilities of underground and underwater Radio communication are expected to issue soon from the Hyattsville laboratory.

HOW SPORT EVENTS ARE "MIKED"

Fights, baseball and football games often are tuned in by constant listeners, but few of these know how it is done. The above group is broadcasting a football game. Left to right, E. F. Grossman of WEAF is announcing scores to listeners by direct wire to Station WEAF; A. E. Potzman is talking by ordinary wire telephone to the WEAF operator. © Keystone View

Lectures by Radio Extend Influence of New York "U"

NEW YORK.—Convinced that its unexcelled educational facilities should, and can be, made to include a student body numbering hundreds of thousands instead of but a few hundred, New York University recently opened its campaign for Radio education by presenting General Charles Hitchcock Sherrill in a series of lectures, through WJZ.

General Sherrill is a former minister to Argentine, a world traveller to whom a welcome is extended by every court in Europe, an authority on the Monroe Doctrine. The titles of his talks were "South America and the Carribean Sea," "The Pacific Ocean" and "Europe."

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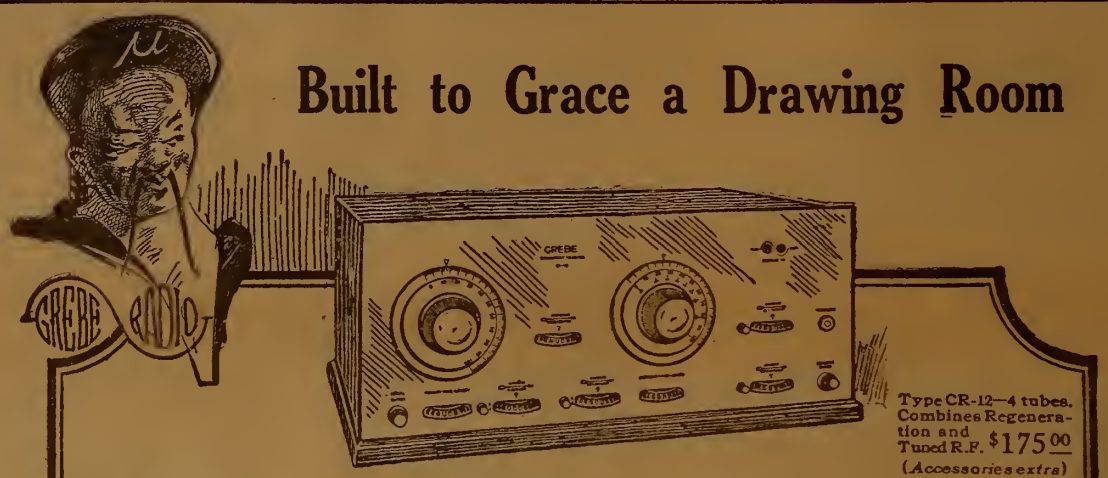

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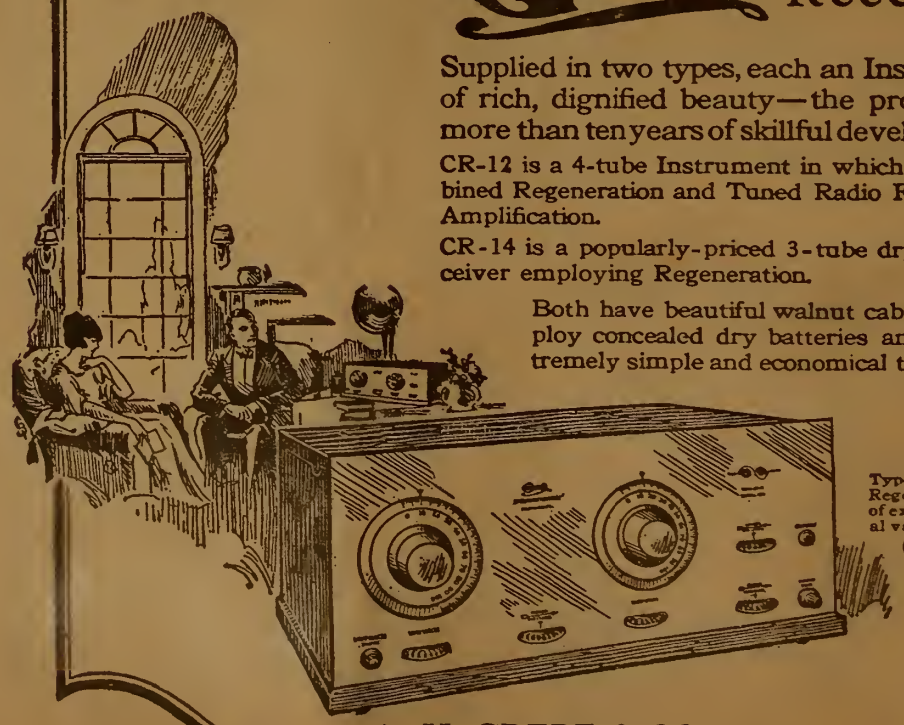

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"And Now Mr. Vaughn Is Hopelessly a Phan," Sighs His Pretty Partner

By P. A. Price

"Art" Harris, who, with Miss Dollie Vaughn, composes the vaudeville team of Harris and Vaughn, has a Radio set that is a wonder. "Art" made it himself, and he says it's a wonder, and he ought to know. Let him tell about it:

"Everywhere I went, all I saw in the shop windows were Radio sets. Big ones, little ones, crystal sets, nine-tube sets with coils and knobs sticking out of the top, sides and front. Seemed like I was missing something good by not having one. At first I resisted, struggled manfully against the thought, but the tubes winked an invitation; the honeycomb coils were appealing by their very name, and the bright, shining plates of the condensers looked so cheerful and business-like that I finally fell, and I fell hard.

Has Terrible Dreams

"Someone told me that half the fun of a set was in building it yourself. Perhaps. But what kind of a set was I to build? I got four dollars' worth of magazines and studied four hundred hook-ups; tried to understand the relative merits of capacity and inductance, grid leaks and A batteries, Radio frequency and audio amplification. I was a mental wreck; dreamt of potentiometers and spider web coils; saw loop aerials grinning at me every time I closed my eyes. It was awful.

"Then I surrounded myself with the makings. Had to pay excess baggage on about fifty pounds of junk every time I moved; had my dressing rooms full of variometers, tripped over tangles of Litz wire; my friends were using tube sockets for ash trays. Almost went flooey on a Flewelling; tried all my arts on a Reinartz; found the Armstrong too strong for my capacity as an amateur; the neutrodyne proved neutral so far as results were obtainable; the 'Pup' circuit only growled when I tried it out, and I would hear the little birdies chirping and whistling till I almost went cuckoo myself.

"All this occurred while we were playing Detroit, Buffalo, Rochester, Columbus, and a lot of other places. Then we went to Cleveland, and I copped the 'Copp' circuit that everybody there is always talking about. I got a coupler specially designed for the circuit, and after buying a soldering iron instead of trying to use Miss Vaughn's curling irons to solder the wires, I got the thing working. Any kind of a loose coupler will do.

"Does it work? You can tell 'em all that it works! They do say that it sends most horrible squeals out into space and makes your neighbors cuss freely and fluently, but you don't hear the squeals, just a nice little chirp that tells you it's right on the job, doing its darndest to pick up Cuba and Birmingham and bring in the chimes from WOC. I used an indoor aerial, and at first I would open the window to let in the Radio waves, so you know how good I was. That was when I fancied the waterpipe ground wouldn't work unless the water was running. But those days are gone.

HARRIS AND VAUGHN "COP" PWX ON THEIR COPP SET

Here they are, the two vaudeville headliners, "Art" Harris and Dollie Vaughn, with Art's suitcase Radio set. While awaiting their cue "Art" has tuned in PWX so Dollie can enjoy "La Golondrina." (Posed for Radio Digest by Strand Photo Studio, N. Y.)

Gets Room on Top Floor of Hotel

"Now, I get a room on the upper floor of a hotel and drop a 30-foot length of wire out of the window and listen to half the United States. In my dressing room I use an electric light socket attachment, or hang the wire around on clothes hooks and chandeliers and 'make up' to music from Schnectady or Ft. Worth. Miss Vaughn borrows the set and tunes in on 'The Waves from Lake Erie' when she is dressing her hair. It is the life!

"When the Dempsey-Firpo fight took place, we were playing Bethlehem, Pa. I had Old Reliable on the job in my dressing room and all the theater staff and other artists were there, too. When the decision was announced I gave it to the audience, hot off the air, before anyone else in town had the news. That is, before anyone who didn't have a Radio set.

"Here's the circuit; a tuner, a 23-plate condenser, grid condenser, tube, socket, rheostat, and A and B battery. That's all. I use a WD-12 tube, but a UV-199

(Continued on page 6)

IT DIDN'T take the boys of the nation long to wake up to the fact that they could get De Forest Audions for their Radio Receiving Sets. They knew De Forest was the inventor of the vacuum tube—they knew that every tube made, no matter what set it works in, was based on De Forest patents. So they are all insisting on De Forest Audions, and they are getting the DX and clear reception results they deserve. Three types available —DV 6-A Universal at $5.00—DV-1 for dry cell use at $6.50—and DV-2 Power Amplifier Audion are suitable for use with receiving sets of all makes, and they work particularly well in the famous cross-continent Reflex Radiophones with indoor loop—D-7-A at $125.00 and D-10 Portable (dry cells enclosed in cabinet) at $150.00. To prices quoted add approximately 6% for transportation for territories west of the Rocky Mountains.

Send for circular "What Tubes Shall I Use?" which gives full details and table of various tubes for different receiving sets.

DE FOREST RADIO TEL. & TEL. CO.
Dept. R. D.5 JERSEY CITY, N. J.

DE FOREST

Tube Efficiency Is Trebled With Erla Synchronizing Transformers

Vacuum tube acting as relay or single-duty amplifier

Vacuum tube doing double duty as amplifier of received and reflexed r.f. currents, with Erla synchronizing radio transformer

Vacuum tube doing triple duty as amplifier of reflexed audio as well as received and reflexed radio frequency currents, with Erla synchronizing radio and audio transformers

Perfect synchronization of received and reflexed r. f. currents make Erla radio transformers indispensable in reflex work. List. $5

Rectified radio frequency and reflexed audio frequency currents are accurately synchronized by Erla audio transformers. List Price, $5

Providing utmost sensitiveness with perfect stability, the Erla fixed crystal rectifier is uniquely adapted for reflex work. List, $1

Jobbers—Unexampled sales opportunities are created by Erla leadership in research and manufacturing. Write for liberal terms and discounts

Responsible for the unduplicated efficiency of Erla reflex circuits is a basic Erla discovery of vital and far reaching importance.

Discordance and instability in reflex circuits, it has been ascertained, are due directly to failure of transformers properly to synchronize received and reflexed currents having the same phase characteristics, in their simultaneous passage through amplifying tubes.

Obviously, if the lag between such currents were as much as 180°, the net result of their opposing forces would be zero, resulting in an absolute canceling of signal strength. Any intermediate lag, on the other hand, results inevitably in the generation of amplified distortion.

Erla scientists solved this problem by designing radio and audio transformers of an entirely new and special type, positively assuring perfect synchronization of received and reflexed radio frequency, as well as rectified radio and reflexed audio frequency currents.

This achievement, enabling vacuum tubes successfully to do triple duty, as simultaneous amplifiers of radio frequency, reflexed radio frequency and reflexed audio frequency currents, marks one of the most important advancements of recent years.

For complete details, ask your dealer for Erla Bulletin No. 14, describing and illustrating perfected Erla one, two and three-tube reflex circuits. Or write us, giving your dealer's name.

Electrical Research Laboratories
Dept. A 2515 Michigan Ave., Chicago

ERLA

STATION WGR SENDS HAWAII ITS MUSIC

BUFFALO PLANT ASTOUNDS WAIKIKI FROLICKERS

Plaintive Music of Orient, Including Ukulele, Heard Plainly by Honolulu Folk

By Lloyd S. Graham

BUFFALO.—Of all the oddities that bob up in Radio broadcasting the most curious that has come to the attention of those who direct Station WGR, Buffalo, is the report that its Hawaiian music is being heard on the beach of Waikiki.

One of the frequent broadcasters at WGR is the American Hawaiian quartette which specializes late at night in strumming the "uke" and like instruments.

His Friend on Waikiki

It happens that M. A. Rigg, jr., general manager of WGR, has a friend who lives in a bungalow near the beach of Waikiki, someone who has something to do with Standard Oil. He is an enthusiastic Radiophan. Of course, he listens for WGR's late programs.

Now comes the report that the American Hawaiian quartette was tuned in one day at Waikiki when there was much frolicking on the beach. Mr. Rigg's friend, whose name is suppressed, caused almost a riot when he hooked up a loud speaker and turned it in the direction of the famous beach.

Where did the plaintive, gentle, strumming sound come from? It was a mystery. It didn't come from the sands of Waikiki. The Oriental music was not Oriental; it was Occidental. It came from Buffalo.

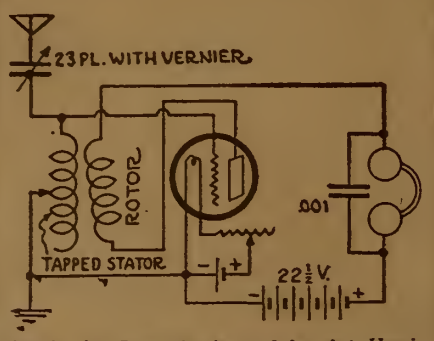
West Wails to East

The reception was strong and clear with only occasional intervals of irritating faintness and sputtering. The loud speaker, amplified to the limit, worked overtime that day for those on the beach of Waikiki.

With several minor changes and improvements, made during the last few weeks at WGR, Mr. Rigg is expecting to achieve more distance records. Take a zippy, clear night or very early morning, with the mercury in the bottom of the thermometer bulb; add to that, WGR transmitting apparatus, the Vincent Lopez orchestra. the American Hawaiian quartette, the high soprano of Edna Lawson Stuart or the Radio Male quartette; the results, as simple and sure as arithmetic, are bound to be unquestionable long distance records.

Let someone organize a Chinese orchestra, featuring the Chinese bull fiddle —Mr. Rigg will probably stir up a rumpus in Hong Kong with some real Chinese music, made in America.

HARRIS AND VAUGHN FIND SET GOOD ONE



This is the Copp circuit used by Art Harris. Like a flivver car, it is positively immoral to have one if you can get some other kind, but, like a flivver, it will sure produce results.

(Continued from page 5)

works just as well. You can use a pencil mark grid leak or none at all; it doesn't seem to make much difference. Simple? Nothing to it at all; I have the whole shooting match in this box, A and B batteries included."

Dolly Visualizes Future of Art

"Art" signed off to his pretty partner, Miss Dollie Vaughn. Miss Vaughn likes Radio, and can tune in as well as any one, but, womanlike, she had a grievance against her partner, which she expressed in this breezy manner:

"Since Mr. Harris has his Radio set he is always missing trains, missing his meals, and missing his cues. But he never misses a good program. He is almost hopeless. I can see him in future years, peddling Radio sets, something like this: 'Nice Radios, lady? Grid leaks? Tuners? Variometers? Yes, we have no transformers.' Life is just one stage of amplification after another, but I'm used to stages," and Miss Dollie tripped away to prepare for her act.

RADIO TALKS

It is not right to expect maximum selectivity from your Radio set if you insist on operating it on a 150 to 200 foot antenna especially if it is a two, three or four wire affair. A 75 to 100 feet of single wire is by far the better. E. T. Flewelling

E. T. Flewelling

Tuner

Your set is no better than its poorest part. And there is a world of satisfaction in knowing that each part is as good as it should be. Consider the tuner—here is one of the most vital parts, therefore so many fans have turned to the one designed by Mr. E. T. Flewelling. The prestige enjoyed by this tuner is to be attributed to no single merit. It's not a good tuner because it is neat, because it is compact, nor because it is efficient. The Flewelling Tuner is par excellence because it incorporates all the good points a perfect tuner should possess.

BUELL MANUFACTURING COMPANY
2977 COTTAGE GROVE AVE.
CHICAGO

$8.00 At your dealers or post paid.

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$7.00
2200 OHMS

Federal head sets are one of the more than 130 radio products which Federal manufactures and guarantees. Your receiving set is no better than its weakest part. Insist on Federal.

Federal
Standard RADIO Products

The Real Thrills of Radio

are assured when you use equipment that is positive in its performance.

For over a quarter century Federal experts have been recognized as pioneers in the Radio field. Complete financial responsibility is behind Federal's iron-clad guarantee on every set and the 130 parts bearing the Federal's mark of manufacture.

For real Radio thrills, ask for

Federal

Federal Telephone and Telegraph Company
Factory: Buffalo, N. Y.
Boston New York Philadelphia Chicago San Francisco Pittsburgh
Bridgeburg, Canada London, England

LISTENING IN FROM WAY UP NORTH

By Vera Brady Shipman

I HAD been down in Chicago for Christmas and was going back to the north to "hibernate." The city had been attractive, especially in holiday regalia, but the deep snowy woods—where dark pines are clothed in white petticoats and gray skies commune with grayer woods—were calling me back. Snow everywhere; sidewalks piled, roads banked, thermometers dropping in humiliation, coat collars tightly adjusted and galoshes no longer despised. I stopped off at Wausau, Wisconsin, for a few hours. I entered a café—the Crystal, I believe its name (but what's in a name?) It was New Year's eve. Youthful couples here and there in party clothes, flimsy gowns under enormous fur coats and inevitable Tuxedos.

My eyes spied a Radio—exactly like my set awaiting me in the north woods. And so, with meager introductions, I sat in this little restaurant in Wausau while New Year's celebrators laughed around me, and I tuned in on my Radio folks.

A Hawaiian trio (always somewhere Hawaiians play—will the ukulele never wane?) from WBAP, and the announcer telling of a Radiophan birth. And what should they name the baby? The announcer suggested Marianna—wonder whose grandmother was named that? At WMAQ, an eleven-year-old harpist was playing her own composition. From WDAP, the cigarboxerino was moaning a jazz blues. Violins with haunting melodies from WOC and WFAA. KFI, Los Angeles, was singing. KSD was playing "Easy Melody" in its most tempting rhythm. The world was dancing the old year away, KYW was broadcasting the opera "Thaïs" with Mary Garden. I turned to tune in on it. Suddenly the strains of the famous "Meditation" came through the air. I settled myself for the opera—and then the announcer said, "KDKA, a violin solo."

Some facetious announcer told his hearers that "she didn't listen in on the party line since Radio came in." There—I touched Regina, Saskatchewan, with a song, a band playing from WEAF, New York City. (The owner tells me he tuned in on Mexico the other night.) WLAG is singing "Sing Me to Sleep," and while "the World was Waiting for the Sunrise" of the new year, and Wendall Hall, the "red-headed music maker," was singing "It Don't Belong to Yoo-Hoo" more forcefully than grammatically, from KYW, a xylophone from WJAZ jingled out "Aloha."

The dream world fades—and I hurry down the snowy street of the little Wisconsin town to my hotel.

THREE CENTS ALL IT COSTS TO BROADCAST

MADISON, WIS.—Really it's not so expensive as it looks, this Radio broadcasting! Radio engineers in charge of Station WHA, the University of Wisconsin here, have calculated that the cost of a forty-minute broadcast is only three cents. This figure, however, does not include depreciation of appartus, but merely the cost of the electricity consumed.

EXPERTS ASK 706-METER WAVE FOR SHIPS

These five Radio experts called on President Coolidge recently, urging him to have Secretary of Commerce Hoover call a Radio conference, out of which a law would be formulated compelling ships and commercial stations to use a 706-meter wave length instead of the 450-meter wave now used. With millions of people listening in nightly to interesting programs, it seems only reasonable that ships and stations should use a wave length which would stop the continual interference now experienced. In the group, left to right, are Walter Howey, George Burghardt, president of the Radio Club of America, John Hogan, John Shepard of WNAC, and Paul Godley. Photo by Underwood

PHONOGRAPH SALES SPURRED BY RADIO

NEW POLICY OF COLUMBIA COMPANY SUCCEEDS

Broadcasting of Songs for Recording by Noted Artists Forms Basis for Big Campaign

NEW YORK.—Instead of withdrawing in fear from the evergrowing competition afforded by Radio, instead of trying to fight it unfairly either in business or by misinterpretation of law, the phonograph industry as represented by the Columbia Graphophone company of this city has applied successfully, it is said, a sales method based on the impetus given popular songs by the airphone.

The prime factor in the new policy of the company is the broadcasting of songs and the like as given by famous artists in the recording studios of the concern by means of connection with Station WEAF, American Telephone and Telegraph company, New York, every Tuesday and Thursday evening from 9:15 to 9:30 o'clock.

Advertisements announcing the broadcasting of the performances of noted artists are a part of the campaign. What effect the policy of the phonograph company will have on that of the National Association of Composers, Authors and Publishers is considered problematic, but it is believed that the latter's course would be modified or rectified were that of the phonograph interests studied and applied.

Opera Club On Air

COLUMBUS, OHIO.—The newly-formed Columbus Grand Opera club, an organization of capital city musicians with the avowed purpose of promoting interest in grand opera, made its public debut by Radio recently. Station WEAO, the Ohio State University, broadcast the first program.

Rangoon and Madras Can Now Talk by Ether Wave

CALCUTTA, INDIA.—Radio communication is now possible betwen Rangoon and Madras, and similar communication is planned between Bombay and Karachi, India, but more rapid development of the stations now in existence is difficult, due to the retrenchment policy of the government.

A number of the native states have established small Radio stations for communication between various parts of their territory. The Maharajah of Gwalior has four stations and is considering the establishment of twenty-four additional ones. There are at present four stations in Mysore State and several in Kashmir.

THE BEST GRID LEAK SAYS FLEWELLING

E. T. Flewelling, inventor of the famous Flewelling circuit, has tried the new Bradleyleak in his laboratory, and he writes—

"The Radio Market is sorely in need of such high type apparatus as the Bradleyleak, and you are to be congratulated on its action. It is the best grid leak I have tried, and the only one that comes anywhere near approaching the ideal grid leak."

Try a Bradleyleak in your radio set and get improved reception. Follow Flewelling's advice.

$1.85 EACH

35¢ FOR .00025 MF. CONDENSER

Manufactured by ALLEN-BRADLEY CO.
290 Greenfield Ave. Milwaukee, Wis.

SOLD BY ALL LEADING RADIO DEALERS AND JOBBERS

Bradleyleak

THE PERFECT GRID LEAK

Electrad Products

Their Quality Absolutely Guaranteed

YOU are safe when you buy Electrad Products. They are absolutely guaranteed, electrically and mechanically, to be of the finest materials and workmanship.

Most good dealers carry them because they are fairly priced and give their customers good service.

Double Your Distance with an ELECTRAD VARIOHM

The latest invention in grid leaks. A simple turn of the knob and you can get any resistance from ½ to 30 megohms. Eliminates circuit noises, is moisture proof and non-microphonic. Absolutely guaranteed.

ELECTRAD LEAD-IN

Fits under closed window. Can be bent to any shape. Covered with fireproof insulation which prevents grounding on wet window sills. No holes in window frames and takes the place of unsightly porcelain tubes. Fitted with Fahnestock Clips.

ELECTRAD INDORARIAL

Ideal for sharp tuning. Wonderful directional effects. Particularly effective where several local stations are broadcasting at once. Can be used also as ground. By using Indorarials for antenna and ground you can get any coupling you desire. Hang on wall, door or lay under rug.

ELECTRAD GRID LEAKS

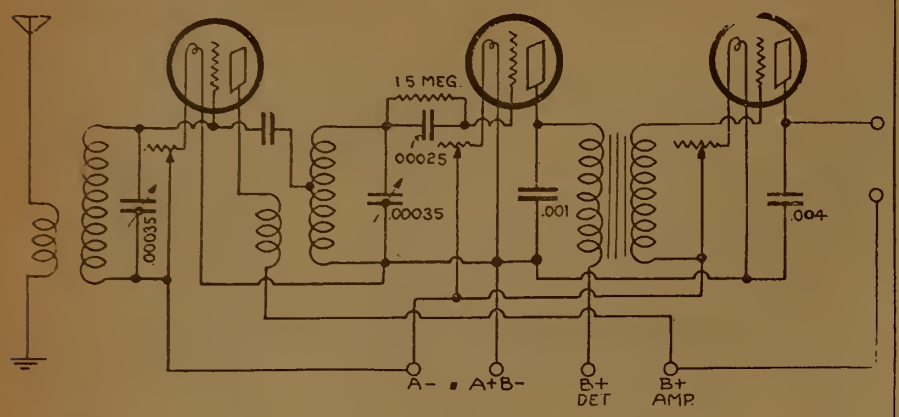
Absolutely uniform unvarying fixed resistance. A superior product of dependability, in all resistances from ¼ to 10 megohms.

Dealers: Write for samples and details on our special group assortment.

ELECTRAD, INC.

428 Broadway, Dept. "L" New York City

SIMPLE THREE TUBE NEUTRODYNE



A SIMPLE form of Neutrodyne circuit in which the number of parts required has been reduced as much as possible is shown in the illustration above. This circuit has one stage of tuned, transformer coupled Radio frequency, the detector and one stage of audio frequency. It has only two tuning controls and is indeed a simple set that any person can operate. The stage of Radio frequency gives the long distance range while the audio frequency builds up the volume. A soft or detector tube is recommended for the detector stage. Hard or amplifier tubes should be used for the two amplifier stages. With the detector tube a plate voltage from 18 to 22½ is sufficient. The amplifier plate voltage should be about 67½. As may be guessed by the maker, the standard form of neutroformer is required. This circuit will require a panel size of about 7 by 21 inches. The expense of constructing the entire set should not be over $50.

PREDICTS "U" HOME CLASSES BY RADIO

Official Foresees New Method of Teaching in Public Schools

DETROIT.—"Science must come to the rescue of urban municipalities in solving educational problems," was the assertion of J. A. Taylor, inspector of public schools at St. Thomas, Ont., in an address at Windsor, Ont., across the river from Detroit, at a conference of Western Ontario school inspectors.

"Time is not far distant," he said, "when secondary school and university training will be carried into the homes of students by means of the Radiophone. It may even develop to such an extent that it will be possible to teach public school children by this method.

"One can well imagine what this will mean to pupils and students living in the outlying districts of northern Canada and the unsettled sections farther north. I see the greatest possibilities for educational work by means of Radio. At present it is only in its beginning. What it eventually will mean to the work can only be imagined."

Quarter Million Sets on Farms

WASHINGTON, D. C.—Radio broadcasting as a means of disseminating market information has been given a thorough trial during the past year and has fully demonstrated its value, says the Secretary of Agriculture in his annual report to Congress. In this connection he says:

"The broadcasting has been further developed, and now any farmer can get full market reports from the air in practically every part of the United States. An inquiry among county agents shows that the number of receiving sets on farms is nearly a quarter of a million."

REAL MUSIC FOR A COST OF .00037 OF A CENT!

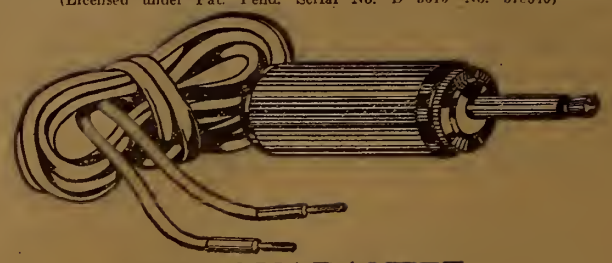
—would you spend .00037 of a cent for every hour of pleasure your radio set can give? Then remember that without a perfect plug you cannot have perfect reception, and treat yourself to

THE ORIGINAL AUTOMATIC

COMSCO COMSCO

BULL DOG GRIP TELEPHONE PLUG

(Licensed under Pat. Pend. Serial No. D 3010—No. 578540)



WE GUARANTEE

that this plug will not demagnetize your phones, ruin your transformers, short circuit your batteries, have battery kicks or break your finger nails. The COMSCO PLUG is the last link in perfect reception. At a small cost it is the final refinement for your set.

For One Pair Phones.....$1.00
For Two Pair Phones..... 1.50

FOR SALE AT YOUR DEALER

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

GENERAL INSTRUMENT CORP.

123 Liberty Street
NEW YORK CITY

Complete Your Radio Outfit

Bring Out the Best in Your Receiving Set with a Bristol

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

IT TOOK six years to develop and perfect Audiophone. That is more time than the average person cares to spend on a Loud Speaker for his receiving set.

But here it is, all ready for you to use by simply connecting to the set.

No auxiliary batteries are necessary.

The tone is big, full, and rich, and without that scratchy, tinny noise so often heard in receiving. It can easily be heard all through the house, so that your own family and friends can enjoy it with you.

The finish is a beautiful, dull gold bronze.

Made in Three Sizes

Senior Audiophone .....Price **$32.50**
Junior Audiophone .....Price **22.50**
Baby Audiophone .....Price **12.50**

When signals are not sufficiently loud to give good results with the loud speaker, Bristol One-Stage Power Amplifier is recommended to build up the power so that it can be heard even in a large hall.....Price **$25.00**

Ask for Bulletins Nos. 3006 and AY-3011

THE BRISTOL COMPANY, Waterbury, Conn.

WHAT IS IT WE CALL "STATIC"?

In Which a New and Different Way of Looking at the Electricity of the Air Is Proposed by the World-Renowned German Radio Authority, Dr. A. Meissner, in a Series of Articles Prepared Exclusively for Radio Digest Readers

By Dr. A. Meissner — Part I

Editor's Note.—The author of this important series is chief engineer for one of the world's largest Radio communication companies, the Telefunken Company of Germany. He has been a leader in the science since Marconi sent his first message across the English Channel. Dr. Meissner promises to upset a few time honored theories. Now read—

ATMOSPHERIC disturbances are the bugbear of all Radiophans. What could we not receive, did they not exist? If we did not constantly—and especially during the summer—hear whistling, hissing, and howling from receivers whenever a higher degree of regeneration is employed, from how many thousand miles could we hear broadcasts? We could hear broadcasts at any time in all tongues and listen to every country's music were there not these noises.

But since the beginning of Radio science, we have scarcely advanced at all in the suppression of these noises, and therefore, very few persons realize the need of discovering the cause to which they may be attributed. We are satisfied when we are told that they are caused by sudden changes in the earth's electrical field and that they originate in the higher strata of the atmosphere or, rather, in interplanetary space. But what goes on up there is accepted as being wholly mysterious and unfathomable to us. Yet each has in his aerial a simple and instructive means of forming a conception of how it is affected by the earth's electric or magnetic field and the changes therein.

We need only connect into the antenna—were the wire even a thousand miles long—a sensitive direct current galvonometer near the ground, to find that an atmospheric electric current—very often continuous but sometimes pulsating—is very nearly always flowing through the antenna to the earth.

Kite Cable Becomes Red-Hot from Current

In a large aerial, such as that of Station POZ at Nauen, these electric currents naturally are quite large, often over 50 and sometimes 100 milliamperes. Very interesting experiments in this field have lately been made with kite antennæ. The apparatus is quite simple. One or more kites hanging on the same string—in this case a steel wire—as in meteorological soundings, are sent up. At the lower end of the cable before it comes in contact with the ground or is led to the winding drum, is placed a galvonometer or a resistance wire. By means of this apparatus a flow of from .0001 to .01 milliampere has been observed in the kite string. If, however, the kites reach a height of 1,500 to 2,000 meters, the flow is very heavy as a rule. In fact, the flow is so heavy that the wire gradually becomes red-hot. This glow often lasts for several minutes and then reaches a white heat and melts or "burns up" the wire.

In this case we are dealing with an enormous electric charge in the air. The glow, it should be remarked, is observed independently of the presence or absence of thunderclouds in the atmosphere.

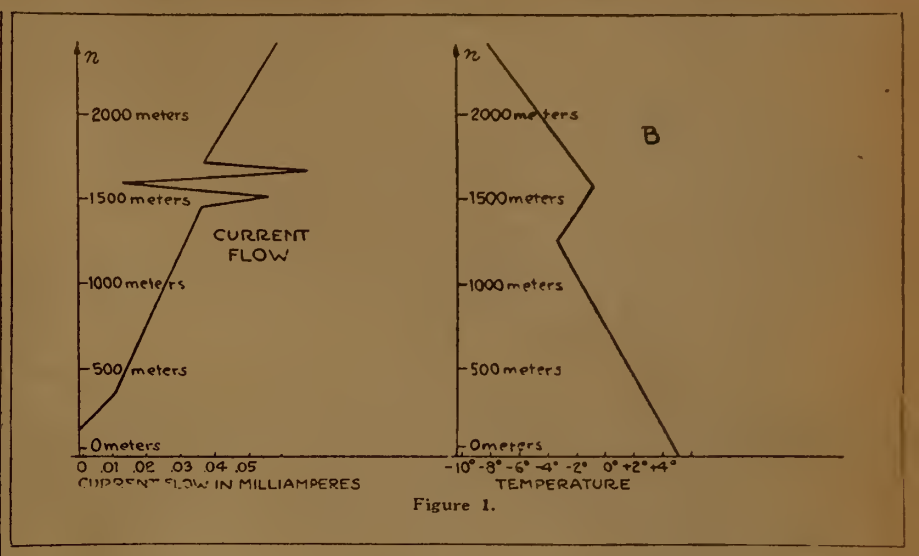


Figure 1.

What We Call "Static"

The total of all this atmospheric electricity is what we call "static" and we can think of the whole atmosphere as a large static storage battery (Leyden jar or condenser). What static is, why it is and how it originates, are all controversial questions.

In many points we still adhere to theories developed during a period of many years. It is assumed, for example, that

(Continued on page 19)

CROSLEY MODEL X-J
$65

That's the unanimous opinion of owners of the Crosley Model X-J Radio Receiver. It is the last word in radio efficiency at a price within the reach of all.

Local interference can be easily tuned out and far distant stations quickly and clearly heard.

This 4-tube set, combining one stage of tuned radio frequency amplification, detector, and two stages of audio frequency amplification, is the best radio receiver ever offered for consistent performance.

Listen in on a Crosley Model X-J for real enjoyment. Then go to any good dealer and purchase this unequalled instrument for just $65.

Free Catalog on Request

Crosley Manufacturing Company
The Largest Manufacturer of Radio Receivers in the World
POWEL CROSLEY, Jr., President
1493 Alfred St. Cincinnati, Ohio

LARGEST SELLING TRANSFORMERS IN THE WORLD

Standard equipment on the better sets

ALL-AMERICAN

Amplifying
TRANSFORMERS
for Utmost Volume—Undistorted!
Use Any Good Loud Speaker and
All-American Power Amplifiers

Months ago, the most severe receiving tests and laboratory comparisons possible to devise, repeatedly demonstrated that All-American Power Amplifiers were the most efficient, most thoroughly satisfactory transformers ever produced in the history of "push-pull" power amplification.

Now, from all over the continent, radio enthusiasts are writing in, further confirming this verdict.

"Results were astounding—both as to clarity of tone and clear volume. The 'All-American' people are certainly producers when it comes to transformers"—is the message which followed an All-American power amplification demonstration at the Duluth Chamber of Commerce. In the same delighted vein, the other users are expressing themselves.

Accustomed as we have been for years to having the virtues of All-American Audio Frequency and Radio Frequency Transformers praised to the skies by radio "old-timers," we can only say that All-American Power Amplifying Transformers seem even more popular if that is possible.

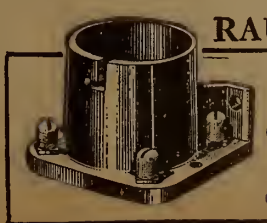
The consensus of opinion is that the addition of the popular "Push-Pull' form of power amplification to an audio frequency amplifier—by means of **All-American Power Amplifiers**—results in amazing volume (wholly undistorted) with a roundness, richness, depth and purity of tone positively unequalled.

See your dealer promptly.

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

Power Amplifying Transformers for "PUSH-PULL" Circuits. (Input and Output Types.) Price each $5.00

All-American Audio Frequency Transformers are available in three ratios: 3-1, 5-1, 10-1. Prices: $4.50, $4.75, $4.75.


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

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Pioneers in the Industry
Over half a million "All-Americans" in use
All the Better Dealers Recommend
THE "ALL-AMERICAN"
All-Americans are best—no need to pay more

WHAT IS IT WE CALL "STATIC"?

(Continued from page 9)

between the earth's surface and the upper strata of the atmosphere there exists a continuously growing electric tension or difference in potential, and that this tension increases by 100 volts per meter altitude. For example, between the 3,000-meter strata and the earth there should be a tension of 300,000 to 1,000,000 volts, that is, a pressure our present day high-voltage power transmission lines cannot possibly carry satisfactorily for a long time to come.

This theory of a drop in potential in the atmospheric electricity and the electric tension in the air, which at first appears contradictory and ununderstandable to the layman, is based upon experiments with a small electrical condenser which gathers the electricity out of a space less than one cubic centimeter in volume. This condenser is placed near the earth's surface and the quantity of electricity is measured by means of the most sensitive instruments, so arranged as to be entirely uninfluenced by local conditions. The assumption is advanced that this quantity—in a somewhat poorly stated manner—bears a certain relation to the gigantic accumulations of electricity in the higher strata of the atmosphere.

Dream of Using "Sky" Energy

This idea of potential differences of more than 300,000 volts has so rooted itself in most minds, that it has been seriously proposed to utilize the condition by creating a short circuit between the upper air and the earth, thus making available fabulous quantities of energy. In Germany there has actually been formed a company which aims to put this energy to industrial use. Numbers of kites and balloons are to be provided with an oxide cathode on tap. As electricity enters this cathode it heats up, becomes continuously warmer and more capable of receiving electricity, until a short circuit occurs and uncalculable energy streams down to the earth. Unfortunately this is only a dream.

More Scientific Study of Static

To throw light upon the matter of atmospheric electricity, the writer has caused certain very interesting experiments and measurements to be made lately which eventually, he hopes, will enlighten us on this dark subject and at least demonstrate the unreliability of methods of measuring heretofore employed and of our theories on atmospheric electricity.

The experiments, as stated above, are made with an ammeter connected into the conductive kite string and the currents that flow through it to earth are measured during different weather conditions, different seasons and different elevations of the kites. The results are diagrammatically represented in Figure 1.

In normal weather the current is approximately proportional to the elevation of the kite. It increases as the air space through which the kite string passes increases. Thus we have at:

500 meters a current of 1.5×10^{-5} ampere or .015 milliampere;

1.000 meters a current of 3×10^{-5} ampere or .03 milliampere;

2.000 meters a current of $5\text{-}10 \times 10^{-5}$ ampere or .05 to .10 milliampere.

The air strata which sweep across the string, so to speak, rub off their electric charges on it.

Inversion Strata Give Different Results

Entirely different, however, is the result when the strata which the string penetrates are not uniform. Let us assume, for example, that the temperature in strata above 1,500 meters be higher than in the lower strata. This often occurs when, for instance, the wind blows in a different direction in the first-mentioned strata. Such a state is called an "inversion" in meteorological parlance.

In this case we meet, as Figure 1 shows, entirely different conditions in the electrical charge of the atmosphere. The curve B gives the temperature in relation to the height.

While up to 1,500 meters the current flow is practically the same as in the first instance, a sudden irregularity occurs at the inversion point. The flow changes from positive to negative, and vice versa, increases and decreases; that is, the kite passes through strata which are positively charged, then negatively, and so on. After the kite has risen above the inversion point, the curve of flow again becomes of the same regularity as under the normal condition.

(TO BE CONTINUED.)

The popular interest taken in listening-in in the open while picknicking or on tour has received the attention of the British Daimler company, which in cooperation with the Marconi company, has successfully developed a complete car receiving equipment which is easily carried and put into operation, connected to headphones or loud speaker.

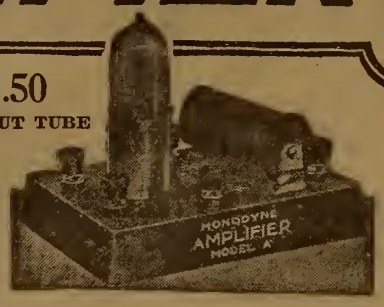
"What a whale of a difference just a few cents make"

All the difference between just an ordinary cigarette and the most skillful blend in cigarette history.

FATIMA

—a mild cigarette

Ready!! the New Monodyne Audio AMPLIFIER



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MODEL GT-1

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Amplifies without distortion or howling.

One or more stages will operate a loud speaker.

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Use any standard tube preferably WD-12.

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Only One Tuning Control

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THE RADIO SCOUT

"ALL WAVE" ALL CIRCUIT Receiving Set

$21.00 *Without Accessories*

NOT A NEW CIRCUIT—BUT

All circuits in one case. Note the ten binding posts at the top of the panel. By different combinations of bridge wires across these posts you may use the set in any circuit you wish, such as:

Single Circuit, Double Circuit, Regenerative, Super-Regenerative, Tuning Unit for Superheterodyne, Reflex, Plate Variometer and numerous others may be devised. Ideal for the beginner. Indispensable for the experimenting fan. Never grows old, fits into any circuit. A child can operate it. Set contains:

THE GENUINE CAPITOL "ALL WAVE" COUPLER SPECIAL for this set, U. S. Tool Condenser, Standard 60 Ohm Rheostat and Socket, Standard Grid Condenser, Solid Mahogany Cabinet and **Genuine Diolite Panel.** Completely Wired and ready to Operate. Instruction Sheet shows five different Circuits. **Guaranteed Wave Length 150 to 1000 meters—Distance of 1000 miles or better.** A set of the finest quality sold on the basis of

"Satisfaction or Your Money Back."

Shipped Prepaid on receipt of Check or Money Order

SHEPARD-POTTER CORPORATION
1552 Franklin St. NEW YORK CITY

OPERATING AND TROUBLE SHOOTING

For the Owner of a Federal Type 59 Receiver

THE FEDERAL TYPE 59 receiving set is a four-tube receiver with one stage of Radio frequency amplification, detector and two stages of audio frequency amplification. In spite of the great number of controls it is actually a simple and efficient one to operate, and it will be found that a little effort spent in learning to handle the controls will justify itself by the increased range of reception and the ease with which tuning may be accomplished. No attempt should be made to catch signals over long distances until reception of nearby stations has been thoroughly mastered.

The Controls

The position of the switch knob number 3 depends upon the size of antenna used. With an extremely long, high outdoor antenna the switch should be set on point L. With a small indoor antenna it should be set at point H. For a large indoor or a small outdoor aerial, the position M should be used.

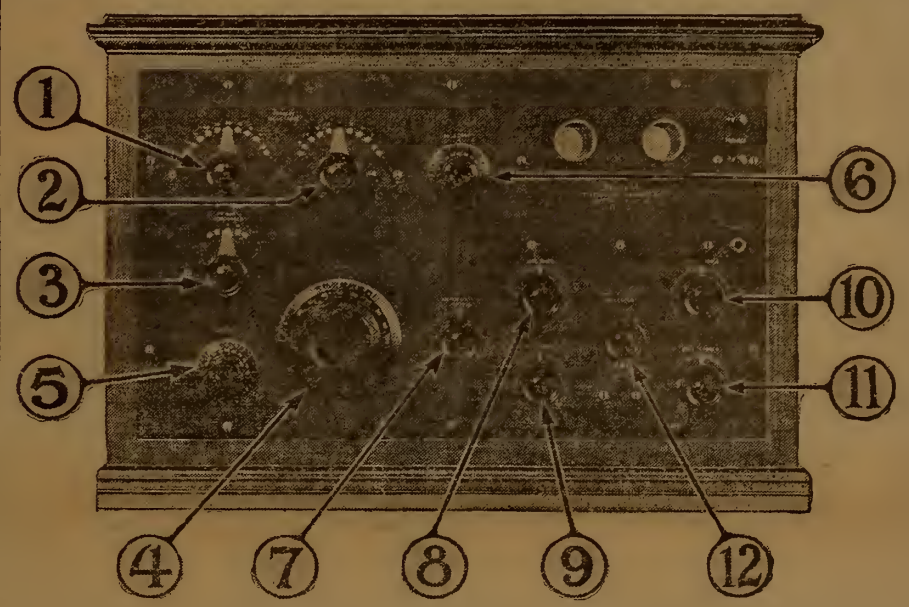
The first step in the tuning operation of any receiver is the adjustment of the vacuum tubes. The antenna wire should be temporarily disconnected to make it easier to adjust the tubes to the proper brilliancy. The telephone plug should be inserted in the telephone jack. Knob number 12, which controls the volume desired, should be set at position 2 and the knob number 8 should be rotated to approximately a three-fourths position. When a gas detector tube, such as UV-200 or C-300, is used, it will be found that as the detector rheostat knob number 8 is rotated in a clockwise direction a position will be found in which a hiss is heard, and that rotation away—one way or the other—from this position will cause the hiss to disappear. The knob should then be rotated to the point where the hiss is heard and then slowly turned back until this hiss just disappears. In this position the detector tube will be found most sensitive. Control number 7 should then be turned until the indicator points to the right. Then turn the knob number 9 until a dull thud is heard and continue the rotating to a point a little beyond.

Now turn knob number 12 to position 4 and turn knobs numbers 10 and 11 until a quite pronounced and loud purring is heard. All the tubes have now been satisfactorily adjusted and the set is ready for the operation of the tuning controls. The antenna should be reconnected to its binding post in the rear. Dial number 6 should be set at zero, and the two switch knobs numbers 1 and 2 at some midway position, such as 26 and 4 respectively. Dial number 4 is then rotated slowly from one side to the other. As reception is heard at some particular position, it will be found that slow rotation will change the pitch. The dial should then be adjusted until the pitch of the note is fairly low; by slow rotation of dial number 5 the pitch of this note should be made still lower until it becomes inaudible. Knob number 7 should then be pulled back until a change of reception is noticed and the voice or music is clearly heard and at its greatest intensity. Knob number 1 can then be adjusted for possible improvement after which the same is done with knob number 2.

It will probably be found that a decided increase of amplification can now be obtained by slight readjustments of controls numbers 7 to 11. It may be necessary, in cases where no reception is heard at the initial rotation of dial number 4, to readjust knobs numbers 1 and 3.

Installation

To obtain best operation of this or any receiver, an outdoor antenna suspended well above the ground should be used, its length not less than 70 feet nor more than 150 feet, if a single wire is used. Several wires supported by wooden crosspieces may, of course, be substituted for a single wire antenna, in which case it may be somewhat shorter than the dimensions given. All wires must be carefully



insulated at the points of support by means of the commonly available antenna insulators. The part of the antenna known as the lead-in, which runs from the antenna proper to the receiving set, should be made no longer than is necessary. Where it passes through the walls of the house, use should be made of some form of insulating tube, and wherever supported along the sides of the building, insulating cleats are necessary. Where it is impractical to erect a good outdoor antenna, wires inside of the building can be substituted at but a slight loss of range. Such indoor antennas may be built by the use of wires strung around the room in which the receiver is located or in any space available, such as attics or hallways. It is recommended that such an antenna be located as far as possible above the set. In general it will be found that the indoor antenna will sacrifice something in the distance of reception as compared to that of an outdoor antenna. If no other type of antenna can be installed, the electric lighting set or telephone wires may be found useful. In such cases, so-called socket antenna plugs are necessary. This form of antenna always results in lessened distance of reception and very often is the cause of humming sounds in reception.

The connection to the ground is best made by providing a good electrical contact to the water pipe as near to the underground pipe system as possible. In fact, the connection should be made to the pipe which leads from the water meter to the street. The use of a ground clamp is recommended and the wire from this clamp to the receiver should be a copper wire, not smaller than number 16 gauge, run in as direct and short a line as possible.

Vacuum Tubes

The filament rheostats of this set allow the use of any of the vacuum tubes commonly used and on the market. For best operation the following selection is recommended: In the detector socket, which is the left front socket, the UV-200, C-300, or other gas detector tube should be used, and in the remaining three sockets the UV-201A, C-301A or their equivalents.

Since the lack of positive electrical contact between the tube and the socket springs will result in noisy operation, the contact surfaces of the studs on the base of the tubes should be carefully cleaned before inserting them in their respective sockets. Omission of this is a common source of annoying noise.

Batteries

Two separate batteries are required, one for supplying the filaments of the vacuum tubes, commonly called the A battery, and one for supplying the plate circuits of the tubes, commonly called the B battery.

The type of A battery to be used depends upon the type of tube employed. The purchaser of this receiver should determine for himself what type of battery he wishes to use with his tube. The rheostats with which the receiver is supplied are such that any type of battery having a voltage not in excess of six, will serve to supply any type of tube, but it will usually be found most economical to use a battery, either storage or dry, having a voltage not greatly in excess of that required by the tubes.

It will be found that for the proper operation of the receiver, the connection between the A battery and the receiving set should be made with a conductor not smaller than number 14 gauge. The battery should be so located relative to the receiver that these conductors need be no more than 3 feet long.

Batteries and Their Care

It is absolutely necessary for best results, to keep the storage A battery well charged at all times. Frequent charges for short periods are recommended; the battery should not be permitted to discharge to such extent that the set no longer functions normally. Best, both for the operation of the set and for convenience, is to use a home charging device, so that recharging can be conveniently done at any time after a long period of discharge.

(Continued on page 12)

"OPERATING and Trouble Shooting" is a new Radio Digest feature beginning this issue. Its purpose is to study various standard receiving set late models and to show the newly initiated broadcast listener, who has purchased such a set, how he can operate it to get the best there is in it and how he can overcome minor difficulties which may be causing some trouble. On pages 11, 12 and 13 this week the Federal 59 and Grebe CR-14 are described. Radiophans with other kinds of sets will also find these articles worth reading, particularly the paragraphs on trouble finding. Two more sets will be described next week.

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2-LO, LONDON, ENGLAND ON ONE TUBE

Another Record for the

ELGIN SUPER-REINARTZ

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

Officially Confirmed

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

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

ELGIN RADIO SUPPLY CO.
207 Chicago St. ELGIN, ILL.

OPERATING AND TROUBLE SHOOTING

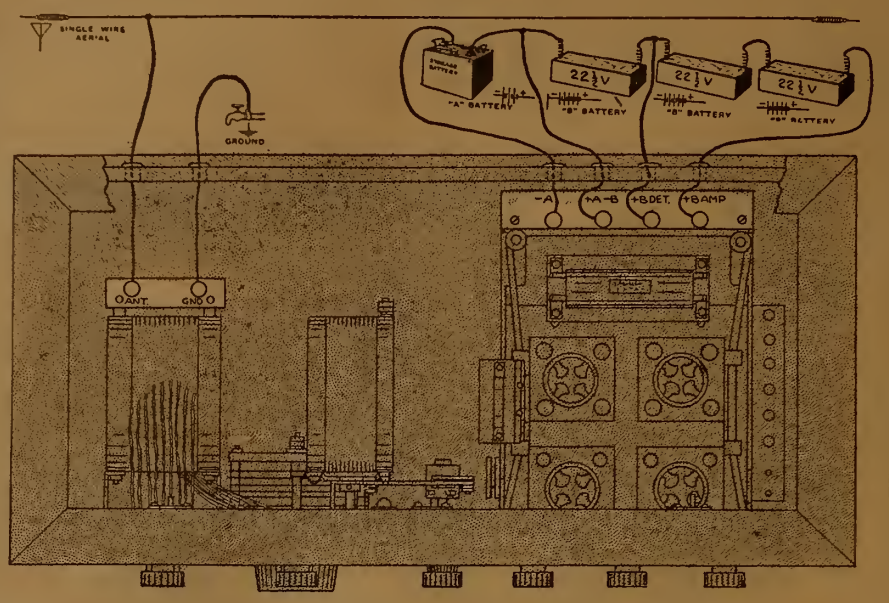
(Continued from page 11)

Where dry A batteries are used, it will be found that the signal strength from the receiver is largely dependent upon the condition of this battery, and care should be taken to replace the latter with a new one as soon as the strength of the signals received is found to be reduced. The user should take note that the mere fact that the battery still has sufficient power to light the tube filament is no measure of its effectiveness for reception of signals, since a proper and rather high degree of brilliancy is required for the reception of signals. The use of exhausted batteries connected in series, so as to give the proper vacuum tube filament brilliancy, is to be avoided, since the life of such batteries is extremely limited, and very frequent adjustment of the receiver will be necessary with such practice.

Connections

For the plate supply battery, dry or storage B batteries may be used. These should be connected to one another as shown in the illustration. The terminals of the batteries are usually labeled as to polarity, the positive terminal being marked with a plus (+) sign, while the negative is marked with a minus (—) sign. In some types the polarity is indicated by the colored terminal wires, the positive usually being red. In connecting them, the positive terminal of each battery should be connected to the negative of each succeeding battery, and the negative terminal of this group of batteries should be connected to the "+A —B" terminal of the receiver. The positive terminal of this same battery should then be connected to "+B Det." terminal and the positive terminal of the entire group to "+B Amp." terminal of the receiving set.

These inter-connecting wires should be just long enough to connect conveniently to the terminals on the receiver, and should be made of a conductor sturdy enough to be proof against breaking due to bending, but need not be made of as heavy a conductor as is used for the connection of the storage battery. These wires should, however, be very carefully insulated from one another, since the voltage difference between them is rather high, and damage may result from accidental contact between them, unless care is taken in the installation. For the operation of the receiver, it is preferable that three batteries in series be used, giving a total voltage of 67½ volts.



Poor Reception and Noises

It will be found that unless the B batteries are maintained at proper voltage, the operation of the receiver will be unsatisfactory, since almost exhausted B batteries will result in noise in reception, either in the form of a rough hissing sound or in a musical whistle. When such noises occur, the B battery should be replaced with a fresh one and thereafter it should be replaced at sufficiently frequent intervals to avoid these noises.

Failure of the receiver to operate properly may be due to poor or improper tubes. Change the tubes about to determine the best positions for the several tubes. If a UV-200 tube is used, it will function only in the left-hand front socket.

Noisy operation may be due to:
(a) Corroded battery terminals.
(b) Corroded or dirty tube prongs.
(c) Discharged batteries.
(d) Tubes burning too brightly.
(e) Atmospheric electrical disturbances; proximity of the antenna to power, telephone or other electrical lines; presence of nearby electrical machinery.
(f) Loose connections in battery, antenna or ground circuits.

Concerts Before Sermons

BIRMINGHAM, ALA.—A receiving outfit has been installed in the Wylam Methodist church, at Wylam, a suburb of Birmingham, and now a Radio program is enjoyed at every church service before the sermon is preached.

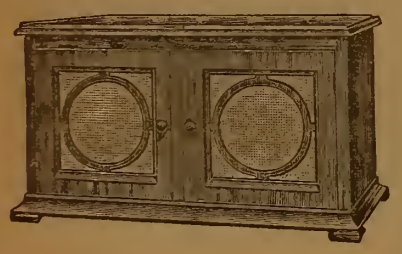
FAN SETS RECORD; LISTENS 28 HOURS

Enthusiast in Elkhart, Ind., Breaks All "Endurance" Tests at Airphone

ELKHART, IND.—The world's champion listener in is Cleve Hoffman of this city, who recently announced that he would on a certain day at a certain time place the receivers to his ears to remain until he became exhausted.

His listening in marathon began at 2 p. m., January 2, 1924, and ended at 6 p. m., January 3, a total of 28 hours. During that time Hoffman said he heard 38 different stations. "The set was not shut off once; the receivers were not taken off and I did not close my eyes in that time," he declared.

Hoffman said that in the period of time named he was able to hear only one "real" DX station—6XG of Oakland, Calif.—although he had heard previously such distant DX stations as PWX, KHJ, KPI and CKCK.



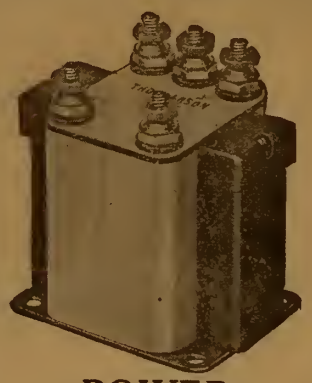
ACE Type 3C Consolette

The Most Satisfactory Radio Set For Real Entertainment

THIS is the last addition to the Ace Family. Has beautiful solid mahogany, wax finished cabinet. Set consists of a regenerative tuner, detector and two stages of amplification with built in loud speaker. Due to the particular method of winding Crosley coils it is exceptionally selective. Has sufficient room inside cabinet for dry batteries making a complete self contained long range receiving outfit. Licensed under Armstrong U. S. Patent No. 1,113,149. Phone jack for tuning with head phones; Crosley multistat; filament switch; engraved Formica panel. Uses all kinds of tubes. An efficient set at a remarkable price, $125.00—without tubes or batteries.

The Precision Equipment Co.
Powel Crosley, Jr., President
127 Vandalia Ave., Cincinnati, Ohio

THORDARSON



POWER AMPLIFYING TRANSFORMERS

Price per pair, $13.00

The new Thordarson Power Amplifying Transformers (push pull) are designed for use as third stage audio frequency amplifiers, to provide high power amplification for operating loud speaking devices.

With power amplification, not only is it possible to increase volume, but, since two tubes replace the usual one, the distortion and howling which usually accompany the overloading of a single tube on the third stage is done away with entirely.

The Thordarson Power Amplifying Transformers are well constructed electrically and are capable of indefinitely carrying the additional load without breaking down.

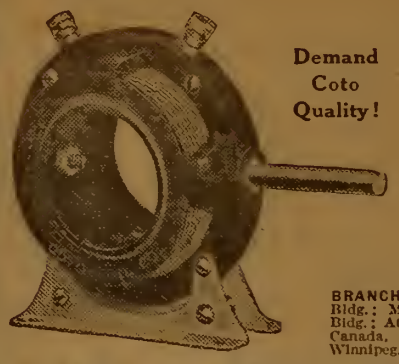
In tonal purity these transformers equal the Thordarson Super Audio Frequency transformer whose rich quality and even amplification has made it the popular transformer of the day.

THORDARSON
ELECT. MFG. CO.
500 W. Huron St. CHICAGO

Coto
"Built First to Last"

New Coto Compact Moulded Variometer

Size is only
3¼ x 1¾ x 3¾



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In brown bakelite. Extreme compactness is made possible by honeycomb wound stator coils. Operates with marked efficiency from 200 to 600 meters. Coto quality in every respect, including pigtail connections to rotor. Volume production results in moderate price.
Type 8000. ..... $5.00

If your Dealer cannot supply you write us giving his name.

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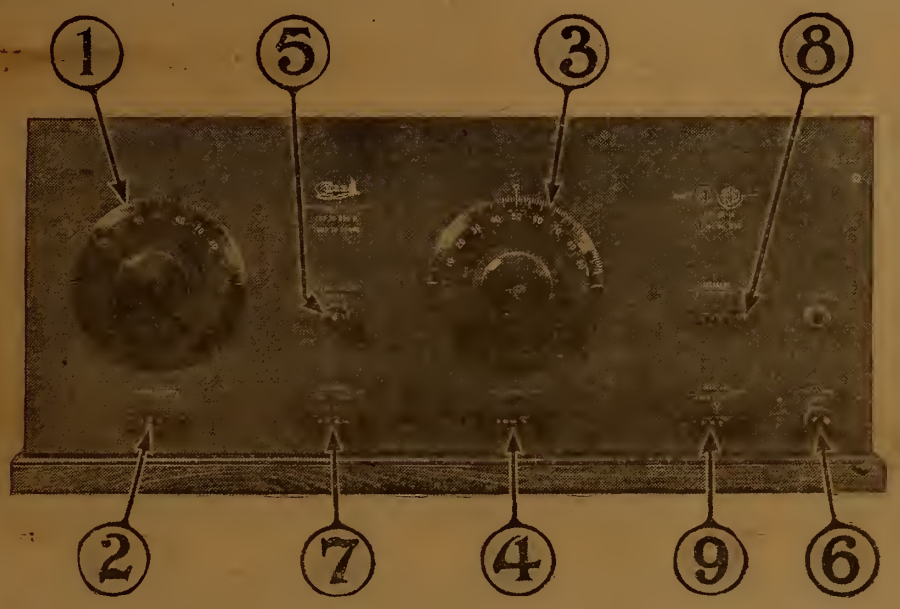
OPERATING AND TROUBLE SHOOTING

For the Owner of a GREBE RADIO CR-14 Receiver

THE GREBE C-14 is a three-tube regenerative circuit consisting of the detector stage and two stages of audio-frequency amplification. This receiver has the feature that the batteries can be placed inside of the cabinet and requires only the antenna and ground connections, and the loud speaker. The required controls have been reduced to a minimum without sacrifice of selectivity for long distance reception.

Tuning is controlled by means of dials numbers 1 and 3, and their vernier adjustments numbers 2 and 4. Switch number 5 controls the range above and below 400 meters. The little wheels numbers 7, 8 and 9 control the lighting of the filaments of the tubes. Number 6 is a small operating switch in the lower right-hand corner which not only shuts off the set when not in use but also controls the stages of amplification to which the loud speaker is automatically connected. Above this switch is a jack for plugging in the head receivers when tuning long distance work. This receiver has sockets for the use of UV-199 or C-299 vacuum tubes. This permits the use of three dry cells which are placed in the small compartment on the left side of the rear end of the cabinet. Three 22½-volt B batteries fit into the compartment on the right side. The method of making the battery connections is shown in the illustration. This is not the model that uses the short 20-foot aerial. A well insulated single wire aerial about 100 feet long is recommended for best results. Likewise, a good ground connection is necessary. The terminals of the loud speaker are connected to the two binding posts provided for on the inside of the cabinet.



Operating Instructions

The head phones should be plugged in the jack for tuning. The three wheels numbers 7, 8 and 9 should be tuned so that the indicator points to number 2. The operating switch number 6 should be pulled all the way out. The characteristic operating sound will then be heard in the receiver. When the wave length switch number 5 is pushed in the tuning range covers 400 meters and over. When it is pulled out it covers a range of 400 and under.

Set the regeneration dial at 70 and the wave length dial number 1 at 100. Now slowly rotate wave length dial number 1 with the left hand until the whistle is heard, then use the vernier wheels below them by turning wheel number 4 slowly, decrease regeneration at the same time, slightly increasing wave length through wheel number 2 until the signal becomes louder and clearer. A slight final readjustment can then be made on all controls. If no whistle is heard increase regeneration and repeat the operation. When reception has been properly tuned in remove the telephone plug from the jack which automatically operates the loud speaker. In local reception where the volume is too loud it can be decreased by pushing the operating switch number 6 halfway in.

When finished using the receiver it is merely necessary to push in the operating switch all of the way. No further disconnecting is necessary. As the batteries weaken from use the current wheels numbers 7, 8 and 9 should be moved in the direction of increased current until strength of signals is restored. When it finally becomes necessary to set current wheels at zero or no resistance it is an indication that the A batteries or dry cells are nearly exhausted.

Trouble Shooting

If no signals are heard investigate the following points:

1. Tubes not making proper contact with socket terminals.
2. Tube doesn't function properly.
3. Battery has been improperly connected.
4. Phones not operating properly.
5. Poor connections.

If knocking, scraping or popping sounds are heard they can be subdivided into two classes—those effected by tuning, in which case investigate:

1. Regeneration has not been adjusted properly.
2. Too much B battery voltage on the detector plate circuit.
3. Too much regeneration.
4. Wheel number 7 turned too far.
5. Poor connection in antenna or ground circuit.
6. Dust or accumulation of dirt in phones.

The second possibility are noises not effected by tuning which may be due to the following:

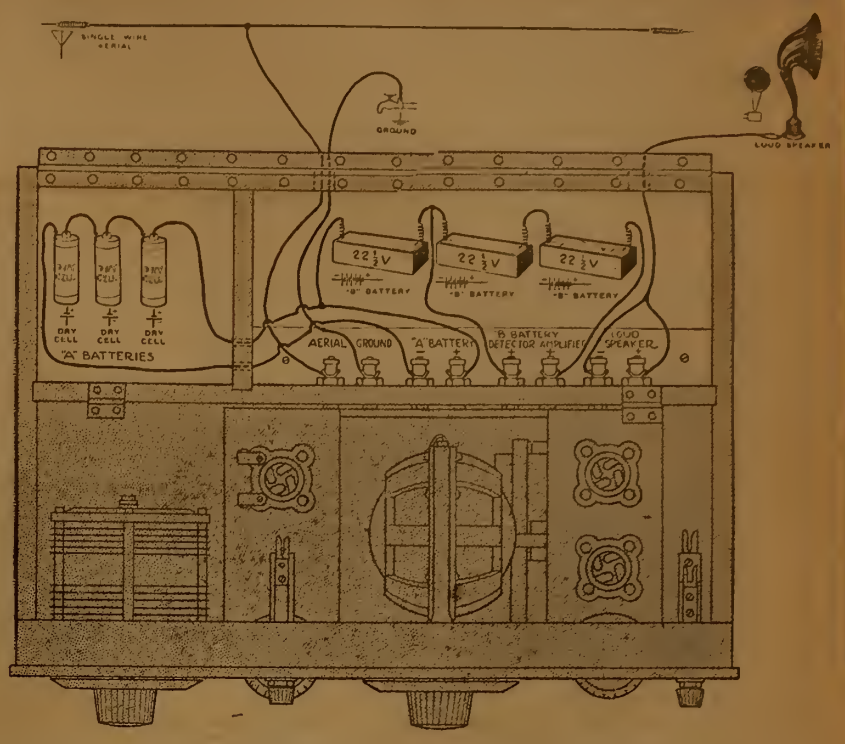
1. Poor connections.
2. Defective rheostat and unsteady filament current.
3. Wrong value of grid leak.
4. Negative B battery connected wrong.
5. Accumulation of dust in parts.
6. Due to static interference.

Trouble is occasionally found in the nature of noises in the amplifier circuits but not in the detector. In order to identify this turn the filament wheel number 7 to the off position and listen in on the amplifying stages. If it still continues, investigate the following points:

1. The transformer may be burned out.
2. Poor connections on the amplifying stages.
3. Moisture in the transformer causing short circuits.
4. Poor amplifying tube.
5. Too much plate voltage.

If the signals or reception is weak even on local and nearby stations, it may be due to the following causes:

1. A battery run down.
2. B battery run down.
3. Filament lighting improperly adjusted.
4. Too high a plate voltage on the detector or amplifying tubes.
5. Too low a plate voltage on the detector or amplifying tubes.
6. Batteries not connected properly.



FLASH!

Another tube gone—"B" battery wires crossed for only an instant. Radeco Fuses would have saved it—they are saving thousands of tubes for satisfied radio fans. Read this letter

Radeco Safety Fuses

may be attached in an instant to any standard tube going in any standard socket.

In ordering, specify type of tube used

Price 50c each

At your dealer's or by mail postpaid

Radio Equipment Co.

Dept. 6, 20 Stuart Street, Boston, Mass.

New England's Oldest Exclusive Radio House

DEALERS: Write for our proposition

1358 Washington Street,
West Newton, Mass.

Radio Equipment Co.
20 Stuart Street, Boston.

Gentlemen:

I am writing to give you an experience which I recently had which may be of interest to you.

I am a Radio fan, and have experimented with many types of hook-up. I have also had the unfortunate experience of "blowing" several Radio tubes. Recently a friend of mine recommended your fuses, and I purchased three for my three-tube set which I am now using. Shortly after installing these fuses, in attempting to tighten a loose connection, my screwdriver accidentally touched the "B" battery lead. All three fuses were blown, and I realized that if it had not been for the Radeco Fuses I would have lost all the tubes in my set. I am inclosing herewith $3.00 for which please send me six fuses for UV261A tubes, as I do not wish to be without them. You are at liberty to use this letter in any way.

Very truly yours,
FRANK J. BODAY.

Radio Fans—Here Is a Winner

Armstrong Regenerative Set
Receiving Radius
600 Miles
$23.25

Order Direct From This Advertisement.

HERE is a money saving Radio Outfit that will bring the news of the world—concerts, lectures and stock reports—into your home. Sold complete with head set, tube, batteries, aerial and ground wires, for **only $23.25!** Connections simple and plainly marked. Easy to tune. Order NOW! Shipping weight, 12 pounds. Shipped **from** CHICAGO or PHILADELPHIA store.

57RD9366.....$23.25

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Save on All Radio Supplies.

Save money on your Radio supplies, and get **guaranteed quality!** Our big FREE **Book** shows hundreds of bargains in complete sets and parts. Many new hook-ups, complete list of broadcasting stations. Contains "How to Build an Aerial."

Mail coupon today to store nearest you for Free Radio Catalog.

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Chicago - Philadelphia

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Name.....

P.O.....State.....
Rural Route.....Box No.....
Street and No.....

Licensed under the Armstrong Patent No. 1113149 for amateur, experimental and scientific uses only.

Sears, Roebuck and Co.

The World's Biggest Mail Order House

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

Station and City	Met.	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
CFCN, Calgary, Alta.	440	12:00- 1:00	Silent	11:00- 2:00	Silent	Silent	11:00- 1:00	Silent
CKAC, Montreal, Que.	430	Silent	6:00-10:30	Silent	6:00-10:30	Silent	6:00-10:30	3:30- 4:30
CYB, Mexico City, Mex.	425	Silent	7:00- 8:30	Silent	7:30- 9:30	Silent	7:00- 8:30	Silent
CYL, Mexico City, Mex.	440	Silent	8:30-10:00	Silent	Silent	8:30-10:00	Silent	Silent
KDKA, E. Pittsburgh, Pa.	326	5:00- 9:00	5:15-11:30	5:30- 9:00	5:15-11:30	5:15- 9:00	5:15- 9:00	6:30- 7:30
KDZE, Seattle, Wash.	455	10:30-12:30	Silent	10:30-12:30	Silent	10:30-12:30	Silent	Silent
KFAE, Pullman, Wash.	330	9:30-11:00	Silent	9:30-11:00	Silent	9:30-11:00	Silent	Silent
KFAF, Denver, Colo.	360	9:00-10:00	9:00-10:00	Silent	8:30- 9:00	9:00-10:00	9:00-10:00	Silent
KFI, Los Angeles, Calif.	469	8:45- 1:00	8:45- 1:00	8:45- 2:00	8:45- 1:00	8:45- 2:00	8:45- 2:00	10:00- 1:00
KGW, Portland, Ore.	492	9:30-12:30	9:30- 1:00	9:30- 1:00	9:30- 1:00	9:30- 2:00	9:30- 1:00	8:00-10:00
KHJ, Los Angeles, Calif.	395	8:45- 9:30	8:45- 2:00	8:45- 2:00	8:45- 2:00	8:45- 2:00	8:45- 2:00	10:00-12:00
KLX, Oakland, Calif.	509	Silent	10:00-12:00	10:00-12:00	10:00-12:00	10:00-12:00	Silent	Silent
KPO, San Francisco, Calif.	423	10:00- 1:00	10:00- 1:00	10:00-12:00	10:00- 1:00	Silent	10:00- 2:00	10:30-12:00
KSD, St. Louis, Mo.	546	8:00- 1:00	8:00- 1:00	8:00- 1:00	8:00-10:30	Silent	7:15- 9:00	Silent
KYW, Chicago, Ill.	536	Silent	8:00- 9:30	8:00-12:30	8:00- 9:30	10:00-12:00	8:00- 9:30	Silent
NAA, Radio, Va.	435	5:45- 7:20	6:05- 7:20	6:25- 7:40	5:45- 7:40	7:05- 7:40	Silent	Silent
PWX, Havana, Cuba	400	Silent	Silent	7:30-10:00	Silent	Silent	7:30-10:00	Silent
WBAP, Fort Worth, Texas	476	7:30-10:45	7:30-10:45	7:30-10:45	7:30-10:45	7:30-10:45	7:00- 7:30	5:00- 6:00
WBAV, Columbus, O.	390	8:00-10:00	Silent	Silent	Silent	8:00-10:00	Silent	4:00- 5:00
WBZ, Springfield, Mass.	337	6:00- 9:00	6:30- 9:00	5:00-11:00	6:30- 8:00	5:00-11:00	6:30- 8:00	5:45- 8:30
WCAE, Pittsburgh, Pa.	462	7:30- 8:30	7:30- 8:30	7:30- 8:30	7:30- 8:30	7:30- 8:30	7:30- 8:30	5:30- 6:30
WCAP, Washington, D. C.	469	Silent	6:30- 9:00	Silent	6:15-11:00	Silent	6:30-11:00	6:20- 9:45
WCBD, Zion, Ill.	435	8:00-10:00	Silent	Silent	Silent	8:00-10:00	Silent	2:30- 5:30
WCX, Detroit, Mich.	517	7:30- 9:00	7:30-11:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	Silent	6:15- 7:15
WDAF, Kansas City, Mo.	411	8:00- 1:00	11:45- 1:00	8:00- 1:00	11:45- 1:00	8:00- 1:00	11:45- 1:00	Silent
WDAP, Chicago, Ill.	360	Silent	7:00- 1:00	7:00- 1:00	7:00- 1:00	7:00- 1:00	7:00- 1:00	9:15-11:15
WDAR, Philadelphia, Pa.	395	6:30- 9:55	6:30- 7:00	6:30-10:00	6:30- 7:00	6:30-12:00	6:30- 7:00	Silent
WEAF, New York, N. Y.	492	6:30- 9:00	6:00- 9:00	6:30- 9:00	6:00-11:00	6:30- 9:00	6:30-11:00	6:20- 9:00
WFAA, Dallas, Tex.	476	8:30- 9:30	8:30-12:00	Silent	8:30- 9:30	8:30- 9:30	8:30-11:00	6:00-11:00
WFI, Philadelphia, Pa.	395	6:00- 6:30	6:00- 8:00	6:00- 6:30	6:00- 8:00	6:00- 6:30	6:00- 8:00	6:30- 7:30
WGI, Medford, Mass.	360	Silent	6:05- 7:30	6:30- 8:00	6:00- 7:30	6:30- 8:00	6:30- 8:00	7:30-10:00
WGR, Buffalo, N. Y.	319	5:30-11:00	5:30- 7:45	5:30-11:00	5:30- 7:45	5:30-11:00	5:30- 7:45	2:00- 3:00
WGY, Schenectady, N. Y.	380	6:45- 9:00	6:45- 9:00	Silent	6:45- 9:00	6:45-10:30	8:30- 9:30	6:30- 7:30
WHA, Madison, Wis.	360	7:30- 8:30	Silent	7:30- 8:30	Silent	7:30- 8:30	Silent	Silent
WHAS, Louisville, Ky.	400	Silent	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	4:00- 5:00
WHAZ, Troy, N. Y.	380	8:00- 9:30	Silent	Silent	Silent	Silent	Silent	Silent
WHB, Kansas City, Mo.	411	7:00- 7:45	7:00-10:00	7:00- 7:45	7:00-10:00	7:00- 7:45	7:00- 7:45	8:00-10:00
WHK, Cleveland, O.	283	5:00- 5:30	5:00- 5:30	5:00- 5:30	5:00- 5:30	5:00- 9:00	5:00- 5:30	7:00- 8:30
WHN, New York, N. Y.	360	6:30-11:00	8:30-11:00	6:30-11:00	8:30-11:00	8:30-11:00	6:30-11:00	8:30-11:00
WIP, Philadelphia, Pa.	509	5:00- 6:30	5:00-11:00	5:00- 6:30	5:00-10:00	5:00- 6:30	5:00-11:00	Silent
WJAR, Providence, R. I.	360	Silent	6:00- 7:00	6:00-11:00	Silent	6:00- 9:00	Silent	Silent
WJAX, Cleveland, O.	390	Silent	6:30- 8:30	Silent	7:00- 9:30	Silent	Silent	Silent
WJAZ, Chicago, Ill.	448	Silent	10:00- 2:00	10:00- 2:00	10:00- 2:00	10:00- 2:00	10:00- 2:00	6:00- 9:00
WJY, New York, N. Y.	405	Silent	6:30-10:30	Silent	6:30-10:30	6:30-10:30	Silent	5:00- 5:30
WJZ, New York, N. Y.	455	6:00-10:30	6:00-10:30	6:00-10:30	6:00-10:30	6:00-10:30	6:00-10:30	6:00- 9:30
WKAQ, San Juan, P. R.	360	Silent	7:00- 8:30	6:00- 7:00	Silent	7:00- 8:30	Silent	Silent
WLAG, Minn.-St. Paul.	417	Silent	Silent	9:15-10:45	Silent	9:15-10:45	9:15-12:30	7:45- 9:15
WLW, Cincinnati, O.	309	10:00-12:00	10:00-12:00	8:00-10:00	10:00-12:00	Silent	Silent	Silent
WMAQ, Chicago, Ill.	448	Silent	7:00-10:00	7:00-10:00	7:00-10:00	7:00-10:00	7:00-10:00	Silent
WMC, Memphis, Tenn.	500	8:30- 9:30	8:30-12:00	Silent	8:30- 9:30	8:30-12:00	8:00- 9:30	Silent
WNAC, Boston, Mass.	278	5:00- 9:00	7:00- 9:00	5:00- 9:00	7:00- 9:00	5:00- 9:00	8:00- 9:00	6:30- 8:30
WOAI, San Antonio, Texas.	385	Silent	9:30-10:30	Silent	7:30- 8:30	Silent	Silent	9:30-10:30
WOAW, Omaha, Neb.	526	6:00-11:00	6:00-11:00	Silent	6:00-11:00	6:30-11:00	6:00-11:00	9:00-11:00
WOC, Davenport, Ia.	484	8:00- 9:00	Silent	8:00-11:00	8:00- 9:00	8:00- 9:00	9:00-10:00	7:00-11:00
WOO, Philadelphia, Pa.	509	6:30-1:000	Silent	6:30-10:00	Silent	6:30-10:00	Silent	Silent
WOR, Newark, N. J.	405	5:15-10:00	5:15- 6:30	5:15-10:00	5:15- 6:30	5:15- 6:30	5:15-10:00	Silent
WOS, Jefferson City, Mo.	441	8:00- 9:30	Silent	8:00- 9:30	Silent	8:00- 9:30	Silent	7:30- 8:30
WRC, Washington, D. C.	469	7:00- 9:00	Silent	7:00- 9:00	Silent	7:00- 9:00	Silent	Silent
WRM, Urbana, Ill.	360	Silent	7:00- 9:30	Silent	8:30- 9:30	Silent	Silent	Silent
WSAI, Cincinnati, O.	309	Silent	8:00-10:00	Silent	8:00-10:00	Silent	10:00-12:00	Silent
WSB, Atlanta, Ga.	429	8:00-12:00	8:00-12:00	10:45-12:00	8:00-12:00	8:00-12:00	8:00-12:00	7:30- 9:15
WSY, Birmingham, Ala.	360	8:00- 8:45	Silent	8:00- 8:45	Silent	8:00- 8:45	Silent	8:00- 9:00
WTAM, Cleveland, O.	390	Silent	Silent	7:00- 9:30	Silent	Silent	8:00-10:00	Silent
WWJ, Detroit, Mich.	517	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30-11:00	7:30- 9:00	Silent	4:00- 5:00

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

Something New and Better in

RADIO PANELS

ELECTRASOTE
REG. U.S PAT OFF
TRADE MARK

One of the many scientific products introduced by
THE PANTASOTE COMPANY, Inc.

Electrasote Radio Panels

are equal to the best phenolic materials, yet are sold at

25 to 50% Lower List Prices

than any other standard quality Panel material.

RESULT OF TEST BY U. S. BUREAU OF STANDARDS:

"Electrasote is as good or better than the average phenolic insulating materials for Radio uses."

Each ELECTRASOTE Radio Panel is finished on one side with a high piano polish, the reverse side in a satin-grain effect that does not show fingermarks.

Each ELECTRASOTE Radio Panel is put up in a durable Individual Envelope, protecting it from handling, as no wrapping is necessary.

ON SALE AT GOOD RADIO DEALERS

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Exclusive Sales Agents for Electrasote Radio Panels

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RADIO AT N.Y. PRICES via Daily Parcel Post

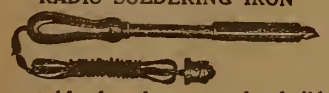
The Prices Quoted Below Deliver Goods to Your Door

HOW TO ORDER—Write your order plainly; state number, description and price of items wanted. Send Post Office or Express Money Order, personal check or bank draft. REFERENCES: Dun's, Bradstreet's or Corn Exchange Bank.

BAKELITE TUBE SOCKETS

Moulded of brown bakelite; Binding Post Connections.
D99 Standard Type for 201A, 301A, W.D.12.....39c
D100 For U.V.199, U.V.299, Socket 39c
D101 For W.D.11, C.11.....39c

RADIO SOLDERING IRON



Indispensable for the man who builds his own sets.
D109 .....$2.50
D133—Soldering Paste, tube..... .25

COCKADAY CIRCUIT COMPLETE

Consisting of

1 Cockaday coil and 7 pigtail connections
2 .0005 Variable Condensers
1 Socket
1 Panel 7x12
2 Dials, 3 in.
1 Grid Leak and Condenser
1 Rheostat
1 Switch Lever
1 Base Board
12 Ft. Bus Bar
7 Switch Points
7 Marked Binding Posts
1 Jack

Wiring Diagram and Instructions

D-178—Our Price $9.95

MISCELLANEOUS

D163 Spaghetti Tubing, per yd.....$0.09
D164 Synthetic Crystal ..... .30
D165 Ground Clamps ..... .17
D166 Black Rubber Binding Posts..... .05
D167 Nickel Plated Binding Posts, 2 for..... .05
D168 No. 18 Annunciator Wire, half pound coil. .39
D169 6 ft. Phone Cord with Tips..... .79
D170 20 ft. Extension Cord with Tips..... 1.95
D171 Wall Insulators, Porcelain..... .05
D172 Tubular Porcelain Lead-in Insulators, 6-in. .10
D173 Reinartz Coil 1.45
D174 Cockaday Coil 2.45
D175 2 in. Dial and Knob..... .25
D176 3 in. Dial and Knob..... .35
D177 4 in. Dial and Knob..... .49

FILAMENT CONTROL RHEOSTATS

Highest grade of material used, tapered knob.
D104— 6 ohm $0.39
D105— 30 ohm ..... .49
D106—300 ohm Potentiometer. .79
D107—400 ohm Potentiometer. .79

AMPLITONE LOUD SPEAKERS

This speaker will give efficient results when used with any pair of Head Phones; highly nickel plated; 18 inches high.
D117 .....$3.95

WOOD CABINETS

Highest grade Mahogany finish Cabinets. Hinged top. These cabinets are being sold at less than one-half regular value.
D57 Wood Cabinet; panel size 7"x10". Ea.$2.50
D58 Wood Cabinet; panel size 7"x12".... 2.75
D59 Wood Cabinet; panel size 7"x14".... 3.00
D60 Wood Cabinet; panel size 7"x18".... 3.50
D61 Wood Cabinet; panel size 7"x21".... 3.75
D62 Wood Cabinet; panel size 7"x24".... 4.00

Baseboards (Mahogany Stained) for use with above cabinets

7x10.....25c 7x14.....35c 7x21.....45c
7x12.....30c 7x18.....40c 7x24.....50c

PLATE CIRCUIT "B" BATTERIES

The highest grade of battery made at prices lower than they ever were sold before.
D80—22½ Volt Small.....$1.15
D81—22½ Volt Medium. 1.45
D82—22½ Volt Large.... 1.95
D83—45 Volt Medium..... 1.95
D84—45 Volt Large..... 2.50
D85—45 Volt Extra Large..... 3.50
D86—360 Hour 1½ Volt Twin Double Duty "A" Battery ..... .75

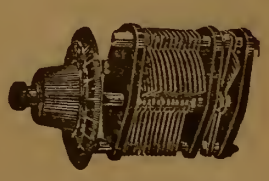
Modells ESTABLISHED 1889

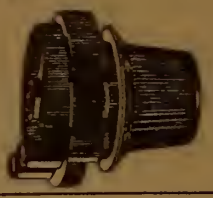
71 Cortlandt Street
NEW YORK, N. Y.
America's Greatest Radio Mail Order House
ELEVEN NEW YORK STORES

WILLARD RADIO COMPANY

291 Broadway New York City

"The Best for Less"





CONDENSERS

3 Plate Variable; value, $1.75.....$1.05
11 Plate Variable; value, $2.50.... ..... 1.20
13 Plate Variable; value $2.50.... ..... 1.20
17 Plate Variable; value, $3.50..... 1.35
23 Plate Variable; value, $3.50..... 1.35
43 Plate Variable; value, $4.50..... 1.95

13 Plate VERNIER; value, $5.50.....$3.75
23 Plate VERNIER; value, $6.00..... 4.00
43 Plate VERNIER; value, $6.50..... 4.25

BEST QUALITY JACKS, Single Circuit: value, 65c; special at.....$ .30
Double Circuit; value, 90c; special at..... .45

MULTIPLE POINT INDUCTANCE SWITCH with Knob and Dial (15 Switch Points).....$1.25

LIGHTNING ARRESTERS approved by underwriters .....$ .90

THREE-INCH DIALS — Unbreakable — heat resisting composition—high finish; special...$ .30

TWO-INCH DIALS—Same design—for rheostats and potentiometer; special at.....$ .25

TELEPHONE PLUGS .....$ .60

Filament Rheostat, 6 ohm.....$ .65
Filament Rheostat, 20 ohm..... .80
Filament Rheostat, 50 ohm..... .90
With 2" Dial, 15c extra.

Honeycomb Coils, 50 turns mounted..$ .95
Honeycomb Coils, 75 turns mounted.. 1.00
Double Coil Mountings..... 2.45
Triple Coil Mountings..... 3.35
Reinartz Coils, increased wave-length and mounting 1.95

AUDIO FREQUENCY TRANSFORMER—Designed for use with W. D. 11 Tubes, list, $4.50; price..... $2.75

BALL BEARING INDUCTANCE SWITCH—value, 75c; special.....$ .25

V. T. SOCKETS—Nickeled, brass sleeve, composition base; value, $1.00; special at.....$ .40

EXTRA SPECIAL—Telephone 3000 Ohms Headsets; $9.00 value; reduced to.....$3.50

Vernier Dial Adjuster. List, 35c; special.....$ .25

FRESHMAN VARIABLE RESISTANCE LEAK and MICA CONDENSER Cobined....$ .75

Practical Circuits at Bargain Prices!

REINARTZ CIRCUIT EVERY PART COMPLETE

1 Reinartz wound coil, 1 tube socket, 1 rheostat, 1 23-plate .0005 MFD. variable condenser, 1 13-plate .00025 MFD. variable condenser, 3 inductance switches, 23 switch points and nuts, 6 switch stops and nuts, 8 binding posts, 2 3" dials, 1 variable grid leak, 1 .002 MFD. phone condenser, 23 feet bus bar wire, 1 high-grade panel ALREADY DRILLED AS PER DIAGRAM and complete instructions..... **$10.95**

Two-Stage Audio Frequency Amplifier—Parts complete in every detail for this Circuit—$11.00
Specify type of tubes you intend using

FLEWELLING CIRCUIT

EVERY PART COMPLETE

2 honeycomb coils, 1 2-coil mounting, 2 coil plugs, 3 .006 condensers, 1 variable grid leak, 1 grid leak, 1 23-plate .0005 MFD. variable condenser, 1 Vernier rheostat, 1 tube socket, 8 binding posts, 20 feet bus bar wire, 1 3" dial and 1 high-grade panel ALREADY DRILLED as per Diagram in Booklet of instruction sent free..... **$11.95**

Two-Stage Audio Frequency Amplifier—Parts complete in every detail for this Circuit—$11.00
Specify type of tubes you intend using

Every article advertised above is guaranteed by the manufacturer and by us—Mail orders filled immediately—transportation PREPAID on all orders of $5.00 or over east of the Mississippi River. Send cash, check or money order—absolutely no goods sent C. O. D.

RDI BROADCASTS WEEK'S PROGRAMS

Tuesday, January 15

KOKA, E. Pittsburgh, Pa. (Eastern, 326), 1:10 p. m., Dougherty's Orchestra; 6:15, Dinner concert, Fort Pitt Hotel Orchestra; 7:30, "Teeth and Health," Dr. Albert I. Wise; 7:45 Children's period; 8:15, "Silence, One of the Virtues of Benjamin Franklin," Dr. John H. Ewers; 8:30, Concert: "Sapphictide," "Springtide," Sara Pock, soprano; "Thank God for a Garden," "Annie Laurio," Gertrude Centorbi, contralto; "Starry Night," duet; "Were I a King," "To a Hill Top," J. E. Bell, tenor; "The Bandolero," "For You Alone," "To Maudalay," "Coming Home," Brinley Jones, baritone; "The Battle Eve," tenor and baritone duet; Flute solos, George Scharnit; 11:30, Queen City Orchestra.

KFI, Los Angeles, Calif. (Pacific, 469), 6:45-7:30 p. m., Concert, presented Emma M. Bartlett; 10:00-11:00, Program by Meaney and Nehls.

KFKX, Hastings, Neb. (Central, 283), Re-broadcasts program of KDKA.

KGW, Portland, Ore. (Pacific, 492), 3:30 p. m., "Eat and Grow Thin," Jeannette P. Cramer; 8:00, Talk for farmers, from Extension Service, Oregon Agricultural College; 10:00, Dance music, George Olsen's Metropolitan Orchestra.

KHJ, Los Angeles, Calif. (Pacific, 395), 12:30-1:15 p. m., Concert; 2:30-3:30, Matinee musicale; 6:45-7:30, Children's program; The weekly visit of "The Sandman" and "Queen Titania;" 8:00-10:00, Program presented by Filmland Trio: Beatrice Schirmerhorn, violinist; Frank Pierce, organist and pianist; E. C. Walker, cellist; J. Edwin Gooderidge, baritone; Rev. Thomas Lutman, lecturer; 10:00-12:00, Art Hickman's Orchestra.

KPO, San Francisco, Calif. (Pacific, 423), 8:00-9:00 p. m., Sadio Carey, dramatic soprano; 9:00-10:00, Program by prominent musicians of the Pacific Coast: Charles Bulotti, Rudy Seiger, Austin Sperry, Charles Dickman, Uda Waldrop, city organist; 10:00-11:00, Max Bradfield's versatile band.

KSO, St. Louis, Mo. (Central, 46), 8:00 p. m., St. Louis Pageant Choral Society of 200 voices, Frederick Fischer, conductor.

KYW, Chicago, Ill. (Central, 536), 11:35 a. m., Table talk, Mrs. Anna J. Peterson; 2:35 **p. m.,** Studio program; 6:50, Children's bedtime story; 8:00, Program, American Farm Bureau Federation, "Supplying the Home Market First," B. H. Critchfield; 8:30-9:30, Musical program, lecture and demonstration on musical sounds, Morgan L. Eastmau; Robert Tait, tenor; Sallie Menkes, accompanist.

WBAP, Fort Worth, Texas (Central, 476), 7:30-8:30 p. m., Concert, Grapevine Texas Stringed Band, featuring old-time tunes; 9:30-10:45, Concert, Fort Worth University Club, featuring college tunes, chorus and stringed selections.

WBZ, Springfield, Mass. (Eastern, 337), 7:00 p. m., Farmers' period, "Your 1924 Fertilizer Order," Prof. John B. Abbott; 7:30, Bedtime story for the kiddies; 8:00, Piano recital; 9:00, Bedtime story for grown-ups, Orison S. Marden.

WCAP, Washington, D. S. (Eastern, 469), 7:30-10:00 p. m., Joint program with WEAF, N. Y. C., program of music and short talks on subjects of national interest.

WOAF, Kansas City, Mo. (Central, 411), 3:30-4:30 p. m., Eddie Kuhn's Kansas City Athletic Club Orchestra; 6:00-7:00, School of the Air; Piano tuning-in number on the Duo-Art; Address, J. Frank Smith; Children's story; Fritz Hanlein's Trianon Ensemble, Hotel Muehlebach; 11:45-1:00 a. m. Nighthawk frolic, "The Merry Old Chief," and the Coon-Sanders Novelty-Singing Orchestra.

WDAP, Chicago, Ill. (Central, 360), 10:00 p. m., Northwestern School of Music; Fred Agard, Bob Cougle, Rosemary Hughes, Jack Chapman's Orchestra.

WOAR, Philadelphia, Pa. (Eastern, 395), 12:00 m., Organ recital, Stanley Theater; 12:30 **p. m.,** Dinner music, Arcadia Cafe Concert Orchestra; 2:00, Concert, Arcadia Cafe Concert Orchestra; Edna Finestone, pianist; 7:30, Dream Daddy's bedtime stories; 7:45, Dramatic review by Arnold Abbott.

WEAF, New York, N. Y. (Eastern, 492), 11:00 a. m., "Posture and the Slim Silhouette," Helen McKinstrey; 11:20, Board of Education; 11:35, "Current Moving Pictures," Adele F. Woodward; 11:50, American Agriculturist; 4:30, Mabel Empie, contralto; 7:30, Thornton Fisher's sport talk; 7:40, Russian Choir; 8:10, American Surety Co.; 8:30, Brooklyn Daily Eagle; 8:45, Rose A. Corello, lyric soprano; 9:15, Columbia Phonograph Co.; 9:30, Wendell Hall, baritone; 9:45, National Carbon Minstrels.

WFAA, Dallas, Texas (Central, 476), 12:30-1:00 p. m., Address, DeWitt McMurray; 8:30-9:30, Five-minute talk for Safety Council on safety week; Music, Harmony Five Orchestra; 11:00-12:00, Entertainers from the Jefferson Theater.

WFI, Philadelphia, Pa. (Eastern, 395), 1:00 p. m., Meyer Davis Concert Orchestra; 3:00, Loretta Kerk, pianist; 6:30, Meyer Davis Bellevue Stratford Concert Orchestra; 7:00, Bedtime stories, Cousin Sue.

WGI, Medford Hillside, Mass. (Eastern, 360), 12:03 m., Selection on the Ampico in the Chickering; Amrad Round Table Selections on the Brunswick Console; 3:00 **p. m.,** Amrad Women's Club program; Descriptive musicale, arranged by Chickering & Son's Company; 3:45, "Tuesday Tea Talk," David McGregor Cheney; 6:00, Big Brother Amrad Club Meeting for the Young Folks; 7:00, Evening program: "Africa From Cape Town to the Congo," Commercial Traveler, A. S. Flint.

WGR, Buffalo, N. Y. (Eastern, 319), 12:30-1:30 p. m., George Albert Bouchard, organist; 4:00, Tea time music, Martha Gomph, harpist; Katherine Stang, violinist; 6:30-7:30, Vincent Lopez Hotel Statler Orchestra; 7:30, Digest of the day's news.

WGY, Schenectady, N. Y. (Eastern, 380), 2:00 p. m., "The American Hostess—Her Dinners," Mrs. C. H. Pearse; 7:45, Musical, WGY Orchestra; "Morning Hymn," William L. Barker, tenor; "La Reve," Edward A. Rice, violinist; "Bendemeers Stream," "The Cloths of Heaven," William L. Parker, tenor; "The Broken Melody," Leo Kliwen, violaist; "Then Shall the Rightcous Shine," William L. Parker; "Cavatlua," Peter Schmidt, clarinetist; "The Year's at the Spring," Parker; "Siegmund's Love Song," Ernest Burleigh, cellist; "Musica Prohibita," Parker; Duet, "Barcarollo," Rice and Kliwen.

WHAS, Louisville, Ky. (Central, 400), 4:00-5:00 p. m., Walnut Theater Orchestra; Strand Theater Orchestra; 7:30-9:00, Concert, Loulsville Railway Inspectors Quartette, Albert Doere, Andrew Anderson, Samuel Morrifield, George Haley; Barney Rapp's Orchestra; Reading, "An Interesting Historical Episode."

WHN, New York, N. Y. (Eastern, 360), 2:15-2:45 p. m., Witmark and Son; 3:45-4:15, Will Tyler's Orchestra; 4:30-5:00 Leo Peist; 10:00, Talk, Hon. Milton W. Sutton, of the National Security League.

WIP, Philadelphia, Pa. (Eastern, 509), 1:00 p. m., Organ recital, Karl Bonawitz; 6:05, Dinner music, Dick Regan and his WIP Concert Orchestra; 7:00, Uncle WIP's bedtime stories; 8:00, Dramatic review, Elliott Lester; 10:10, Danco music, Charlie Kerr and Orchestra from St. James Hotel.

WJAX, Cleveland, Ohio (Eastern, 390), 8:00 p. m., Address by John Mills, Radio engineer Western Electrio Co. and author of "Letters of a Radio Engineer to His Sou," under auspices of Cleveland Engineering Society; Musical numbers, Male Chorus of the Ohio Bell Telephoue Company; Program arranged by the Cleveland News-Leader.

WJAZ, Chicago, Ill. (Central, 447.7), 10:00-2:00 a. m.; "Dream Daddy," "Susie," "On a Moonlight Night," "Danco and Keep Young," "Silvery Moon," "Sobbing Blues," Oriole Orchestra; Chicago Musical College.

WJY, New York, N. Y. (Eastern, 405), 7:30 p. m., Pearl Spaulding, soprano; Creighton Allen, accompanist; 7:45, "Etiquette," a Doubleday Page talk; 8:00, Pearl Spaulding, soprano; 8:15, "Hidden Fortunes in Cancelled Stamps," E. E. Power; 8:30, Lenox String Quartet of New York University; 10:30, Dance program, Hotel Astor Grill Orchestra, Al Epps, leader.

WJZ, New York, N. Y. (Eastern, 455), 3:00 p. m., Afternoon auditorium concert, Wanamaker Auditorium; 4:00, Harper's Bazaar Fashions; 4:15, New York Univesity's Radio Extension Course lecture; 4:30, "Peace Talk," Mrs. Edward Robinson; 7:00, Supper music, Paul Specht and his Alamac Hotel Orchestra; 8:00, "Business Forecast for 1924," a University of the Air talk, Dr. Warren F. Hickermeel; 8:15, "The Marriage of Figaro," a Wagnerian Opera Company production, Manhattan Opera House.

WLAG, Minneapolis and St. Paul, Minn. (Central, 417), 10:45 a. m., Housebold hints; 11:35, Surprise program; 2:00 **p. m.,** Talk, League of Women Voters; 2:35, Musical program; 4:00, Short story; 5:30, Children's hour, Antoinette Zwingge, story teller; 6:00, Sport review, Ed Walker; 6:15, Georgo Osborn's Minneapolis Athletio Club Orchestra; 7:30, Farm lecture program.

WLW, Cincinnati, Ohio (Central, 309), 4:00 p. m., Forum for Women; 10:00, "A Voice With a Smile," "I're Got the Fox Trot," "He May Be Your Man on Friday," "Mean Blues," "Step On It," Clarence Lipp Dance Orchestra; Mitchel Dane, violinist.

WMAQ, Chicago, Ill. (Central, 447.5), 4:30 p. m., Glenn Dillard Gunn School of Music; 7:30, Program arranged by Austrian consul; 8:30, WMAQ Orchestra; 9:15, Luther Memorial Choir.

WMC, Memphis, Tenn. (Central, 500), 8:30 p. m., Program, Mrs. Garner Strickland, director; 11:00, Midnigbt frolic.

WOAW, Omaha, Nebr. (Central, 526), 6:30 p. m., Dinner program, Jaffy's Music Masters; 9:00, Program, Loyal Order of Moose, Albert Sahd, pianist; Mrs. Margaret R. Burns, soprano; Frank Buckingham, banjoist; Nadrie Hibbs, soprano; John Regan, violinist; Gus T. Wiekstrum, bass; Dean Rimmer, saxophonist; W. C. Kuehn, zither player; S. T. Davis, harp guitarist; Address, "Mooseheart and Moosehaven," Henry F. Wulf; Margaret Wheeler, saxophonist; Phil A. Helgren, baritone.

WOC, Davenport, Iowa (Central, 484), Chimes; 3:30 **p. m.,** "Smallpox," A. C. 5:45, Chimes.

WOO, Philadelphia, Pa. (Eastern, 509), Organ recital, Mary E. Vogt; 12:00 m., Tea Room Orchestra, Robert E. Golde 4:45-5:00 **p. m.,** Organ recital, Mary E.

WOR, Newark, N. J. (Eastern, 405), 6:15- Halsey Miller and his orchestra—"Music Dine"; 6:30-8:45 **p. m.,** Man in the M for the Children—Newark Sunday Call Halsey Miller and his orchestra—"Music Dine."

WOS, Jefferson City, Mo. (Central, 440.9 m., Evening program of the Missouri Sta Week Session at Columbia.

WWJ, Oetroit, Mich. (Eastern, 517), 9:30 night's dinner," Woman's Editor; 9:45, pianist; 3:30 **p. m.,** Detroit Newa Orch Detroit News Orchestra; Joseph M. Sp Marcus Kellerman, vocalist.

Headliners of the Week

HEAR 200 volces at one time from KSD *Tuesday*. The St. Louis Pageant Choral Soelety slngs. WMAQ wlll give an Austrlan program this same evenlng. *Wednesday*, as you have no doubt seen from the photographs below, KPO is giving its first birthday party. To step from one coast to the other no longer rqeuires seven league boots, so listen in to WOR if you like Russian music, directed by a real Russian, Andrey Talalaeff. *Thursday*, WJZ will celebrate the birthday of a man who no donbt helped make Radio possible, Benjamin Franklin. *Friday*, WGY will give a Scotch program and even a genulne Bagpipe is promised. Perhaps, if you are an Elk, you would prefer to llsten to the Elks Club concert at WLAG. *Saturday*, KDKA schedules a concert of old favorites from all ages by the Westinghouse Band. Mrs. Jane Webster Murrell will direct an excellent concert for WHAS *Sunday*. If you are a Dickens fan you may be interested in what Frederick D. Losey has to say on "A Christmas Carol" by Charles Dickens, at WMC on *Monday*.

—THE PROGRAM LADY.

Station KPO, Hale Bros., San Francisco, will celebrate its first birthday anniversary on January 16 with a party to whicb all Radiophans are invited. For tbe occasion an excellent musical program has been arranged to be broadcast from eight o'clock until midnight (Pacific time). Among the artists will be tbe singers presented herewith, wbo are, above, Mrs. Edward E. Bruner, dramatic soprano; Irwin Holten, tenor, at the right, and opposite him E. Harold Dana. The latter was selected as the winning baritone by Tita Ruffo, the famous opera singer, in a contest held not long ago in San Francisco. There will be a number of other entertainments by solo vocalists and instrumentalists, and by two orchestras. The mayor of tbe city will wind up the festivity with an address.

Wednesday, January

KOKA, E. Pittsburgh, Pa. (Eastern, 326), Broudy's Orchestra, 6:30, Dinner concert, Athletio Association Orchestra; 7:45, period; 8:15, Travel talk, Grace Latus, T of the Pittsburgh Post; 8:30, "Thrift De B. Coll; 8:40, Pearl Reed, violinist; Miss cellist; Edith Wickel, pianist.

KFAE, Pullman, Wash. (Pacific, 330), "Vocational Manner," Dr. Hamilton; Beneke, soprano; "The Hibernation of mals," Dr. W. T. Shaw.

KFI, Los Angeles, Calif. (Pacific, 469), 6:45- Detective Stories presented by Detective N 10:00-11:00, Concert—entertainment pre Hollywoodland.

KFKX, Hastings, Nebr. (Central, 283), Re program of.

KGW, Portland, Ore. (Pacific, 492), 3:30 p. dren's program; 8:00, Concert, Oregonian Orchestra; 9:00, Income tax talk, 10: music, George Olsen's Metropolitan Orches

KHJ, Los Angeles, Calif. (Pacific, 395), 12 m., Program presenting Harold Lishman Keau Nui, Hawaiian players; 2:30-3:30, Ma ficale presented by Harold Lishman and K Nui, Hawaiian players; 6:45-7:30, Child gram, presenting piano pupils of Ethel 8:00-10:00, Program presented by Band o Shrine Lodge, Arthur Jenkins, director; gardt, lecturer; 10:00-12:00, Art Hick chestra.

KPO, San Francisco, Calif. (Pacific, 423), Children's half-hour, "Animals that p "The Golden Bird in the King's Garden"; midnight, Anniversary program (1 year o Mueller, tenor; C. Judson Weller, accompa Hillman, baritone; Walter Wenzel, pian Holton, tenor; Pearl Hassock Whitcomb, Lela Gordon Saling, soprano; Fermin violinist; Mrs. D. B. McKinley, contralto Herold, tenor; Palace Hotel Orchestra; Fa Hotel Orchestra; Addresses, Mayor of San cisco and City Supervisors.

KSD, St. Louis, Mo. (Central, 546), 7:00 p. Abergh's Concert Ensemble; Arne Arensen, vio 11:00, Hotel Statler dance music, Rodemich chestra.

KYW, Chicago, Ill. (Central, 536), 11:35 a. m., talk, Mrs. Anna J. Peterson; 6:30 **p. m.,** Child bedtime story; 7:45, "Le Jongleur De Notre Da opera in three acts at the Auditorium Theate Chicago Civio Opera Co., opera in French, mus Massenet, libretto by Lena. Cast: Jean, a Ju Mary Garnen; Boniface, Edouard Cotreuil; Alexander Kipnis; Monk Poet, Jnse Mojica; Painter, William Beck; Monk Sculptor, Virgilio zari; Monk Musician, Desire Defrere; Conde Giorgio Polacco.

PWX, Havana, Cuba (Eastern, 400), 8:30-11:00 p. Staff Band of the Cuban Navy.

WBAP, Fort Worth, Texas (Central, 476), 7:30- p. m., Concert, Sani S. Lash, baritone; 9:30-1 Concert, George Freeman's Texas Hotel Orchestra

WBZ, Springfield, Mass. (Eastern, 337), 6:00 p. Dinner concert, WBZ Quintette; 7:00, Hum program; 7:30, bedtime story for the Kiddies; "Give your Fruit Trees a Chance," Farmers Per 11:00, Program of Chamber Music, WBZ Quint Troy P. Gorum, baritone.

WDAF, Kansas City, Mo. (Central, 411), 3:30-4:3 m., Johnnie Campbell's Kansas City Cub Orches 6:00-7:00, School of the Air, Piano tuning-in n ber on the Duo-Art; Address, Weekly health given under the auspices of the Health Conserva Association; Children's story; Fritz Hanlein's Trio Ensemble; 8:00-9:15, Classical concert, "Surp program"; 11:45-1:00 a. m., Nighthawk frolic, Merry Old Chief" and the Coon-Sanders Nove Singing Orchestra.

WDAP, Chicago, Ill. (Central, 360), 10:00 p. Lyceum Arts Conservatory; Jack Chapman's Orches

WOAR, Philadelphia, Pa. (Eastern, 395), 12:00 Organ recital, Stanley Theater; 12:00 **p. m.,** Din music, Arcadia Cafe Concert Orchestra; 2:00-3 Concert, Arcadia Cafe Concert Orchestra; 7:30, Dr Daddy's bedtime stories; 8:00, WDAR Male Quar

(Continued on Page 16)

PLAYS, OPERA AND DANCE OR

Opera "Louise," from KYW, January 16

THIS is a story of Bohemian Paris. **Louise**, a beautiful young girl working in a dressmaking establishment, falls in love with **Julien**, an artist. As her parents refuse to allow her to marry him, and they are unable to marry without this consent, **Julien** urges **Louise** to run away with him, which she does. They are enjoying the carefree life of Bohemian Paris, when **Louise's** mother appears in the midst of a dance and tells the girl her father is ill. Promising that she will let **Louise** return as soon as her father is well, the mother takes **Louise** away. However, both parents try to keep her from returning. Angry because she does not want to give up her lover, the father at last turns her out. His anger gone, the poor man rushes to the window and calls her, but all that he sees are the lights of Paris in the distance.

—THE PROGRAM LADY.

Wednesday, January 16

(Continued from Page 15)

10:00, Dance music, Howard Lanin's Arcadia Cafe Orchestra.

WEAF, New York, N. Y. (Eastern, 492), 11:00 a. m., Columbia University; 11:25, N. Y. Tuberculosis Society; 11:50, American Agriculturist; 4:15 p. m., Anna Sheffield, dram. soprano; 7:00, United Synagogues of America; 7:30, Thornton Fisher's Sport Talk; 7:40, Wendell Hall, baritone; 8:00, Lois Boyles, soprano; 8:30, N. Y. Stock Exchange; 8:45, Minnie Weil, pianist; 9:15, "The Principles of Safe Investment"—talk by Peter Hamilton; 9:30, Charles F. Robinson, baritone.

WFAA, Dallas, Texas (Central, 476), 12:30-1:00 p. m., Address, Dr. E. D. Shurter.

WFI, Philadelphia, Pa (Eastern, 395), 1:00 p. m., Meyer Davis Bellevue Stratford Concert Orchestra; 3:00, Ednyfed Lewis, tenor, Loretta Kerk, pianist; 6:00, Bedtime stories, Cousin Sue; 6:30, Meyer Davis Bellevue Stratford Concert Orchestra.

WGI, Medford Hillside, Mass. (Eastern, 360), 12:00 m., Selections on the Ampico in the Chickering; Amrad Round Table; Selections on the Brunswick Console; 6:00 p. m., Big Brother Amrad Club Meeting for Young Folks; 6:50, Message to Camp Fire Girls, Charles W. Casson, "Big Smoke"; 7:20, "Science Up to Date," Scientific American; 7:30, Evening Program; Musicale program, Concert Company, F. Chester MaDan; 8:00, Address, Edward Dana; Musicale, Concert Company.

WGR, Buffalo, N. Y. (Eastern, 319), 12:30-1:00 p. m., George Albert Bouchard, organist; 4:00, Tea time music, Martha Gomph, harpist, Katherine Stang, violinist; 6:30 and 11:30, Vincent Lopez Hotel Statler Orchestra; 7:30, Digest of the day's news; 9:30, Concert, mixed program, direction of J. P. Quinn.

WGY, Schenectady, N. Y. (Eastern, 380), 6:30 p. m., "Adventure Story," The Youth's Companion.

WHAS, Louisville, Ky. (Central, 400), 4:00-5:00 p. m., Strand Theater Orchestra; Walnut Theater Orchestra; Dancing lesson, No. 7; 7:30-9:00, Ches Meyer's Orchestra; Reading, An Interesting Episode.

WHN, New York, N. Y. (Eastern, 360), 2:15-3:00 p. m., Sam Wooding's Creole Syncopators; 7:30-8:00, Jack Fox's Clover Carden's Orchestra; 8:15, Dr. Arthur H. Howland; 8:30, Murray H. O'Neil, baritone; 9:30-10:00, Melodyland Syncopators; 10:30-11:00, M. Whitmark Black and White Program.

WIP, Philadelphia, Pa. (Eastern, 509), 6:05 p. m., Dinner music, Jordan-Lewis Dance Orchestra, direction Bob Lewis; 7:00, Uncle Wip's bedtime stories.

WJAZ, Chicago, Ill. (Central, 447.7), 10:00-2:00 a. m., Evelyn Bostleman, soprano; Rudolph Bostleman, violinist; Leonard Fifer, pianist; Oriole Orchestra.

WJZ, New York, N. Y. (Eastern, 455), 3:00 p. m., New York University's Radio Extension Course Lecture; 3:15, Margaret Livingston, pianist; 3:30, Katherine Phillips, soprano; 4:00, Memphis Five of Roseuont Ballroom; 4:30, Hotel Commodore Orchestra; 7:00, A Shadowland Story, Florence S. Vincent; 7:30, Irving Selzer and his Cafe Boulevard Orchestra dance program; 8:00, Irving Selzer and his Cafe Boulevard Orchestra; 8:30, One of the "City Official Series" talks, Honorable Joseph Hennessy, Commissioner of the Park Department of the Bronx; 8:45, Mr. and Mrs. Herbert Dittler in a piano and violin recital; The Phoenix Male Quartette; 9:45, Marie Rothman, soprano; 10:20, Avy LaSkere, double voice entertainer.

WLAG, Minneapolis & St. Paul, Minn. (Central, 417), 10:45 a. m., Household hints; 11:35, Surprise program; 2:00 p. m., Woman's Club Hour, "Care of the Furnace," E. N. Jane; 4:00, Short story; 5:30, Children's hour, Eleanor Poehler, story-teller; 6:00, Sport hour, "The Automobile Show," Walter Wilmot; 7:30, Farm lecture program; 9:30, Concert.

WLW, Cincinnati, Ohio (Central, 309), 4:00 p. m., Special program for Shut-Ins, Wurlitzer Concert Co., William Afsprun, Mrs. William Duning, Mrs. O. B. Kaiser, Mrs Rehbun; 10:00, Grove's Orchestra; Ocarina Trio; Dorothy Klein, soloist; Martha Wright, pianist; Bertha Kershner, volinist; Helen Kershner, pianist; Xylophone solo, Mr Louis.

WMAQ, Chicago, Ill. (Central, 447.5), 1:00 p. m., Speeches, Chicago Association of Commerce; 4:30, Pupils of Cosmopolitan School of Music; 7:00, Georgene Faulkner, story lady; 7:30, Weekly lecture from Northwestern University; 8:30, WMAQ's orchestra 9:15, Program, Lyceum Arts Conservatory.

WDC, Davenport, Iowa (Central, 484), 12:00 m., Chimes; 3:30 p. m., "The Value of Urinalysis," Clyde G. Kern; 6:30, Sandman's visit; 7:00, "Landscape Gardening, Wm. H. Mast; 8:00, Erwin Swindell, organist; Mrs. O. D. Doran, soprano; 10:00, Program given by a group of artists from Muscatine; "Take all of Me," "Little Brown Owl," "Vale," Grace Harper, soprano; "Friend of Mine," "Keep on Hoping," "Old-Fashioned Town," Leonard Plesy, tenor; "Night in Venice," duet; "Sweet Genevieve," "Until," Elsa Fack, contralto; Song Cycle (In Fairyland), quartette; Chester Len, bass; Mrs. Morell MacKinzie, pianist.

WOO, Philadelphia, Pa. (Eastern, 509), 11:00 a. m., Organ recital, Mary E. Vogt; 12:00 m., Wanamaker Crystal Tea Room Orchestra; 4:45 p. m., Organ recital, Mary E. Vogt; 7:30, Hotel Adelphia Concert Orchestra; 8:15, Monologue, Ralph Bingham; 8:30, WOO Orchestra, Robert E. Golden, director; 10:10, Organ recital, Mary E. Vogt.

WOR, Newark, N. J. (Eastern, 405), 6:30-6:45 p. m., "Radio for the Layman," Albert E. Sonn of Newark Sunday Call; 8:30-9:00, Arthur Murray, nationally known dancing instructor assisted by Jersey Collegians under direction of Julie Wintz; 9:00-11:00 Russian program—chorus and orchestra, under the leadership of Andrey Talalaeff.

WOS, Jefferson City, Mo. (Central, 440.9), 7:30 p. m., Evening program of the Missouri State Farmers' Week Session at Columbia.

WTAM, Cleveland, Ohio (Eastern, 390), 8:00 p. m., Overture, "Poet and Peasant," WTAM Orchestra; Violin solo, Ben Silverberg; Clara Sharp, accompanist; Baritone solo, H. J. Dunham; A. R. Willard, accompanist; Piano solo, Miss Clara Sharp; Tenor solo, Enrico Servillo; Mise Blanche Hakinson, accompanist; Cello solo, Max Schmidt; Clara Sharp, accompanist; Vocal solo, Edna Dunham Willard, soprano; A. R. Willard, accompanist; "Très Jolie Valse," WTAM Orchestra; Saxophone solo, Frank Hruby; Favorite numbers by the WTAM Orchestra.

WWJ, Detroit, Mich. (Eastern, 517), 9:30 a. m., "Tonight's Dinner," Woman's Editor; 12:00 m., Jean Goldkette's Orchestra; 8:30, Detroit News Orchestra; Vocal numbers, Mme. Homer DuBard.

Thursday, January 17

KDKA, E. Pittsburgh, Pa. (Eastern, 326), 12:10 p. m., Dougherty's Orchestra; 6:15, Dinner concert, Fort Pitt Hotel Orchestra; 7:30, Weekly Chat with the Farmers Frank E. Mullen; 7:45, Children's period; 8:30, "Budget Day," A. C. Robinson; 8:40, "Liberty Bell;" "Mighty Lak a Rose," "Lullaby," "The Rosary," "The Atonement of Pan," "Intermezzo and Dance of the Nymphs—Entr'Acte and Dance of the Harpies," Tunes from Stephen Foster; "To a Wild Rose," "Uncle Remus," "Witches Dance" "Little Flower Garden," "The Heart of America," KDKA Little Symphony Orchestra; Lillian Canuti, soprano; Frank M. Johnston, Jr., bass; 11:30, Special late evening concert.

KFI, Los Angeles, Calif. (Pacific, 469), 6:45-7:30 p. m., Concert program by local Y. M. C. A.; 10:00-11:00, Vocal and instrumental concert.

KFKX, Hastings, Nebr. (Central, 283), Re-broadcasts, program of KDKA.

KGW, Portland, Ore. (Pacific, 492), 3:30 p. m., Woman's program; 8:00, Shakespeareau readiugs, J. Hunter Addison; 10:00, Dance nuusic, George Olsen's Metropolitan Orchestra.

KHJ, Los Angeles, Calif. (Pacific, 395), 12:30-1:15 p. m., Program presented through courtesy of Zoellner Conservatory of Music; 2:30-3:30, Matiuee Musicale presented through courtesy of the Zoellner Conservatory of Music; 6:45-7:30, Children's program; 8:00-10:00, Program presenting Vera Leavitt Owen, mezzo-soprano; George Campbell, cellist; Beverly Bayne and Francis Bushman, actors; 10:00-12:00, Art Hickman's Orchestra.

KPO, San Francisco, Calif. (Pacific, 423), 6:00-7:00 p. m., Dinner concert, George Lipschultz and Music Masters, Loew's Warfield Theater; Lela Johnstou, soprano; 8:00-9:00, Herold Montague Schulteis, organist; 9:00-10:00, A Japanese Romance, Mrs. Philip V. Hein, soprano; Abraham Levin, tenor; Mrs. Abraham Levin, pianist; Prof. Jean Kovalski, mandolinist; 10:00-11:00, Palaco Hotel Dance Orchestra.

KSD, St. Louis, Mo. (Central, 546), 8:00 p. m., St. Louis Symphony Orchestra, Frederick Fischer, conductor; Rudolph Ganz, pianist.

KYW, Chicago, Ill. (Central, 536), 11:35 a. m., Table talk, Mrs. Anna J. Peterson; 2:35 p. m., Studio program; 6:50, Children's bedtime story; 8:00-8:20, Twenty Minutes of Good Reading, Rev. C. J. Pernin; 8:30, Musical program, Chicago Rock Island Railroad Co.; 9:15, Prograau, National Live Stock and Meat Board, "Preparatiou of Live Stock for Human Consumption," Thomas E. Wilson.

WBAP, Fort Worth, Texas (Central, 476), 7:30-8:30 p. m., Concert, Fort Worth artists; 9:30-10:45, Concert, groap of artists frou Van Alstyne.

WBZ, Springfield, Mass. (Eastern, 337), 7:00 p. m., "Preparation of Federal Income Tax Returns," Thomas McCarry; 7:30, Bedtime story for the Kiddies; 7:40, Farmers' period—Letter from the New England Homestead; 8:00, Margaret O'Brien, soprano; Mrs. Miriam M. Thomson, pianist; 9:00, Bedtime story for Grown-ups, Orleon S. Marden.

WCAP, Washington, D. C. (Eastern, 469), 7:15-9:45 p. m., Concert music, Orchestra; 10:00-12:00 midnight, Dance music, Meyer Davis' Le Paradis Band.

WDAF, Kansas City, Mo. (Central, 411), 3:30-4:30 p. m., D. Ambert Haley's Dance and Concert Orchestra; 6:00-7:00, School of the Air; Piano tuning-in nuuber on the Duo-Art; Address, Speaker from the William Jewell College; Children's etory; Fritz Hanlein's Trianon Ensemble; 11:45-1:00 a. m., Nighthawk frolic, "The Merry Old Chief," and the Coou-Sauders Novelty-Singing Orchestra.

WDAP, Chicago, Ill. (Central, 360), 10:00 p. m., D. A. Clippinger, Jack Chapmau'e Orchestra.

WDAR, Philadelphia, Pa. (Eastern, 395), 12:00 m., Organ recital, Stanley Theater; 12:30 p. m., Dinner music, Arcadia Cafe Concert Orchestra; piano solos, Edna Finestone; 2:00-3:00, Coucert, Arcadia Cafe Concert Orchestra; 7:30, Dream Daddy'e bedtime stories.

WEAF, New York, N. Y. (Eastern, 492), 11:30 a. m., Edith Burtis, talk on Spring Fashions; 11:50, American Agriculturist; 7:00 p. m., New York Federation of Churches; 7:30, Thornton Fisher's Sport Talk; 7:40, Ruth Bodell, lyric soprano; 7:55, "Care and Treatment of the Scalp"—talk; 8:05, Talk on "Holland's Deeert"; 8:15, Bank of America; 8:30, Hunter Collego Musical Program; 9:30, Dora Damon Pardee, cornetist; 9:45, Talk by National Carbon Co.; 10:00, Raymond Freemantle, baritone; 11:00-12:00, Vincent Lopez Orch., courtesy Gimbel Brothers.

WFAA, Dallas, Texas (Central, 476), 12:30-1:00 p. m., "Old-Time Hujor Exemplified," Epps G. Knight; Music, Red-head girl of the Dallas Journal; 8:30-9:30, Five-minute talk for Safety Council on safety week; Music, Belcanto Male Quartet.

WFI, Philadelphia, Pa. (Eastern, 395), 1:00 p. m., Meyer Davie Bellevue Stratford Orchestra; 3:00, Piano solos, Caroline Hoffman; 6:00, Bedtime etories, Cousin Sue; 6:30, Meyer Davis Bellevue Stratford Orchestra; 8:00, Boy Scouts Radio Corps.

WGI, Medford Hillside, Mass. (Eastern, 360), 12:00 m., Selections on the Ampico in the Chickering; Amrad Round Table; Selections on the Brunswick Console; 6:00 p. m., Meeting of the "Big Brother Amrad" Club; 7:00, Evening program, "Stories for Parents." Children's Aid Association; "Why Does Your Child Fuss about His Food?" Habit Clinic of the Division of Mental Hygiene and the Community Health Association; Musicale, George B. Beale and Friends.

WGR, Buffalo, N. Y. (Eastern, 319), 12:30-1:00 p. m., George Albert Bouchard, organist; 4:00, Tea time music, Martha Gomph, harpist, Katherine Stang, violinist; 6:30-7:30, Vincent Lopez Hotel Statler Orchestra; 7:30, Digest of the day's news; Boy Scout Radiogram, Employment bulletin, story from "The American Boy" magazine.

WGY, Schenectady, N. Y. (Eastern, 380), 2:00 p. m., "The Ex-Service Man as a Citizen," Ralph Mead; 7:45, Radio Drama: "The Truth," WGY Players. Cast: Warder, Edward H. Smith; Roland, Maurice G. Randall; Lindon, Edward E. St. Louis; Servant at the Warders, Frank Oliver; Becky Warder, Rose Cohn; Eve Lindon, Margaret V. Smith; Laura Fisher, Lola Sommers; Mrs. Genevieve Crespigny, Helen Campbell; Messenger Boy, Earle Harvey; WGY Orchestra.

WHAS, Louisville, Ky. (Central, 400), 4:00-5:00 p. m., Waluut Theater Orchestra; Strand Theater Orchestra; Alamo Theater organ; 7:30-9:00, Concert, Reginald Billin, director; Four-minute digest of International Sunday School lesson; Four-minute Radio Forum Talk.

WHN, New York, N. Y. (Eastern, 360), 4:00-5:00 p. m., Preste and His Pekin Orchestra; 5:15-5:30, Jerome H. Remick; 9:30, "Benjamin Franklin," Joseph A. Laweon; 10:00, Lon Gold'e Wigwam Orchestra; 10:30, Edward B. Marks program; 11:00, Melo Club Dance Orchestra; 11:45, M. Whitmark program.

WIP, Philadelphia, Pa. (Eastern, 509), 6:05 p. m., Dick Regan's WIP Concert Orchestra; 7:00, Uncle Wip's bedtime stories; 8:00, Automobile talk by Eugene Hogle, Secretary Automobile club of Philadelphia; 9:00, Organ recital, Karl Bonawitz.

WJAX, Cleveland, Ohio (Eastern, 390), 8:00 p. m., Popular dance program by the Mandarin Orchestra. Vocal and instrumental solo numbers by favorite entertainers.

WJAZ, Chicago, Ill. (Central, 447.7), 10:00-2:00 a. m., Isabelle Cuny, pianist; Max Rosner, baritone; Alice Cunradi, eoprano; Oriole Orchestra.

WJY, New York, N. Y. (Eastern, 405), 8:30 p. m., Charles D. Isaacson; 9:30, Singers Glee Club at Aeolian Hall, forty male voices.

WJZ, New York, N. Y. (Eastern, 455), 9:30 a. m., Benjamin Franklin Birthday Celebration, auspices of the Sons of the American Revolution; Messages frou President Coolidge, Postmaster General Harry New, Charlee N. Hughes, Thomas A. Edison, Edwin Denby, Governor Alfred E. Smith, Senator Royal S. Copeland, British Consulate General, French Consulate General, Federation of French Alliances, tributes by United Typothetae of America, New York Electrical League, Sphinx Club, Poor Richard Club, Young Men's Christian Club, Young Men's Christian Association, Daughters of the American Revolution, National Security League, University of Pennsylvania Club; 3:00, "Die Gotterdaemmerung," a Wagnerian Opera Company; 7:00, "Jack Rabbit Stories," David Cory; 7:30, Sport talk, Edward Hughes; 7:45, "The World's Work"; 8:00, Jimmy Moore, popular songs; 8:15, J. Thurston Noe, organist; 9:00, "Investing your First $500," R. D. Wyckoff of the Magazine of Wall Street; 9:30, Zimbler Trio; 10:30, Dance program, Hotel Commodore Orchestra.

WLAG, Minneapolis & St. Paul, Minn. (Central, 417), 10:45 a. m., Household hints; 11:35, Surprise program; 2:00 p. m., Dancing lesson, Tess Cooperman; 2:35, Ronning's Leamington Orchestra; Lou Emmel, baritone; 4:00, Short etory; 5:30, Children's hour, Tess Cooperman, story-teller; 6:00, Sport hour, "More Dogs," Dr. J. S. Dick, Jr.; 8:15, Osborn's Minneapolis Athletic Club Orchestra; 7:30, Talk, Benjamin Franklin Coffin.

WLW, Cincinnati, Ohio (Central, 309), 4:00 p. m., Adelaide Apfel, pianist; 10:00, "Ile" a Radarlo in one act, Crosley Radarians, Helen Schuster-Martin, director. Cast: Ben the Cabin Boy, Maynard Bebhe; Steward, Joseph Schreck; Capt. Keeny, Willard Crane; Scloum 2nd Mate, Joseph Flick; Mrs. Keeny, Alice Harrie; Joe, Ralph Harburtou; Descriptionist, A. R. Plough; Sea Program of Music from the Cincinnati Conservatory of Music: "The Sea," Margaret Power, eoprano; "Sea Pieces," Hildred Gabriel, pianist; "An Old Song Reeung," "Am Meer," Everett Fuldner, baritone; Carey's Band & Orchestra.

WMAQ, Chicago, Ill. (Central, 447.5), 4:30 p. m., Dayton Choir; 7:00, Weekly talk to Boy Scouts; Talk, Rockwell R. Stephens, Auto Editor of the Daily News; 8:00, Opera.

WMC, Memphis, Tenn. (Central, 500), 8:30 p. m., Chisca Hotel Philharmonic Orchestra.

WOC, Davenport, Iowa (Central, 484), 12:00 m., Chimes; 3:30 p. m., "Gall Stones," Karl G. Stephan; 5:45, Chimes coucert; 6:30, Sandman's visit; 8:00, "Island Nights," "Triflu' Blues," "Sweet Eileen," "Santa Rosa," "I've Got the Foxtrot Somethin'. But It Ain't No Blues," "Clouds," P. S. C. Orchestra; V. B. Rochte, baritone.

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

WOR, Newark, N. J. (Eastern, 405), 6:15-6:30 p. m., Constance Irwin—Children's Stories; 6:30-7:30, Tom Cooper and his Country Club Orchestra.

WOS, Jefferson City, Mo. (Central, 440.9), 7:30 p. m., Evening program of the Missouri State Farmers' Week Session at Columbia.

WWJ, Detroit, Mich. (Eastern, 517), 9:30 a. m., "Tonight's Dinner," Woman's Editor; 3:00 p. m., Detroit News Orchestra; 8:30, Detroit News Orchestra; Francis Firth, baritone; 10:00, Dance music, Jean Goldkette's Orchestra; 11:00, Detroit News Orchestra.

Friday, January 18

KOKA, E. Pittsburgh, Pa. (Eastern, 326), 12:10 p. m., Broudy'e Orchestra; 6:15, Organ recital, Lucile Hale; 7:15, Radio Boy Scout Meeting, Richard Victor, Scoutmaster; 7:45, Children's period; 8:15, Sunday School lesson; 8:30, "Pay your Bills Promptly Day," first prize paper by the Thrift Week Essay Contest; 8:40, Concert, Edwin P. Riehl, director of Knights of Columbia Opera Company.

KFAE, Pullman, Wash. (Pacific, 330), 7:30 p. m., "Physical Training for Women," Genevieve Barber; Vincent Hidèn, cellist; Taxation talk, Dr. Cordell; Vocal solos.

KFI, Los Angeles, Calif. (Pacific, 469), 6:45-7:30 p. m., Concert—program presented by Marion Warde; 10:00-11:00, Instrumental concert.

KFKX, Hastings, Nebr. (Central, 283), Re-broadcasts program of KDKA.

KGW, Portland, Ore. (Pacific, 492), 3:30 p. m., Lecture, Margery Smith of Oregon Agricultural College extension service; 8:15, George Olsen's Metropolitan Orchestra; 9:00, "Land Settlement Work under the Development Program," A. S. Dudley, executive secretary, Oregon State Chamber of Coumerce; 10:30, Hoot Owls with Pautages Frolic.

KHJ, Los Angeles, Calif. (Pacific, 395), 12:30-1:15 p. m., Concert; 2:30-3:30, Matinee Musicale; 6:45-7:30, Children's program; 8:00-10:00, Program presented by Hollywood Woman's Club Chorus; Hugo Kirchofer director; 10:00-12:00, Art Hickman's Orchestra.

KSD, St. Louis, Mo. (Central, 546), 6:30 p. m., Annual banquet of Missouri Uuiversity Alumni.

KYW, Chicago, Ill. (Central, 536), 11:35 a. m., Table talk, Mrs. Anna J. Peterson; 6:50 p. m., Children's bedtime story; 10:00-12:30 a. m., Midnight Revue: Wendell W. Hall, KYW's Music Maker; Walter Wilson and Harry Davis, songsters; Herbie Mintz, pianist; R. D. Hinkle, singer; "Sen" Kaney, specialty-act.

WBAP, Fort Worth, Texas (Central, 476), 7:30-8:30 p. m., Concert, Choral Club of the Daniel Baker College; 9:30-10:45, Concert, Texas Christian University.

WBZ, Springfield, Mass. (Eastern, 337), 6:00 p. m., Dinner concert, WBZ Quintette; 7:00, "Afire Under Hatches," dramaatized story, Youth's Companion; 7:30, Bedtime story for the Kiddies; Current Book Review, R. A. MacDonald of the Court Square Book Store; 7:50, Farmers' period—talk by a member of the Eastern States Farmers' Exchange; 11:00, Chamber music, WBZ Quintette; Walter B. Marsh, baritone; Mrs. Ruby Tilton Kingsley, accompanist.

At the left we present Sylvia Brown, popular song artist, who will be on the air from WHN, New York, on January 17. The lady below is Miss Marjorie Drew, whose noonday playing of late popular selections is a much relished feature of the WGI programs.

WCBD, Zion, Ill. (Central, 345), 8:00 p. m., Mixed Quartet: Mrs. J. D. Thomas, Mrs. G. R. Sparrow, M. P. Barton, J. D. Thomas, Richard F. Hire, violinist; Edith Carey, contralto; Herbert Hendricks, reader; Alexander DePew, flutist; Mrs. Marion Moulton Priddy, pianist.

WDAF, Kansas City, Mo. (Central, 411), 3:30-4:30 p. m., Leo R. Davis Radio Orchestra; 6:00-7:00, Piano tuning-in number on the Duo-Art, Address, Speaker from the Kansas City Children's Bureau; Address, Second of a series of travelogues, E. O. Moffatt; Children's story; Fritz Hanlein's Trianon Ensemble; 8:00-9:15, Fritz Hanlein's Trianon Ensemble; 11:45-1:00 a. m., Nighthawk frolic, "The Merry Old Chief" and the Coon-Sanders Novelty-Singing Orchestra.

WDAP, Chicago, Ill. (Central, 360), 10:00 p. m., Esther Whittington, soprano; String Trio furnished by Joseph E. Chapek; George R. Hill, Jr., baritone; Cambridge Sisters; Jack Chapman's Orchestra.

WDAR, Philadelphia, Pa. (Eastern, 395), 12:00 m., Organ recital, Stanley Theater; 12:30 p. m., Dinner music, Arcadia Cafe Concert Orchestra; piano solos; Edna Fluestone; 2:00-3:00, Concert, Arcadia Cafe Orchestra; 7:30, Dream Daddy's bedtime stories; 8:00, Poets and Authors' Corner; Radio play by Walter Greenough's WDAR Players; 10:10, Dance music, Howard Lanin's Arcadia Cafe Orchestra; special "Morning Glory Club" features; Harry Glyn, songs.

WEAF, New York, N. Y. (Eastern, 492), 11:00 a. m., Prof. James R. Angell, Pres. Yale University; 11:50, American Agriculturist; 4:30 p. m., Joseph Kilmayer, violinist; 7:30, Thornton Fisher's Sport Talk; 7:50, Battery Talk by National Carbon Co.; 8:00, Billy Joues and Ernest Hare; 8:30, Musical Program World Mutual Ins. Co.; 9:00, Astor Coffee Dance Orchestra; 10:00, Mildred Nash Carrington, soprano, 10:30, Wendell Hall, baritone.

WFAA, Dallas, Texas (Central, 476), 12:30-1:00 p. m., Address, Dr. Robert Stewart Hyer; 8:30-9:30, Five-minute talk, Safety Council; Music, St. James Methodist Church Choir singers.

WFI, Philadelphia, Pa. (Eastern, 395), 1:00 p. m., Meyer Davis Bellevue Stratford Orchestra; 3:00, WFI Male Quartet, Loretta Kerk, accompanist; 6:00, Bedtime stories, Cousin Sue; 6:30, Meyer Davis Bellevue Stratford Orchestra.

WGI, Medford Hillside, Mass. (Eastern, 360), 12:00 m., Selections on the Ampico in the Chickering, Amrad Round Table Meeting; Selections on the Brunswick Console; 3:00 p. m., Amrad Women's Club program: "Wastage in Marketing Produce," Dorothy H Goodwin; Afternoon musicale, Brunswick Console 3:30, Talk by Dorothy Bean, Dir. Metropolitan Division Mass. Council of Girl Scouts; 6:00, Meeting of the "Big Brother Amrad" Club; 7:30, Selected verses, Charles L. H Wagner, Radio Poet; Red Cross Health Talk, Henry Copley Green; 8:15, "Association of Broadcast Listeners," Rachael N. Thompson; Musicale, Isabel Kirshen.

WGR, Buffalo, N. Y. (Eastern, 319), 12:30-1:00 p. m., George Albert Bouchard, organist; 4:00, Tea time music, Martha Gomph, harpist, Katherine Stang, violinist; 6:30 and 11:30, Vincent Lopez Hotel Statler Orchestra; 7:30, Digest of the day's news; 9:00, Coucert, mixed program, direction of Roy L. Noah.

WGY, Schenectady, N. Y. (Eastern, 380), 2:00 p. m., "The New Spring Coats and Suits," Paul A. Brown; 7:45, Scotch program: Bagpipe selections, "Scotland and the Brave," "Pipers, Isaac Riddell and Campbell, P. MacRae; "Afton Water," "Mary of Argyle," James R. Hampson, tenor; "My Ain Folk," "A Bonnie Brier Bush," Jean H. Gray, contralto; "Burns' Address to the Mouse," Mungo L. MacRae, reader; "Corn Rigs," Quartet, Mrs. Fred Ellison, soprano; Jean H. Gray, contralto; James Hampson, tenor; Wm. R. Gray baritone; Bagpipe, "Isles"; "Within a Mile of Edinburgh Toon," Mrs. Fred Ellison; "The Life of Robert Burns," Rev. Peter A. MacDonald; "The Battle of Stirling," "The Emblem of Scotland," Gray; "Burns' Address to the Daisy," Mungo L. MacRae; "Ye Banks and Braes," Jean Gray and J. Hampson; Bagpipe, "Corrymeela's Welcome to the Highlands"; "Scotland Yet," Quartet; 10:30, "Aufschwung," Benjamin Fenzel, pianist "Macushla," Robert MacNeish, tenor; "Caro Mio Ben," Florence Alteri de Blase, soprano; "Just Boy," reading from the American; "Maire My Girl," MacNeish; "Impromptu in C Sharp Minor," Fenzel "Santa Lucia, "O Sole Mio," Florence Alteri de Blase; "Vogel Als Prophete," Fenzel, "The Gard

HESTRAS VIE ON WEEK'S BILL

Below and to the right we have Bertha L. Iles, who will read plays over the Radio from WMAQ on January 18, and Dora Damon Pardee, who is a cornet artist. Hear her January 17 from WEAF.

" above are the opular vaudeville ave pleased vast song and dance ave not heard or opportunity to do tuning in WHN, January 17.

Opera "Le Jongleur," from WMAQ, January 19

THE JUGGLER of Notre Dame, as it reads in English, is the story of a starved little Juggler who attempts to entertain a crowd in front of a monastery. The angry **Prior**, after having driven away the mob, urges **Jean** to enter the monastery. The second act reveals **Jean's** poor attempt to become a good monk. **Jean** hears the story of the little sage-flower and the lily. He learns that even a juggler's work well done is acceptable to the Virgin. In the third act, **Jean** enters the Chapel dressed in his juggler's costume and performs his tricks before the picture of the Virgin. Although the monks are at first indignant, they soon see that a miracle has been performed, for over the face of the Virgin a glow of light appears. The monks pray for his passing soul.

—THE PROGRAM LADY.

Saturday, January 19

KDKA, E. Pittsburgh, Pa. (Eastern, 326), 1:30 p. m., Daugherty's Orchestra; 6:15, Dinner concert, Westinghousa Band; 7:45, Children'a period; 8:15, "Foreign Trade of tba U. S.," Howard C. Kidd; 8:30, "Share with Others Day," Rev. Hugh T. Kerr; 8:40, "Merry Wives of Windsor," "Summer Evening in Hawaii," Westinghouse Band; "Carry Me Back to Old Virginny," "In a Woodland Glade," "Espagnole," "Bartered Bride," "A Night in Berlin," "Patrol Guard Mount," "Hear Ye, O Israel," "Annie Laurie," "I Bring You Heartsease," Westinghouse Band; Christine Raum, soprano; Oliver C. Aiten, tenor; Ethel McTeak, accompanist.

KFI, Los Angeles, Calif. (Pacific, 469), 6:45-7:30 p. m., Concert presented by Coral Atkins; 8:00-9:00, Concert by University of California (Southern Branch), Glee Club; 10:00-11:00, Concert, direction Hugo Kirchhofer.

KFKX, Hastings, Neb. (Cantral, 283), Re-broadcasts program of KDKA.

KGW, Portland, Oregon (Pacific, 492), 3:30 p. m., Children's program; 10:00, Dance music, George Olsen's Metropolitan Orchestra.

KHJ, Los Angeles, Calif. (Pacific, 395), 12:30-1:15 p. m., Program presenting Ethel Sanborn, pianist-composer; 2:30-3:30, Matinee Muaicale; 6:45-7:30, Children's program; 8:00-10:00, Program presented through courtesy of Harry James, of Glendale, Calif.; 10:00-12:00, Art Hickman's Orchestra.

KPO, San Francisco, Calif. (Pacific, 423), 8:00-12:00 midnight, Art Weidner and his popular dance Orchestra.

KSO, St. Louis, Mo. (Central, 546), 7:15 p. m., Orchestra concert, organ recital, vocal and instrumental specialties Missouri Theater.

KYW, Chicago, Ill. (Cantral, 536), 11:35 a. m., Table talk, Mrs. A. J. Peterson; 6:50 p. m., Children's bedtima story; 8:00, Borghild Balsted Olsen, soprano; G. B. Hammond, harmonica; David Linn, boy aoprano; Herbia Mintz, pianist; Sallie Menkes, accompanist; Salvatora Cannezzo, cornetist; Florence Rose, pianist, reader; 9:05-9:25, "Under the Evening Lamp," Youth's Companion.

PWX, Havana, Cuba (Eastern, 400), 8:30-11:00 p. m., Valero Vallve, violinist; Grace Yanez del Castillo de Vallve, lyric soprano; Carlos Fernandez, pianist; Juan Vallve, flute-player; Pascual da Rojas, violinist; Humberto Trigo, saxophonist.

WBAP, Fort Worth, Texas (Central, 476), 7:30-8:30 p. m., Review of the interdenominational Sunday school lesson and Radio Bible Class, Mrs. W. F. Barnum.

WBZ, Springfield, Mass. (Eastern, 337), 7:00 p. m., Dinner concert, Hotel Kimball Trio; Jan Geerts, violinist; Angela G. Lonergan, cellist; Paul Lawrence, pianist; 7:30, Bedtime story for the Kiddies; "Bringing the World to America," "Our World Magazine;" 8:00, Myrtle Atchinson, pianist; Alice Mikus, violinist; Irene E. Mikus, accompanist; 9:00, Bedtime atory for Grown-ups, Orison S. Marden.

WCAP, Washington, D. C. (Eastarn, 469), 7:30-10:00 p. m., Joint program with WEAF, N. Y. C.; **10:00-12:00 midnight,** Dance music.

WOAF, Kansas City, Mo. (Central, 411), 3:30-4:30 p. m., Riley-Ehrhart Orchestra; 6:00-7:00, Piano tuning in number of the Duo-Art; Fifth of series of travelogues, Edgar A. Linton, writer-lecturer; Children's atory; Fritz Hanein's Trianon Ensemble; 11:45-1:00 a. m., Nighthawk frolic, "The Merry Old Chief" and the Coon-Sanders Novelty-Singing Orchestra.

WOAP, Chicago, Ill. (Central, 360), 10:00 p. m., Loretta Giles, Bob Brown, Harmony Girls, Jerry Sullivan, Jazke & Neuber, Melodians, Jack Chapman's Orchestra.

WOAR, Philadelphia, Pa. (Eastern, 395), 12:00 m., Organ recital, Stanley Theater; 12:30 p. m., Dinner music, Arcadia Cafe Concert Orchestra; 2:00-3:00, concert, Arcadia Cafe Concert Orchestra; 7:30, Dream Daddy's bedtime stories.

WEAF, New York, N. Y. (Eastern, 492), 1:45 p. m., Luncheon Speeches of Forcign Policy Association; 4:00, Carolinians Orchestra; 5:00, Solomon Pimsler, pianist; 7:30, Claire M. Gillespie, soprano; 8:00, American Chicle Trio & Quartette; 9:00, John V. L. Hogan, engineer; 9:10, Immigration Talk; 9:20, James MacDonald, baritone; 9:40, Winfred T. Barr, pianist; 10:10, Prof. Howard Driggs; 11:00-12:00, Vincent Lopez Orchestra, courtesy Gimbel Bros.

WFAA, Dallas, Texas (Cantral, 476), 12:30-1:00 p. m., "The Logic of Organization for Labor," William M. Reilly, editor of the Craftsman; 8:30-9:30, Five-minute talk for Safety Council; A. Harris & Company's Orchestra; 11:00-12:00, Evan H. Evans, baritone; Ruth Abernathy, pianist.

WFI, Philadelphia, Pa. (Eastern, 395), 1:00 p. m., Meyer Davis Bellevue Stratford Concert Orchestra; 6:00, Bedtime stories, Cousin Sue; 6:30, Meyer Davis Bellevue Stratford Orchestra.

WGI, Medford Hillside, Mass. (Eastern, 360), 6:30 p. m., Meeting of the "Big Brother Amrad" Club; 7:30, Evening program: New England Business Problems, Arthur R. Curnick; Arthur Murray's course in Ball Room Dancing, lesson 7; Concert, Strani's Orchestra.

WGR, Buffalo, N. Y. (Eastarn, 319), 12:30-1:00 p. m., George Albert Bouchard, organist; 4:00, Tea time music, Martha Gomph, harpist; Katherine Stang, violinist; 6:30, Vincent Lopez Hotel Statler Orchestra; 7:30, Digest of the day's news.

WGY, Schenectady, N. Y. (Eastern, 380), 9:30 p. m., Dance music, Jack Symonds' Orchestra.

WHAS, Louisville, Ky. (Central, 400), 4:00-5:00 p. m., Strand Theater Orchestra; Walnut Theater Orchestra; 7:30-9:00, LaGrange Orchestra, Karl Kuerateiner, director; Readiug, An Interesting Historical Episode.

WHK, Clevaland, Ohio (Eastern, 283), 9:00 p. m., Popular dance program arranged by the Cleveland Radio Dealers' Association; Orchestral numbers by Tomson'a Novelty Orchestra; Stephen N. Tomson, pianist and director; Vocal uumbers by George Seegist, baritone.

WHN, New York, N. Y. (Eastern, 360), 2:15 p. m., Original Indiana Flva, John Sylvester, leader; 4:30, All Star Ladies' Versatile Trio; 5:15, Jack Fox's Melody Belles Orchestra; 9:30, Jimmy Clarke Entertainera; 10:15, Kew Gardens Society Orchestra; 11:00, Whitehousa Review.

WIP, Philadelphia, Pa. (Eastern, 509), 6:05 p. m., Dinner music, Dick Regan's WIP Concert Orcheatra; 7:00, Uncia Wip's bedtime stories.

WJAZ, Chicago, Ill. (Central, 447.7), 10:00-2:00 a. m., Columbia School of Music; "Hac an' Sack," "Susie," "Misfortuna Blues," "Silvery Moon," "Pekin," "So This Is Venice," Oriole Orchestra.

WJY, New York, N. Y. (Eastern, 405), 7:30 p. m., "Incoue Taxes," talk; 7:45, "The Work of the New York Assembly," Julius Berg, Assemblyman from the Bronx; 9:00, Report of the Wilaon-Greb fight; 10:30, Paul Specht and his Alamac Hotel Orchestra dance program.

WJZ, New York, N. Y. (Eastarn, 455), 12:15 p. m., Friday Noon Hour of Music, Brick Presbyterian Church; Straus program; Walter Leary, baritone; 3:00, Organ recital, Leo Riggs; 4:00, New York University Radio Extenaion Course Lecture; 4:00, Dance program, Juica Berkins Rosemont Orchestra; 5:00, "A Broader View of Curreut News," Iuternational Interpreter; 7:30, Burr McIntosh, the Cheerful Philosopher; 8:05, Looseleaf Current Topics; 8:30, "Four Years in the Rhineland," General Henry T. Alleu; 9:30, Dinner, auapices of the International Benjamin Franklin Association, speeches, Honorable James L. Beck, Solicitor General; Honorable George N. Carter, United States Public Printer; Honorable Grove A. Whelan.

WLAG, Minneapolis & St. Paul, Minn. (Central, 417), 10:45 a. m., Household hints; 11:35, Surprise program; 2:00 p. m., Woman'a Club, talk arranged by Community Fund; 2:35, Daylight concert; 4:00, Short Story; 5:30, Children's hour, Ellen Nye, story-teller; 6:00, Sport program, Harold Honmyhr, "Andy Gump Preferred"; 7:30, Farm lectures; 9:30, Elk's Club of St. Paul.

WLW, Cincinnati, Ohio (Central, 309), 4:00 p. m., Lecture recital, Mildred Templeton Williams.

WMAQ, Chicago, Ill. (Central, 447.5), 4:30 p. m., Program; 7:00, "Wide Awake Club," Mrs. F. M. Ford; 7:30, Music Memory Contest, Mra. Marx E. Oberndorfer; 8:30, WMAQ's Orchestra; 9:15, Bush Conservatory.

WMC, Memphis, Tenn. (Central, 500), 8:30 p. m., Program, Mrs. Arthur Bower, leader; 11:00, Midnight frolic.

WOC, Davenport, Iowa (Central, 484), 12:00 m., Chimes; 3:30 p. m., "Water Purification," C. A. Russell; 5:45, Chimes; 6:30, Sandman's visit; 7:00, "Health, the Nation'a Greatest Asset," A. L. Willis; 7:20, International lesson for the next Sunday, Dr. Frank W. Court; 8:00, Mrs. Martin Silberstein, harpist; Edna Viewet, pianist; Sheffield Saxophone Quartette.

WOO, Philadelphia, Pa. (Eastern, 509), 11:00 p. m., Organ recital, Mary E. Vogt; 12:00 m., Wanamaker Crystal Tea Room Orchestra; 4:45 p. m., Organ recital, Mary E. Vogt; 7:30, Hotel Adelphia Concert Orchestra; 8:30, Musical program from Fox Theater, Erno Rapee, orchestra director; 9:30, Organ recital, Mary E. Vogt; 10:10, Sam Brown Dance Orchestra from Hotel Adelphia.

WOR, Newark, N. J. (Eastern, 405), 6:30-6:45 p. m., Man in the Moon Stories for tha Children.

WOS, Jefferson City (Central, 440.9), 7:30 p. m., Evening program of the Missouri State Farmers' Week Session at Columbia.

WWJ, Oetroit, Mich. (Eastern, 517), 9:30 a. m., "Tonight'a Dinner," Woman's Editor; 12:00 m., Jean Goldkette's Orchestra; 3:00 p. m., Detroit News Orchestra; 8:30, Detroit News Orchestra; Anne Campbell, Detroit News poet; Mathew Sallie, baritone.

Sunday, January 20

KFI, Los Angeles, Calif. (Pacific, 469), 10:00-10:45, a. m., Service by L. A. Church Federation; 4:00-5:00 p. m., Concert presented by Church Musicians of the Federation; 6:45-7:30, Opera Story and concert by Coral Atkins.

KGW, Portland, Ore. (Pacific, 492), 6:00 p. m., Church services; 7:00, Georga Olsen's Metropolitan Orchestra.

KHJ, Los Angeles, Calif. (Pacific, 395), 10:00 a. m., Sermon; 10:30-12:30 m., Service, First M. E. Church, Rev. E. E. Helms, pastor; Arthur Blakeley, organist; 7:00-7:30 p. m., Arthur Blakeley, organist.

KPO, San Francisco, Calif. (Pacific, 423), 11:00-12:15 p. m., Sunday church services, American Bible Society, Victor Voge, bass.

KYW, Chicago, Ill. (Central, 536), 11:00 a. m., Central Church service, Dr. F. F. Shannon, pastor; 6:30 p. m., Excerpts from the New Testament—An American Translation, Prof. E. J. Goodspeed; 7:00, Chicago Sunday Eveuing Club, Orchestra Hall, Dr. J. Percival Huget.

WBAP, Fort Worth, Texas (Central, 476), 11:00-12:15 p. m., Church services, Methodist Church, Rev. J. W. Bergin, pastor; 4:00-5:00, Concert, Rialto Theater; 5:00-6:00, Radio vesper concert.

WOAP, Chicago, Ill. (Central, 360), 9:15 p. m., Draka Concert Ensemble and soloists.

WOAR, Philadelphia, Pa. (Eastern, 395), 2:00 p. m., Concert, Arcadia Cafe Concert Orchestra.

WEAF, New York, N. Y. (Eastern, 492), 2:45 p. m., New York Federation of Churches; 3:45, Dr. S. Parkes Cadman; 7:20, Capitol Theatre Orchestra & Capitol Staff Artists; 9:00, Skinner Organ Recital.

WFAA, Dallas, Texas (Central, 476), 6:00-7:00 p. m., Radio Bible Class, Dr. William M. Anderson, Jr.; 9:30-10:00, Address, "Christianity and World Affairs," Dr. Graham Frank; 10:00-11:00, Footwarmers' Orchestra.

WFI, Philadelphia, Pa. (Eastern, 395), 7:30 p. m., Services, Arch Street Presbyterian Church.

WGI, Madford Hillside, Mass. (Eastern, 360), 4:00 p. m., Twilight program: "Adventure Hour," Youth's Companion; Afternoon musicale; 8:30, Evening program: "World Unity," Auspices of the Greater Boston Federation of Churches; Evening Musicale.

WGR, Buffalo, N. Y. (Eastern, 319), 3:00 p. m., Vesper service, Mrs. Agnes Luther Tullis, lyric soprano sololat; the Rev. Warren D. Hall, University Presbyterian Church, Snyder, N. Y., speaker; 4:00-5:00, Robert Munn, organist.

WGY, Schanactady, N. Y. (Eastern, 380), 10:30 a. m., Church services, First Reformed Church, Rev. Clayton Potter, pastor; 3:30 p. m., Program, WGY Symphony Orchestra; Fred Heacox, baritone; 7:30, Church services, First Church of Christ Scientist.

WHAS, Louisville, Ky. (Central, 400), 9:57 a. m., Church service, Trinity Lutheran Church, Rev. Dr. Ira R. Ladd, pastor; Esther Barth, organist; 4:00-5:00, Concert, Mrs. Jane Webster Murrell, director.

WHK, Clevaland, Ohio (Eastarn, 283), 8:00 p. m., Concert program by the WHK Trio; Ben Silverberg, violinist; Max Schmidt, cello; Ben Burtt, piano; Vocal solos by Miss Ruth Sponseller, contralto.

WHN, New York, N. Y. (Eastern, 360), 3:00-4:30 p. m., Christian Endeavor program; 5:00, John D. Flynn of the National Security League; 5:15-6:00, WHN Radio Five Orchestra.

WLW, Cincinnati, Ohio (Central, 309), 9:30 a. m., Sunday School Services, Editorial Staff of Sunday School Publications, Methodist Book Concern; 11:00, Services, Church of the Covenant, Rev. Frank Stevenson, minister; 8:00, Reading Road Unitarian Church.

WOC, Davenport, Iowa (Central, 484), 9:00 a. m., Chimes; 1:30 p. m., Orchestra; 7:00, Pipe organ recital; 8:00, Church services; 9:00, Musical program.

WWJ, Oatroit, Mich. (Eastern, 517), 11:00 a. m., Services, St. Paul's Episcopal Cathedral; 5:00 p. m., Detroit News Orchestra.

Monday, January 21

KFAE, Pullman, Wash. (Pacific, 330), 7:30 p. m., Chemistry popular lecture, Dr. Ralph W. Gelbach; Hawaiian Guitar solos, Ray Kromer; Poems, Prof A. B. Cunningham; Xylophone solos, Edward Whittendalo.

KGW, Portland, Ore. (Pacific, 492), 3:30 p. m., Program; 8:00, Musical program.

KPO, San Francisco, Calif. (Pacific, 423), 8:00-9:00 p. m., G. Herold Montague Schutteis, organist; 9:00-10:00, Lecture on Bach and Handel, San Francisco Conservatory of Music; 10:00-11:00, E. Max Bradfield's Palace Hotel Dance Orchestra.

WBAP, Fort Worth, Texas (Central, 476), 7:30-8:30 p. m., Concert; 9:30-10:45, Concert, John Fanning's Minatrels of Mineral Wells.

WDAR, Philadelphia, Pa. (Eastern, 395), 12:00 m., Organ recital, Stanley Theater; 12:30 p. m., Dinner music, Arcadia Cafe Concert Orcheatra; 2:00-3:00, Concert, Arcadia Cafe Concert Orchestra; 4:30, Betsy Logan; 7:30, Dream Daddy's bedtime stories; 7:50, Moving Picture Review; James A. Nasaau; 10:10, Danco music, Howard Lanin's Arcadia Cafe Orchestra.

WEAF, New York, N. Y. (Eastern, 492), 7:30 p. m., Thornton Fisher's Sport Talk; 7:50, Peoples Trust Co.; 8:00, Roxie N. Fairchild; 8:20-10:30, Philharmonic Concert from Carnegie Hall.

WFI, Philadelphia, Pa. (Eastern, 395), 1:00 p. m., Meyer Davis Bellevue Stratford Orchestra; 6:00, Bedtima stories, Cousin Sue; 6:30, Meyer Davis Bellevua Stratford Orchestra.

WGR, Buffalo, N. Y. (Eastern, 319), 12:30-1:00 p. m., George Albert Bouchard, organist; 4:00, Tea time music, Martha Gomph, harpist; Katherine Stang, violinist; 6:30-7:30, Vincent Lopez Hotel Statler Orcheatra; 7:30, Digest of the day's newa; 8:00-8:15, Second talk on "Investments" by Walter Delaplante; 9:00, Concert, mixed program, direction of Clifford Bettinger, for Niagara Battery Corporation.

WGY, Schenectady, N. Y. (Eastern, 380), 2:00 p. m., "Cooking by Wire," Society for Electrical Development; 7:45, "The Old Refrain," Elizabeth B. Carrigan, contralto; "Say Sometbiug Good," "Rather Be the Horn," "Nothing to Do But Go," Genevieve Liddane, reader; "His Lullaby," "Lullaby," Elizabeth B. Carrigan; "Roofs," "House with Nobody In It," "Sometime," Genevieve Liddane; "To a Wild Rose," "Starlight," "Song," Alice M. Bellringer, pianist; "Ave Maria," Elizabeth B. Carrigan; "Lucy's Dreadful Dream," "Teddy O'Rourke," Liddane; "O Dry Those Tears," "Good-Bye," Carrigan.

WHAS, Louisville, Ky. (Central, 400), 4:00-5:00 p. m., Strand Theater Orchestra; Walnut Theater Orchestra.

WHAZ, Troy, N. Y. (Eastern, 380), Concert of songs and ballads, Dick Reese, director; "College Athletics," Captain Harry A. Van Velsor; Thrift talk, George N. Patrick.

WHN, New York, N. Y. (Eastarn, 360), 2:15-2:45 p. m., Edward B. Marks program; 3:45-4:30, Colonial Inn Orchestra, Tom Bauks, leader; 7:30-8:00, Lannin's Roseland Dance Orchestra; 8:45, Dorothy Wallace Portingall, saxophonist; 9:30-10:00, Jerome H. Remick program.

WIP, Philadelphia, Pa. (Eastern, 509), 6:05 p. m., Dinner music by Ches. West's Orchestra; 7:00, Uncle Wip's bedtime stories.

WLW, Cincinnati, Ohio (Central, 309), 8:00 p. m., Services, Unitarian Church, Dr. William Sullivan; 9:00, Crosley Theatrical Review; Roger Hill and his Orchestra, Clyde Tenworth, saxophonist; Charles Holden, saxophonist; Eddy Hunt, violinist; Ralph Ross, trombonist; Al Grunkemeyer, banjoist; Maurice Magill, bass; Burnia Hegenor, drummer; Roger Hill, pianist and director.

WMC, Memphis, Tsnn. (Central, 500), 8:00 p. m., "A Christmas Carol," by Charles Dickens," Frederick D. Losey.

WOC, Davenport, Iowa (Central, 484), 12:00 m., Chimes; 3:30 p. m., Educational program; 5:45, Chimes; 6:30, Sandman's visit; 7:00, Lecture; 8:00, Musical program.

WOO, Philadelphia, Pa. (Eastern, 509), 11:00 a. m., Organ recital, Mary E. Vogt; 12:00 m., Wanamaker Crystal Tea Room Orchestra; 4:45 p. m., Organ recital, Mary E. Vogt; 7:30, Hotel Adelphia Concert Orchestra; 8:15, Ralph Bingham; 9:15, Erno Rapee and Orchestra from Fox Theater; 10:10 p. m., Sam Brown Danca Orchestra.

WOR, Newark, N. J. (Eastarn, 405), 8:00-8:15 p. m., Mr. McCosker on Current Motion Pictures; 8:30-8:45, Jolly Bill Steinke of the Newark Morning Ledger in Radio Cartooning; 8:45-9:00, Mary Eaton, violinist; 9:00-9:15, Beth Tregaskis, contralto; 9:15-9:30, Mary Eaton, violinist; 9:30-9:45, Bsth Tregaskis, contralto; 10:00-11:00, Meadowbrook Orchestra.

WOS, Jefferson City (Central, 440.9), 8:00 p. m., Dance program, Missouri State Prison Orchestra.

WWJ, Oetroit, Mich. (Eastern, 517), 9:30 a. m., "Tonight's Dinner," Woman's Editor; 3:00 p. m., Detroit News Orchestra; 8:30, Detroit News Orchestra; Melville Ray, tenor.

New York to Use WJAX Way to Trap Swindlers

Better Business Commission Sees Radio Catch Stock Fakers

NEW YORK.—Legitimate financial interests of this city plan to apply the policy of those of Cleveland, which recently used Radio to warn potential investors against swindlers or speculators. First steps along this line were taken here recently by the New York Better Business commission.

Its course like that in Cleveland purposes to issue warning perhaps every Thursday evening (as is done by Station WJAX, Union Trust company, Cleveland, and the Better Business commission of that city) to listeners in as to stocks or bonds under suspicion.

The warning consists in the main of a description of the false securities and of questionable methods employed in the sale of sound shares or like instruments.

Ohio Convicts Entertain

COLUMBUS, OHIO.—Another program by talent from among the prisoners of the Ohio penitentiary, the first for Radiophans in many months, was given from Station WPAL of the Superior Radio & Telephone Equipment Co. recently.

PLAYS, OPERA AND DANCE ORCHESTRAS VIE ON WEEK'S BILL

Opera "Louise," from KYW, January 16

THIS is a story of Bohemian Paris. Louise, a beautiful young girl working in a dressmaking establishment, falls in love with Julien, an artist. As her parents refuse to allow her to marry him, and they are unable to marry without their consent, Julien urges Louise to run away with him, and she does. They are enjoying the carefree life of Bohemian Paris, when Louise's mother appears in the midst of a dance and tells the girl her father is ill. Fearing that she will let Louise return as soon as her father is well, the mother takes Louise away. However, both parents try to prevent her from returning. Angry because she does not want to give up her lover, the father at last turns her out. His anger gone, the poor man rushes to the window and calls her, but all that he sees are the lights of Paris in the distance.

—THE PROGRAM LADY.

At the left we present Sylvia Brown, popular song artist, who will be on the air from WHN, New York, on January 17. The lady below is Miss Marjorie Drew, whose noonday playing of late popular selections is a much relished feature of the WGI programs.

Below and to the right we have Bertha L. Iles, who will read plays over the Radio from WMAQ on January 18, and Dora Damon Pardee, who is a cornet artist. Hear her January 17 from WEAF.

The "baby dolls" above are the Carroll Sisters, popular vaudeville artists who have pleased vast audiences by their clever song and dance acts. Radiophans who have not heard or seen them will have an opportunity to do at least the former by tuning in WHN, on the evening of January 17.

Opera "Le Jongleur," from WMAQ, January 19

THE JUGGLER of Notre Dame, as it reads in English, is the story of a starved little juggler who attempts to entertain a crowd in front of a monastery. The saintly Prior, after failing driving away the mob, urges Jean to enter the monastery. The second act reveals Jean's pose attempt to become a good monk. Jean hears the song of the little sacre-bleuer and the Lily. He learns that even a juggler's work will done is acceptable to the Virgin. In the third act, Jean enters the Chapel dressed in his juggler's costume and performs his tricks before the picture of the Virgin. Although the monks are at first indignant, they soon see that a miracle has been performed, for over the face of the Virgin a glow of light appears. The monks pray for his passing soul.

—THE PROGRAM LADY.

Wednesday, January 16

(Continued from Page 15)

10:00, Dance music, Howard Lanin's Arcadia Cafe orchestra

WEAF, New York, N. Y. (Eastern, 492), 11:00 a. m., Columbia University, 11:25, N. Y. Tuberculosis Association, "Open Air Treatment"; 4:15 p. m., Recital: 11:30, Andre Benoist, pianist; 4:45 p. m., Anna Sheffield, dram. soprano; 7:00, United Synagogue of America; 7:30, Theatrical Fisher's Sport Specials of America; 7:45, Health Talk; 8:00, Lalo Talk; 7:40, Wendell Hall, baritone; 8:00, Lalo Hughes, soprano; 8:30, N. Y. Stock Exchange; 9:45, Minute Wolf, pianist; 9:15, "Our Relations to Each Other Important" talk by Peter Hamilton; 9:30, Charles F. Robinson, baritone

WFAA, Dallas, Texas (Central, 476), 12:30-1:00 p. m., Address, Dr. R. D. Sharles.

WFI, Philadelphia, Pa (Eastern, 395), 1:00 p. m., Meyer Davis Bellevue Stratford Concert Orchestra; 3:00, Lindell Lobb, tenor, Lorel's Kelly, pianist; 6:00, Bellhop music, Ouesta Nov. 6:30, Meyer Davis Bellevue Stratford Concert Orchestra

WGI, Medford Hillside, Mass. (Eastern, 380), 12:00 m., Selections on the Angelus in the Chickering; Admiral Round Table, Selections on the Brunswick Console; 8:00 p. m., Big Brother Aircal Club Minstrels, Ship to Shore Talk, 7:40, Weslagh Hall, baritone, 8:00, Lalo Hughes, soprano; 8:30, N. Y. Stock Exchange; 9:45, Minute Wolf, pianist; 9:15, "Our Relations to Each Other Important" talk by Peter Hamilton; 9:30, Charles F. Robinson, baritone

WFAA, Dallas, Texas (Central, 476), 12:30-1:00 p. m., Address, Dr. R. D. Sharles.

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WLAG, Minneapolis & St. Paul, Minn. (Central, 417), 10:45 a. m., Household hints; 11:35, Surprise program; 2:00 p. m., Dancing lesson, Tres Coeurmant; 2:35, Rotnlug's Leamington Orchestra; Lea Emmel, baritone; 4:20, Short story; 5:30, Children's hour, Tess Cooperman, story-teller; 6:00, Sport hour, "More Dogs," Dr. J. S. Dick, Jr.; 6:15, Osborn's Minneapolis Athlete Club Orchestra; 7:30, Talk, Benjamin Franklin Coffin.

WLW, Cincinnati, Ohio (Central, 309), 4:00 p. m., Adelaide Aufel, pianist; 10:00, "The" a ritadorio in une art, Crosley Radiolinus, Helen Schuster-Martin, Director, Cast: Ben the Cabin Boy, Blueprint Robbe; Steward, Joseph Schreck; Capt. Kreuz, Willard Cruse; Seloom 3rd Mate, Joseph Flick; Mrs. Kreuz, Alice Harris; Joe, Ralph Hamilton; Descriptionist, A. R. Clough; Sea Program of Music from the Cincinnati Conservatory of Music: "Pipe Sea," Hubert Parry, baritone; "Sea Pieces," Hilfred Gabriel, pianist; "An Old Song Resting," Ara Alger, Everett Fuldner, pianist; Trombone, Band and Orchestra.

WMAQ, Chicago, Ill. (Central, 447.5), 4:30 p. m., Dayton Choir; 7:00, Bible talk, Rev. Hugh T. Kerr; 8:00, Reading, Rachel K. Stephens, Auto Editor of the Daily News; 8:00, Opera.

WMC, Memphis, Tenn. (Central, 500), 8:30 p. m., Phisca Hotel Philharmonic Orchestra.

WOC, Davenport, Iowa (Central, 484), 12:00 m., Chimes; 3:30 p. m., "Water Purification"; Karl G. Stephan; 5:45, Chimes concert; 6:30, Sandman's visit; 8:00, "Initial Night," Mme. Nordica; 8:30, Bedtime story; 9:00, Sonia Rowe, "I've Got the Foxtrot Somethin. But It Ain't No Blues," "Clouds," T. S. C. Orchestra; N. B. Rockwell, director.

WOC, Philadelphia, Pa. (Eastern, 509), 11:30 a. m., Organ recital, Mary E. Vogt; 12:00 m., Wanamaker Organ recital, Mary E. Vogt; 4:45 p. m., Organ recital, Mary E. Vogt.

WOR, Newark, N. J. (Eastern, 405), 6:15-6:20 p. m., Bunstance Trefu—Children's Stories; 6:30-7:30, Tom Cooper and his Country Club Orchestra.

WOS, Jefferson City, Mo. (Central, 440.9), 7:30 p. m., Evening program of the Missouri State Farmers' Week Session at Columbia.

WRC, Washington, D. C. (Eastern, 469), 7:30-8:30 p. m., Concert, Fort Worth artists; 9:30-10:45, Concert, group of artists from Van Alstyne.

WSB, Atlanta, Ga. (Eastern, 429), 12:10 p. m., Organ recital, Lucille Dale; 7:15, Radio Rec Sports; 7:30, Bedtime story for the Kiddies; 7:40, Farmers' period—letter from the New England Homestead; 8:00, Margaret O'Brien, soprano; Mrs. Miriam M. Thomson, pianist; 8:30, Old Song Resting," Ara Alger," Everett Fuldner, pianist; Trombone, Band and Orchestra.

WSG, Philadelphia, Pa. (Eastern, 509), 4:00 p. m., Concert, Arcadia Cafe Concert Orchestra; 10:00-12:00 midnight, Dance music, Meyer Davis' Le Paradis Band.

WDAF, Kansas City, Mo. (Central, 411), 4:00-4:30 p. m., Ambassador Hotel Dance and Concert Orchestra; 6:00-7:00, School of the Air; Piano tuning-information on the Dan Sri. Address, Speaker from the Kansas City Athletic Club; Children's story; Fritz Hanlein's Trianon Ensemble; 11:45-1:00 a. m., Nighthawk Frolic, The Merry Old Chief, and the Chief Sunbeam Nursery-Singing Orchestra.

WDAP, Chicago, Ill. (Central, 360), 10:00 p. m., D. Clifford Williams, Jack Chapman's Orchestra.

WDAR, Philadelphia, Pa. (Eastern, 395), 12:00 m., Organ recital, Stanley Theater; 12:30 p. m., Dinner music, Arcadia Cafe Concert Orchestra; piano solos, Edna Fiershone; 2:00-3:00, Concert, Arcadia Cafe Concert Orchestra; 3:30, Children's hour, Bedtime stories.

WEAF, New York, N. Y. (Eastern, 492), 11:30 a. m., Judith Rutherford, contralto; Sonia Tashlow; 11:50, American Agriculture; 7:00 p. m., New York Federation of Churches, 7:30, Theatrical Fisher's Sport Specials of America; 7:45, Health Talk; 8:00, Talk on "Treatment of the Scalp"—talk, 8:00, Talk on "Bolshevism in Russia and America," Harry A. Hollis, of College Musical Program; 9:30, Dora Damon Pardee, cornetist; 9:45, Talk by National Carbon Co.; 9:55, Romaine Fielding, story-teller; 11:00-2:00, Concert, Lopez Brothers' Orchestra.

WEAO, Columbus, Texas (Central, 476), 12:30-1:00 p. m., Address, Dr. R. D. Sharles.

WFI, Philadelphia, Pa (Eastern, 395), 1:00 p. m., Meyer Davis Bellevue Stratford Concert Orchestra; 3:00, Lindell Lobb, tenor, Lorel's Kelly, pianist; 6:00, Bellhop music, Ouesta Nov. 6:30, Meyer Davis Bellevue Stratford Concert Orchestra

WGI, Medford Hillside, Mass. (Eastern, 380), 12:00 m., Selections on the Angelus in the Chickering; Admiral Round Table, Selections on the Brunswick Console; 8:00 p. m., Big Brother Aircal Club Minstrels, Ship to Shore Talk, 7:40, Weslagh Hall, baritone, 8:00, Lalo Hughes, soprano; 8:30, N. Y. Stock Exchange; 9:45, Minute Wolf, pianist; 9:15, "Our Relations to Each Other Important" talk by Peter Hamilton; 9:30, Charles F. Robinson, baritone

WGY, Schenectady, N. Y. (Eastern, 380), 2:00 p. m., "The Jo-Serfus Jina as a Writer," Ralph Waldo Emerson; 7:45, Radio Drama, "The Truth," WGY Players. Cast: Walter, Edward H. Smith, Roland, Maurice Hamilton; Ronald Bolsdale, Edward De St. Lorie Servant at the Warkins, Frank Oliver; Beckp Warder, Rose Dale; Lin Lindon, Margaret V. Smith; Laura Fryer, Lelia Newcomer; Mrs. Summers, Mrs. Josephine Helen Campbell, Messenger Boy, Karlo Harvey; WGY Orchestra.

WHAS, Louisville, Ky. (Central, 400), 4:00-5:00 p. m., Walnut Theater Orchestra; Strand Theater Orchestra; Alamo Theater Orchestra; Walnut Theater Orchestra; Phillis, director; Four-minute digest of International Sunday School lesson, Four-minute Radio Farm talk.

WHN, New York, N. Y. (Eastern, 360), 4:00-5:00 p. m., Concert under direction of Jerome H. Remick; 9:30, "Benjamin Franklin," Joseph A. Lawson, 10:00, Len Spencer and Ukulele Ike; 10:30, Vincent Lopez Hotel Statler Orchestra; 11:45, Whitmark program.

WIP, Philadelphia, Pa. (Eastern, 509), 6:05 p. m., Dinner music, Jordan Lee's Dance Orchestra, direction Bob Lewis; 7:00, Uncle Wip's bedtime stories.

WJAZ, Chicago, Ill. (Central, 447.7), 10:30-2:00 a. m., Evelyn Rostigan, soprano; Rudolph Rostigan, violinist, Leonard Fenster, pianist; Orlole Orchestra.

WJZ, New York, N. Y. (Eastern, 455), 5:00 p. m., New York University's 99th Annual Alumni Convocation; 8:15, Margaret Livingston, pianist; 3:30, Katherine Phillips, soprano; 4:00, Memphis Five of Rosemont Inn, Chicago; 4:30, Hotel Commodore Orchestra; 7:00, A Shipboard Story, Florence S. Vincent; 7:30, Irving Seltzer and his Cafe Boulevard Orchestra dance program; 8:00, Dance of the "City Official Series" tales, Honorable Joseph Mayer, Commissioner of the Bureau of Weights and Measures; 8:45, Mr. and Mrs. Herbert Dittler in a piano and violin recital; The Phantom Male Quartette, Alarie Holtman, soprano; 10:20, Ary LaSkore, double voice entertainer.

WLAG, Minneapolis & St. Paul, Minn. (Central, 417), 10:45 a. m., Household hints; 11:35, Surprise program; 2:00 p. m., Dancing lesson, Tres Coeurmant; 2:35, Rotnlug's Leamington Orchestra; Lea Emmel, baritone; 4:20, Short story; 5:30, Children's hour, Tess Cooperman, story-teller; 6:00, Sport hour, "More Dogs," Dr. J. S. Dick, Jr.; 6:15, Osborn's Minneapolis Athlete Club Orchestra; 7:30, Talk, Benjamin Franklin Coffin.

WLW, Cincinnati, Ohio (Central, 309), 4:00 p. m., Adelaide Aufel, pianist; 10:00, "The" a ritadorio in une art, Crosley Radiolinus, Helen Schuster-Martin, Director, Cast: Ben the Cabin Boy, Blueprint Robbe; Steward, Joseph Schreck; Capt. Kreuz, Willard Cruse; Seloom 3rd Mate, Joseph Flick; Mrs. Kreuz, Alice Harris; Joe, Ralph Hamilton; Descriptionist, A. R. Clough; Sea Program of Music from the Cincinnati Conservatory of Music: "Pipe Sea," Hubert Parry, baritone; "Sea Pieces," Hilfred Gabriel, pianist; "An Old Song Resting," Ara Alger,"

7:30, Music Memory Contest, Mrs. Marx E. Oberudorfer; 8:30, WMAQ's Orchestra; 9:15, Bush Conservatory.

WMC, Memphis, Tenn. (Central, 500), 8:30 p. m., Program, Mrs. Arthur Bower, leader; 11:00, Midnight frolic.

WOC, Davenport, Iowa (Central, 484), 12:00 m., Chimes; 3:30 p. m., "Water Purification," C. A. Russell; 5:45, Chimes; 6:30, Sandman's visit; 7:00, "Health, the Nation's Greatest Asset," A. L. Willis; 7:20, International lesson for the next Sunday, Dr. Frank W. Court; 8:00, Mrs. Martin Silberstein, harpist; Edna Viewet, pianist; Sheffield Saxophone Quartette.

WOO, Philadelphia, Pa. (Eastern, 509), 11:00 p. m., Organ recital, Mary E. Vogt; 12:00 m., Wanamaker Crystal Tea Room Orchestra; 4:45 p. m., Organ recital, Mary E. Vogt; 7:30, Hotel Adelphia Concert Orchestra; 8:30, Musical program from Fox Theater, Ernio Rapee, orchestra director; 9:30, Organ recital, Mary E. Vogt; 10:10, Sam Brown Dance Orchestra from Hotel Adelphia.

WOR, Newark, N. J. (Eastern, 405), 6:30-6:45 p. m., Man in the Moon Stories for the Children.

WOS, Jefferson City (Central, 440.9), 7:30 p. m., Evening program of the Missouri State Farmers' Week Session at Columbia.

WWJ, Detroit, Mich. (Eastern, 517), 9:30 a. m., "Tonight's Dinner," Woman's Editor; 12:00 m., Jean Goldkette's Orchestra; 3:00 p. m., Detroit News Orchestra; 8:30, Detroit News Orchestra; Anne Campbell, Detroit News poet; Mathew Sallie, baritone; pianist; 7:30, Claire M. Gillespie, soprano; 8:00, American Chicle Trio & Quartette; 9:00, John V. L. Hogan, engineer; 9:10, Immigration Talk; 9:20, James MacDonald, baritone; 9:40, Winfred T. Barr, pianist; 10:10, Prof. Howard Driggs; 11:00-12:00, Vincent Lopez Orchestra, courtesy Gimbel Bros.

WFAA, Dallas, Texas (Central, 476), 12:30-1:00 p. m., "The Logic of Organization for Labor," William M. Reilly, editor of the Craftsman; 8:30-9:30, Five-minute talk for Safety Council; A. Harris & Company's Orchestra; 11:00-12:00, Evan H. Evans, baritone; Ruth Abernathy, pianist.

WFI, Philadelphia, Pa. (Eastern, 395), 1:00 p. m., Meyer Davis Bellevue Stratford Concert Orchestra; 6:00, Bedtime stories, Cousin Sue; 6:30, Meyer Davis Bellevue Stratford Orchestra.

WGI, Medford Hillside, Mass. (Eastern, 360), 6:30 p. m., Meeting of the "Big Brother Amrad" Club; 7:30, Evening program: New England Business Problems, Arthur R. Curnick; Arthur Murray's course in Ball Room Dancing, lesson 7; Concert, Stram's Orchestra.

WGR, Buffalo, N. Y. (Eastern, 319), 12:30-1:00 p. m., George Albert Bouchard, organist; 4:00, Tea time music, Martha Gomph, harpist; Katherine Stang, violinist; 6:30, Vincent Lopez Hotel Statler Orchestra; 7:30, Digest of the day's news.

WGY, Schenectady, N. Y. (Eastern, 380), 9:30 p. m., Dance music, Jack Symonds' Orchestra.

WHAS, Louisville, Ky. (Central, 400), 4:00-5:00 p. m., Walnut Theater Orchestra; Strand Theater Orchestra; 7:30-9:00, Georgetown Indiana Night, Irma Clip, soloist; the Rev. Warren D. Hall, University Presbyterian Church, Snyder, N. Y., speaker; 4:00-5:00, Robert Munn, organist.

WGY, Schenectady, N. Y. (Eastern, 380), 10:30 a. m., Church services, First Reformed Church, Rev. Clayton Potter, pastor; 3:30 p. m., Program, WGY Symphony Orchestra; Fred Beacox, baritone; 7:30, Church services, First Church of Christ Scientist.

WHAS, Louisville, Ky. (Central, 400), 9:57 a. m., Church service, Trinity Lutheran Church, Rev. Dr. Ira R. Ladd, pastor; Esther Barth, organist; 4:00-5:00, Concert, Mrs. Jane Webster Murrell, director.

WHK, Cleveland, Ohio (Eastern, 283), 8:00 p. m., Concert program by the WHK Trio; Ben Silverberg, violinist; Max Schmidt, cello; Ben Burtt, piano; Vocal solos by Miss Ruth Sponseller, contralto.

WHN, New York, N. Y. (Eastern, 360), 3:00-4:30 p. m., Christian Endeavor program; 5:00, John D. Flynn of the National Security League; 5:15-6:00, WHN Radio Five Orchestra.

WLW, Cincinnati, Ohio (Central, 309), 9:30 a. m., Sunday School Services. Editorial Staff of Sunday School Publications, Methodist Book Concern; 11:00, Services, Church of the Covenant, Rev. Frank Stevenson, minister; 8:00, Reading Road Unitarian Church.

WOC, Davenport, Iowa (Central, 484), 9:00 a. m., Chimes; 1:30 p. m., Orchestra; 7:00, Pipe organ recital; 8:00, Church services; 9:00, Musical program.

WWJ, Detroit, Mich. (Eastern, 517), 11:00 a. m., Services, St. Paul's Episcopal Cathedral; 5:00 p. m., Detroit News Orchestra.

Ohio Convicts Entertain

COLUMBUS, OHIO.—Another program by talent from among the prisoners of the Ohio penitentiary, the first for Radiophans in many months, was given from Station WPAL of the Superior Radio & Telephone Equipment Co. recently.

Radiophone Broadcasting Stations

Corrected Every Week—Part II

CHALLENGE SUPPORTS LIST'S CORRECTNESS

ONE DOLLAR will be paid to every Radiophan reader of Radio Digest submitting the most errors in any one station's listing in the Directory of Radiophone Stations, which appears in four parts, serially continuously, on page 23. Letters must reach Radio Digest's office not later than one week from date of issue corrected. Readers are not limited to correcting one station. Turn in corrections for as many stations as you can find—if you can find errors! Use separate sheet of paper for each station submitted and place name and address on each sheet.

(NOTE.—The second part of the schedule list appears below. The first appeared last week and the third part will appear next week.)

KGN, Portland, Ore. 360 meters. 10 watts. Northwestern Radio Mfg. Co. Irregular schedule.

KGU, Honolulu, Hawaii. 360 meters. 250 watts. Marion A. Mellroy, The Honolulu Advertiser. Daily, 7:30-9 pm. Tues, Thurs, Sat, special program. 150th meridian. (2½ hours later than Pacific.)

KGW, Portland, Ore. 492 meters. 500 watts. Oregonian Pub. Co. Slogan, "KGW, Keep Growing Wiser." Daily ex Sun, 11:30 am, weather; 3:30-4 pm, women's program; 7:30 pm, markets, weather. Daily ex Sat, Sun, 8-9 pm, music, entertainment. Mon, 9:30 pm, community program. Wed, Fri, 9 pm, lecture. Tues, Wed, Thurs, Sat, 10 pm, dance music. Fri, 10:30 pm, Hoot Owls. Sun, 6 pm, church services; 7 pm, organ. Pacific.

KGY, Lacey, Wash. 258 meters. 10 watts. St. Martins College. Slogan, "Out Where the Cedars Meet the Sea." Tues. Fri, Sun, 8:30-9:30 pm. news, concert, lecture, bedtime story. Pacific.

KHJ, Los Angeles, Calif. 395 meters. 500 watts. Los Angeles Times. Daily ex Sun, 12:30-1.15 pm, 2:30-3:30, 6:45-7:30, 8-10. Daily and Sun, Mon, 10-12, dance music. Sun, 10-11 am, 8-10 pm. Pacific.

KHQ, Seattle, Wash. 360 meters. Louis Wasmer.

KIAF, Shattuck, Minn. 421 meters. 500 watts. Steele Co. Program irregular.

KJQ, Stockton, Calif. 360 meters. 5 watts. Gould, The Light Man. Daily ex Sun, 5-6 pm, concert. Mon, Wed, 9-10 pm, concert. Sun, 10-11 am, church services. Pacific.

KJR, Seattle, Wash. 283 meters. 100 watts. Northwest Radio Service Co. Daily ex Sun, 5:30-6.15 pm, reports. Mon, 7:30-8:30 pm, music. Wed, Thurs, 7:30-8:30 pm, concerts, lectures, bedtime stories. Pacific.

KJS, Los Angeles, Calif. 360 meters. Bible Inst. of Los Angeles. Tues, Thurs, 8-9 pm, sacred music, lectures, etc. Sun, 11-12:30 pm, 6-6:45, 8-9, church services. Pacific.

KLN, Del Monte, Calif. 261 meters. Monterey Elec. Shop. Discontinued temporarily.

KLS, Oakland, Calif. 360 meters. 250 watts. Warner Bros. Radio Supply Co. Daily, 11:30-1 pm, Fri, 8-9 pm. Sun, 12-1 pm. Pacific.

KLX, Oakland, Calif. 509 meters. 500 watts. Oakland Tribune. Daily ex Sun, 7 pm, news; 7:30, weather. Tues, Wed, Thurs, Fri, 8 pm, talks, entertainment. Pacific.

KLZ, Denver, Colo. 360 meters. 250-500 watts. Reynolds Radio Co. Daily ex Sun, 7:30-8 pm, uews, markets, bedtime story. Tues, 8:15-9:30 pm. Sun, 9-10:30 pm. Mountain.

KMJ, Fresno, Calif. 273 meters. 50 watts. San Joaquin Lt. & Pr. Corp. Sun, Tues, Fri, 8-9 pm., music. Pacific.

KMO, Tacoma, Wash. 360 meters. 10 watts. Association Station. (Love Electric Co.) Daily ex Sun, Thurs, 6-7 pm, 9:15-10, concert, news, lecture. Pacific.

KNT, Aberdeen, Wash. 263 meters. 250 watts. Grays Harbor Radio Co. Daily ex Sun, 7-8 pm, news, concert. Pacific.

KNV, Los Angeles, Calif. 256 meters. 100 watts. Radio Supply Co.

KNX, Los Angeles, Calif. 360 msters. 100 watts. Elec. Lighting & Supply Co. Mon, 2:30 pm, Wed, Fri, 3:15 pm, concert. Pacific.

KOB, State College, N. M. 360 meters. 500 watts. N. M. Agri. & Mech. Arts. Daily 11:55-12 m, 9:55-10 pm, time, reports. Mon, Wed, Fri, 7:30-8:30 pm, concert. Mountain.

KOP, Detroit, Mich. 286 meters. 500 watts. Detroit Police Dept. Slogan, "Safety First." Daily ex Sun, 1 pm, 6:30, reports, police information, emergency. Tues, 12 midnight, concert. Eastern.

KPO, San Francisco, Calif. 423 meters. 500 watts. Hale Bros., Inc. Daily ex Sun, 12 m, reading. Daily ex Sat, Sun, 1-2 pm, 4:30-5:30 pm, music. Sat, 1-2 pm, 3:30-5:30 pm, music. Mon, Tues, Thurs, 8-11 pm, concert, lectures. Wed, 8-10 pm, Sat, 8-12 midnight, music. Sun, 11-12:15 pm, church services, 8:30-10, music. Pacific.

KQP, Hood River, Ore. 360 meters. 10 watts. Apple City Radio Club. Slogan "The Home of the Hood River Apple." Mon, Wed, Fri, 6:30 pm, music. Wed, 9 pm, special. Pacific.

KQV, Pittsburgh, Pa. 360 meters. 250 watts. Doubleday-Hill Elec. Co. Daily ex Sun, 1-1:30 pm, 5-5:30. Mon, Wed, Fri, 9-10 pm. Eastern.

KQW, San Jose, Calif. 360 meters. 50 watts. Chas. D. Herrold. Daily ex Sun, 1-1:30 pm. Wed, 8-9 pm, concert. Pacific.

KRE, Berkeley, Calif. 275 meters. 50 watts. Daily Gazette. Mon, Wed, 8-10 pm, concert. Pacific.

KSD, St. Louis, Mo. 546 meters. 500 watts. St. Louis Post Dispatch. Daily ex Sun, 9:40 am, 10:40, 11:40, 12:40 pm, 1:40, 2:40, 4, 5. Mon, Tues, Wed, 12 midnight, concert. Fri and Sun, silent nights. Central.

KSL, San Francisco, Calif. 360 meters. 50 mi. The Emporium. Temporarily discontinued.

KSS, Long Beach, Calif. 229 meters. 20 watts. Prest & Dean Radio Elec. Co. Radio Society of Long Beach. No regular schedule.

KTW, Seattle, Wash. 360 meters. 750 watts. First Presbyterian Church. Sun, 11-12:30 pm, 3-4:30, 7-9:30, church service. Pacific.

KUO, San Francisco, Calif. 360 meters. 150 watts. San Francisco Examiner. Slogan, "The Voice of the West." Daily ex Sat, Sun, 9:05-9:20 am, weather, news; 11-11:30, markets; 2:30-2:45 pm, sports; 3, financial bulletin; 6-6:15, sports; 6:10, weather. Thurs, 5:30-5:45 pm, health. Sat, 9:05-9:20 am, weather, news; 2:30-2:45, sport; 6-6:20, sport, news; 6:40, weather. Sun, 9:05 am, 6:40 pm, weather. Pacific.

KUS, Los Angeles, Calif. 360 meters. 100 watts. City Dye Works & Laundry Co. Discontinued temporarily.

KUY, El Monte, Calif. 360 meters. 50 watts. Coast Radio Co. Wed, 4-4:30 pm. Sat, 3-4 pm. Pacific.

KWG, Stockton, Calif. 360 meters. Portable Wireless Telephone Co. Daily ex Sun, 4-5 pm, news, concert, market. Tues and Fri, 8-9 pm, concert. Sun, 2-3 pm, concert. Pacific.

KXD, Modesto, Calif. 252 meters. 10 watts. Modesto Herald Pub. Co. Daily ex Sun, Mon, 6:30-7 pm. Mon, 7-9 pm. Sun 1-2 pm. Pacific.

KYW, Chicago, Ill. 536 meters. 1000 watts. Westinghouse Elec. & Mfg. Co. Daily ex Sun, Sat aft, 9:30 am, 10, 10:30, 11, markets; 10:55, time; 11:05, weather; 11:30, news; 11:35, table talk; 12, 12:30, 1, 1:20, 2:15, 2:30, markets; 3, 3:30, 4, news; 4:15, markets; 4:30, 5, news; 6:30, markets. Daily ex Sun, Mon, 6:50, bedtime story; 8, concert; 9, special. Tues, Thurs, 2:35:3 pm, musical frolic. Wed, Fri, 3:30. Sun, 11 am, 6:45-8:45, church services. Central.

KZM, Oakland, Calif. 360 meters. 100 watts. Western Radio Institute (Hotel Oakland). Daily ex Sun, 6:45-7 pm, news. Pacific.

KZN, Salt Lake City, Utah. 360 meters. 500 watts. Deseret News. Slogan, "Salt Lake City, Utah, The Center of Scenic America." Daily ex Sun, 8-9:30 pm, markets, music, bedtime stories, etc. Mountain.

KZV, Wenatchee, Wash. 360 meters. 50 watts. Wenatchee Battery & Motor Co. Daily ex Sun, 3:30-4:15 pm, weather. Mon, Wed, Fri, 1st to 15th each month, 8:45-9:30 pm; 15th to last each month, 8-8:45 pm, weather. Suu, 1st to 15th each month, 7:30-9 pm; 15th to last each month, 11 am-12:30 pm, church services. Eastern.

NAA, Radio, Va. 435 meters. United States Navy Dept. Daily ex Sun, 9:45-10:40 am, 12:25-12:40 pm, 1:45-2:20, markets, weather; 2:45-8 (Tues. only). Dept. Interior: 3:25-4:40, 5:05-5:20, markets, weather 10:05-10:20, weather. Mon, 6:45-8:20 pm, Dept. programs. Tues, 7:05-8:20 pm, Dept. programs. Wed, 7:25-7:40 pm, Dept. programius; 8:05-9:40, Marine Band. Thurs, 6:45-8:40 pm, Dept. programs. Fri, 8:05-8:40 pm, band concert. Eastern.

OA, Ottawa, Ont., Can. Dept. of Marine & Fisheries. Sat 7.45-10 pm, music, entertainment.

PWX, Havana, Cuba. 400 meters. 500 watts. International Tel. & Teleg. Corp. Wed, Sat, 8:30-11 pm, music. Eastern.

WAAB, New Orleans, La. 268 meters. 100 watts. Waldemar Jensen.

WAAC, New Orleans, La. 360 meters. 400 watts. Tulane Univ. Fri, 7:15-7:30 pm, reports; 8-9:30, educational and entertainment program. Central.

WAAD, Cincinnati, O. 360 meters. 25 watts. Ohio Mechanics Inst. No regular schedule. Central.

WAAF, Chicago, Ill. 286 meters. 200 watts. Chicago Daily Drovers Journal. Daily ex Sun, 8:10 am, 10:30, 10:45, 12:30 pm. Daily ex Sun, Sat, 12:45, 3, 4:30, live stock and weather reports. Central.

WAAK, Milwaukee, Wis. 280 meters. 100 watts. Gimbel Bros. Temporarily discontinued

WAAM, Newark, N. J., 263 meters. 250 watts. I. R. Nelson Co. Daily ex Sun, 9:15-9:45 am, Daily ex Sat 11-11:55 am; Mon, Tues, Wed, Thurs, 8-10:30 pm. music. Eastern.

WAAN, Columbia, Mo. 254 meters. 80 watts. Univ. of Mo.

WAAW, Omaha, Neb. 360 meters. 500 watts. Omaha Grain Exchange. Daily ex Sun 9:35, 10:45, 11:45, 12:45-1:15 pm, 8, market reports. Tues, Thurs, 7:45-9 pm, concert. Central.

WABA, Lake Forest, Ill. 266 meters. 100 watts. Lake Forest University.

WABB, Harrisburg, Pa. 266 meters. 10 watts. Dr. John B. Lawrence.

WABC, Anderson, Ind. 229 meters. 10 watts. Fulwider-Grimes Battery Co. Irregular schedule.

WABD, Dayton, O. 283 meters. 10 watts. Parker High School. Fri, 7-8 pm. Central.

WABE, Washington, D. C. 283 meters. 500 watts. Y. M. C. A. Temporarily discontinued.

WABF, Mt. Vernon, Ill. 234 meters. 100 watts. Mt. Vernon Register-News Co.

WABG, Jacksouville, Fla. 275 meters. 10 watts. Arnold Edwards Piano Co. Daily ex Sun, 4-5 pm, music. Tues, Thurs, Sat, 8-9 pm, music, entertainment. Eastern.

WABH, Sandusky, O. 240 meters. 20 watts. Lake Shore Tire Co.

WABI, Bangor, Me. 240 meters. Bangor Ry. & Elec. Co. No regular schedule.

WABJ, South Bend, Ind. 240 meters. 10 watts. The Radio Laboratories. Tues, Thurs, Sat, 6:30-7:30 pm, music, entertainment. Central.

WABK, Worcester, Mass. 252 meters. 10 watts. First Baptist Church. Sun, 10:30 am-12 m. Eastern.

WABL, Storrs, Conn. 283 meters. 200 watts. Connecticut Agri. College.

WABM, Saginaw, Mich. 254 meters. 100 watts. F. E. Doherty Auto & Radio Equip. Co. Daily ex Sun, 10:15 am, news, markets, weather, stocks; 6, news, stocks, sports, music. Thurs, 8:30 pm, Sat, 10 pm, concert. Eastern.

WABN, La Crosse, Wis. 244 meters. 450 watts. Waldo O. Grover.

WABO, Rochester, N. Y. 252 meters. 10 watts. Lake Avenue Baptist Church.

WABP, Dover, Ohio. 266 meters. 100 watts. Robert F. Weinig.

WABQ, Haverford, Pa. 261 meters. 100 watts. Haverford College Radio Club. Tues. 7:30-9:30 pm. Eastern.

WABR, Toledo, Ohio. 270 meters. 50 watts. Scott High School. Wed, 10:30 am, health talk. Evening programs. Central.

WABS, Newark, N. J. 244 meters. 50 watts. Essex Mfg. Co.

WABT, Washington, Pa. 252 metera. 100 watts. Holliday-Hall, Radio Engineers.

WABU, Camden, N. J. 226 meters. 100 watts. Victor Talking Machine Co.

WABV, Nashville, Tenn. 263 meters. 20 watts. John H. DeWitt, Jr.

WABW, Wooster, Ohio. 234 Meters. 20 watts. The College of Wooster. Dept. of Physics.

WABX, Mt. Clemens, Mich. 270 meters. 150 watts. Henry B. Joy.

WAR, Sisiht, Wis. 406 meters. 500 watts. Kopp Radio Co. Indefinite schedule.

WBAA, W. Lafayette, Ind. 360 meters. 250 watts. Purdue University. Mon, Fri, 7:15 pm. Special programs. Central.

WBAH, Minneapolis, Minn. 417 meters. 500 watts. The Dayton Co. Daily ex Sun, 12:30-1:30 pm, 7-7:30. Mon, Thurs, 9:15-10:45 pm. Central.

WBAK, Harrisburg, Pa. 400 meters. 500 watts. Pennsylvania State Police. Daily ex Sun, 10:30 am, 1:30 pm, 5:45, police reports, fire protection, markets; 12 midnight, police reports. Mon, Tues, Wed, 7:30 pm, special. Easteru.

WBAN, Paterson, N. J. 244 meters. 100 watts. Wireless Phone Corp. Slogan, "The Silk City of America." Daily ex Sun, 9-11:30 am, 12:30-5:30 pm. Sat morn, only. Sun, 10-12 am, 2-5 pm, 7:30-10:30. Eastern.

WBAO, Decatur, Ill. 360 meters. 50 watts. James Millikiu Univ. University activities. No definite schedule. Central.

WBAP, Fort Worth, Tex. 476 meters. 750 watts. Fort Worth Star-Telegram. Club, "Radio Truth League." Daily ex Sun, 10 am, 11, 12 m, 1 pm, 2, 2:20, 3, 4, markets, reports, weather. Mon, Tues, Wed, Thurs, Fri, 7:30-8:30 pm, 9:30-10:45, concert. Sat, 7-7:30 pm, Bible lesson. Sun, 11 am-12:15 pm, church; 4-5 pm, 5-6, concert. Central.

WBAV, Columbus, O. 990 meters. 500 watts. The Erner and Hopkins Co. Slogan, "We Broadcast a Variety." Daily ex Sun, 12:30-1 pm. Mon, Fri, 8-10 pm. Sun, 4-5 pm, organ. Central.

WBAX, Wilkes-Barre, Pa. 360 meters. 20 watts. John H. Stenger, Jr. Three nights of week, irregular.

WBAY, New York, N. Y. 492 meters. 500 watts. A T. & T. Co. Experimental purposes only.

WBBA, Newark, O. 240 meters. 20 watts. Newark Radio Lab. Slogan, "The City in the Valley." Daily ex Sat, Sun, 6:30-7:30 pm, music. Sun, 1:30-4 pm, music. Eastern.

WBBD, Reading, Pa. 234 meters. 50 watts. Barbey Battery Service.

WBL, Anthony, Kans. 261 meters. 100 watts. T & H Radio Co. Mon, Fri, 8-9 pm, concert. Sun, 10 am, Sunday School lecture. Central.

WBR, Butler, Pa. 286 meters. 250 watts. Pa. State Police.

WBS, Newark, N. J. 360 meters. 10 watts. D. W. May, Inc. Daily ex Sun, 11-12 m, music; 1-2:15 pm, reports, music. Tues, Thurs, Fri, 7:30-9:30 pm, program. Eastern.

WBT, Charlotte, N. C. 360 meters. 500 watts. Southern Radio Corp. Slogan, "Queen City of the South." Daily ex Sun, 11 am, 7:30 pm, weather, markets; 12 m, 5 pm, music. Tues, 8:30 pm, music. Fri, 11 pm, entertainment. Sun, 8 pm, church services. Eastern.

WBZ, Springfield, Mass. 337 meters. 1000 watts. Westinghouse Elec. & Mfg. Co. Daily ex Sun, 7 pm, lectures; 7:30, children's hour; 7:45, markets, weather, lecture. Mon, Tues, Thurs, Sat, 8-9 pm, concert. Mon, Wed, Fri, 6-7 pm, concert. Wed, Fri, 11-12 midnight, concert. Sun, 11 am, church service; 6:45, chime vespers; 8:30, church service. Eastern.

WCAC, Fort Smith, Ark. 360 meters. 20 watts. John Fink Jewelry Co. Tests only.

WCAD, Canton, N. Y. 280 meters. 250 watts. St. Lawrence Univ. Daily, 11 am, weather, reports, time. Fri. 8 pm, program. Eastern.

WCAE, Pittsburgh, Pa. 462 meters. 500 watts. Kaufman & Baer Co., Pittsburgh Press. Daily ex Sun, 12:30 pm, news; 3:30, news, music; 4:30, reports, entertainment; 6:30, music; 7:30, news; 8:30, music. Sat 2 pm, sermon; 4:30 pm, Eastern.

WCAG, New Orleans, La. 268 meters. 50 watts. Clyde R. Randall. Mon, Thurs, 8-9 pm, concert. Central.

WCAH, Columbus, O. 286 meters. 100 watts. Entrekin Elec. Co. Slogan, "The Heart of Ohio." Daily ex Sun, 11:30-12:30 am, music, news. Tues, 7:30-9:30 pm, 11:30-1:20 am, concert, Columbus Philharmonic Society. Sun, 1:30 am, concert; 10-12:30, church service. Central.

WCAJ, Univ. Place, Nebr. 360 meters. 500 watts. Nebr. Wesleyan Univ. Daily, 10:30 am, weather. Tues, 7 pm, Children's Hour. Thurs, 7:30 pm, music, lectures. Central.

WCAK, Houston, Tex. 360 meters. 50 watts. Alfred P. Daniel. Slogan, "Where Eighteen Railroads Meet the Sea." Wed, 8-10 pm, novelty program. Sun, 3-5, feature program. Central.

WCAL, Northfield, Minn. 360 meters. 500 watts. Dept. of Physics, St. Olaf College. Slogan, "The College on the Hill." Daily ex Sun, Mon, 9:45 am, chapel. Thurs, 9 pm, music. Fri, 8:30 pm, talk, Sat, 12 midnight, music. Sun, 11 am, church services; 9:30 pm, sermon, music. Central.

WCAM, Villanova, Pa. 360 meters. 150 watts. Villanova College.

WCAO, Baltimore, Md. 360 meters. 50 watts. Sanders & Stayman Co. Daily ex Sun, 12-1 pm. Mon, Wed, 8-9 pm. Eastern.

WCAP, Washington, D. C. 469 meters. 500 watts. Chesapeake & Potomac Tel. Co. Tues, Sat, 7:30 pm, Sun, 7:20 pm, broadcast jointly with WEAF. Thurs, 7:15-9:45 pm, concert; 10-12, dance music. Sat, 10-12 pm, dance music. Sun, 11 am, church services; 4 pm, 9-10, organ.

WCAR, San Antonio, Tex. 360 meters. 150 watts. Southern Radio Elec. Co., Inc. and Alamo Radio Elec. Co. Mon, Thurs, Sat, 8:30-9:30 pm, concert. Central.

WCAS, Minneapolis, Minn. 246 meters. 100 watts. Wm. H. Dunwoody Industrial Inst. Slogan "From the Flour City of the World." Mon, 7-7:30 pm, technical program. Tues, 8:15-9:30 pm, or 9:30-10:45, on alternate weeks, music, lectures. Wed, 6:30-7 pm, radio problems. Thurs, 7-7:30 pm, code, radio problems. Central.

WCAT, Rapid City, S. D. 240 meters. 50 watts. S. D. State School of Mines. Daily ex Sun, 9:30 am, 12:30 pm, weather, reports. Thurs, 7:15 pm, concert. Mountain.

WCAU, Philadelphia, Pa. 286 meters. 100 watts. Durham & Co. Daily 11:45 am. Tues, Fri, 7:30-8 pm, concert. Sun, 10:55 am, church services. Eastern.

WCAV, Little Rock, Ark. 360 meters. 20 watts. J. C. Dice Elec. Co. Tues, 8:30 pm.

WCAY, Milwaukee, Wis. 261 meters. 250 watts. Kesselman-O'Driscoll Music House. Daily ex Sun, 11 am, reports. Mon, Tues, Thur, Fri, 7:30-8:30 pm, music. Tues, 10:30-11:30 pm, dance music. Sun, 7:30-9 pm, church services. Central.

WCAZ, Carthage, Ill. 246 meters. 50 watts. Carthage College. Wed, 9-10 pm, music. Athletics as scheduled. Central.

WCBA, Allentown, Pa. 280 meters. 10 watts. Chas. W. Heimbach. Wed, 7:30-9:45 pm. Sat, Sun, 2-4 pm, 6-8. Eastern.

WCBD, Zion, Ill. 345 meters. 500 watts. Wilbur Glenn Voliva. Slogan, "Where God Rules, Man Prospers." Mon, Fri, 8-10 pm, concert. Wed, Fri, 2:30-3:45 pm, service. Sun, 9-10:45 am, Bible School; 2:30-5:30 pm, church services. Central.

WCE, Minneapolis, Minn. 360 meters. 250 watts. Findley Elec. Co.

WCK, St. Louis, Mo. 360 meters. 100 watts. Stix, Baer & Fuller. Daily, 12-12:30 pm, 3-4:15, 5-5:30. Mon, Wed, Fri, 6:45-8 pm, concert, lecture. Central.

WCM, Austin, Tex. 360 meters. 500 watts. Univ. of Tex.

WCX, Detroit, Mich. 517 meters. 500 watts. The Detroit Free Press. Slogan, "The Call of the Motor City." Club, "Red Apple Club." Daily ex Sun, 2 pm, news; 2:15, stock reports; 2:50, weather, markets; 4:15, 6, music. Daily ex Sat, Sun, 8:30-10 pm, week starting Dec. 11 and alternate weeks thereafter, concert. Tues, 10-12 pm, Club. Sun, 10:30 am, 7:15 pm, church services. Eastern.

WDAE, Tampa, Fla. 360 meters. 250 watts. Tampa Daily Times.

WDAF, Kansas City, Mo. 411 meters. 500 watts. Kansas City Star. Club, "Nighthawks." Daily ex Sun, 3:30-4:30 pm, music; 6-7, educational, bedtime story, etc.; 11:45 pm-1 am, Nighthawk Frolic. Mon, Wed, Fri, 8-10 pm, concert. Sun, 4-5 pm, music. Central.

WOAG, Amarillo, Tex. 263 meters. 100 watts. J. Laurence Martin. Tues, Thurs, 8-9:30 pm, music. Central.

WDAH, El Paso, Tex. 268 meters. 100 watts. Trinity Methodist Church South. Wed, Thurs, Sun, 7:30-8:30 pm. Sun, 11 am. Mountain.

WOAK, Hartford, Conn. 261 meters. 100 watts. The Courant. Sat, 8 pm, concert. Eastern.

WDAL, Jacksonville, Fla. 360 meters. 100 watts. Florida Times Union. Daily, 11 am, weather; 4-5, 6-7 pm, music; 8-9, entertainment; 9:30, reports. Sat. 12-1 am, "The Midnight Aggravators." Eastern.

WDAO, Dallas, Tex. 360 meters. 50 watts. Automotive Elec. Co. Daily, 1-1:45 pm, 7:15-8. Central.

WOAP, Chicago, Ill. 360 meters. 500 watts. Chicago Board of Trade. Drake Hotel. Daily ex Sun, every half hour from 9:30 am to 1:30 pm, quotations, reports; 6 pm, news. Daily ex Sun, Mon, 1:35, 7-8 pm, dance music; 10, concert. Sun, 9:15, concert. Central.

WDAR, Philadelphia, Pa. 395 meters. 500 watts. Lit Bros. Club, "Morning Glory." Daily ex Sun, 12-12:55 pm, music; 2-3 pm, 4:30-6, music, talks; 7:30-8 pm, Dream Daddy. Mon, 7:30-10:55, Wed, 8-11 pm, entertainment. Fri, 8-10:50, entertainment; 1 am, Club. Eastern.

WDAS, Worcester, Mass. 360 meters. 5 watts. Samuel A. Waite.

WDAU, New Bedford, Mass. 360 meters. 100 watts. A. H. Smith. Mon, Wed, Fri, 12:15-12:50 pm, industrial reports; 7:45-10 pm, music. Sun, 11 am-12:30 pm, 7-8 pm, church services. Eastern.

WDAY, Fargo, N. D. 244 meters. 50 watts. Radio Equip. Corp. Slogan, "The Biggest Little City in the World." Daily ex Sun, 9:30 am, weather. Tues, Thurs, Sat, 8-9 pm, concert. Sun, 10:30 am, church services. Central.

WOBC, Lancaster, Pa. 258 meters. 50 watts. Kirk Johnson & Co., Inc. Mon, Tues, Thurs, 8 pm. Eastern.

WDM, Washington, D. C. 360 meters. 50 watts. Church of the Covenant. Sun, 11 am, church service; 8 pm, church service. Eastern.

WDP, New York City, N. Y. 405 meters. Ship Owners Radio Service & Premier Grand Piano. Discontinued temporarily.

WDZ, Tuscola, Ill. 278 meters. 10 watts. James L. Rush. Daily ex Sun, 9:30 am, 10, 10:30, 11, 11:30, 12 m, 12:30 pm, 1, 1:15, Chicago Board of Trade quotations. Central.

WEAA, Flint, Mich. 280 meters. 100 watts. Frank D. Fallain. Slogan, "The Vehicle City." Daily ex Sun, 7:15 pm, police broadcasts, music. Eastern.

WEAE, Blacksburg, Va. 360 meters. Polytechnic Inst.

WEAF, New York City, N. Y. 492 meters. 500 watts. A. T. & T. Co. Slogau, "The Voice to the Millions." Mon, 4-5:30 pm. Tues, Wed, Thurs, Fri, 11-12 am, 4-5:30 pm. Mon, Tues, Wed, Fri, 7:30-10. Thurs, 7-12 pm. Sat, 4-5:30 pm, 7:30-11. Sun, 2:45-5:30 pm, 7:20-10. Eastern.

WEAH, Wichita, Kan. 244 meters. 50 watts. Wichita Board of Trade and Board of Commerce. Daily ex Sun, 9:35 am, 10, 11, 12 m, 1 pm, 2, market reports. Tues, Fri, 8-9 pm, music. Daily ex Sun, 6-6:15 pm, news; 6:15-6:30, bedtime stories; 6:30-7, music. Central.

WEAI, Ithaca, N. Y. 286 meters. 500 watts. Cornell Univ. Irregular.

WEAJ, Vermilion, S. D. 283 meters. 200 watts. Univ. of S. D. Irregular.

WEAM, North Plainfield, N. J. 252 meters. Borough of N. Plainfield. No definite schedule.

WEAN, Providence, R. I. 273 meters. 100 watts. The Sheppard Stores. Daily ex Sun, 12-1, 4-5, music, reports, weather, concerts. Mon, Wed, 6-7 pm. Tues. Thurs, 8:15-10, concert. Sat, 9-11 pm, dance music. Sun, 10:45-11:30 am, 7:30-8:45 pm, church service. Eastern.

WEAO, Columbus, O. 360 meters. 500 watts. Ohio State Univ. Daily ex Sun, 1:30 pm. Wed, Fri, 4 pm, lectures. Thurs, 8-10 pm, lecture, concert. Central.

WEAP, Mobile, Ala. 360 meters. 150 watts. Mobile Radio Co. Daily ex Sun, 4-5 pm, music. Daily ex Sun, Mon, 7:45-8:45 pm, music. Sun, 3:30 pm. First Mon each month, 11-12 midnight. Central.

WEAR, Baltimore, Md. 360 meters. 50 watts. News & American Pub. Co. Tues, Thurs, Fri, 7-10 pm, music, weather, sports. Eastern.

WEAU, Sioux City, Ia. 360 meters. 100 watts. Davidson Bros. Co. Slogan, "The Heart of the Corn Belt." Daily ex Sun, 10 am, 11, 12:30-1 pm, 2, 5, 6-7. Mon, Wed, Fri, 8-9 pm, concert. Sun, 7-9 pm, church services. Central.

WEAY, Houston, Tex. 360 meters. 1000 watts. Will Horwitz (Iris Theater.) Slogan, "Where All the Oceans Meet All the Railroads." Daily ex Sun, 11 am, dinner hints, news; 12 m, music; 12:57-1 pm, time; 2:30 pm, music; 6 pm, news. Fri, Sat, 8-10 pm, concert. Sun, 11 am, 8 pm, church services; 9 pm, concert. Central.

WEB, St. Louis, Mo. 360 meters. 500 watts. The Benwood Co., Inc. Tues, 9-10:30 pm. Wed, 8-9:30 pm. Sat, 7:30-9 pm, 11 pm-1 am. Central.

WEV, Houston, Tex. 360 meters. 100 watts. Hurlburt-Still Elec. Co. Daily ex Sun, 10 am, 5:30 pm, weather, roads, Tues, Thur, 8 pm, concert. Central.

WEW, St. Louis, Mo. 261 meters. 100 watts. St. Louis Univ. Daily ex Sun, 9 am, 10, 2, 5 pm, reports. Central.

WFAA, Dallas, Tex. 476 meters. 500 watts. Dallas News and Dallas Journal. Slogan, "Working For All Alike." Daily, 10:20 am, reports; 12:30-1 pm, address; 2:30-3:30, reports, news; 5:30, bedtime story; 6:45-7, sports, news; 8:20-9:30, concert, weather (silent Wed). Tues, Sat, 11-12 pm, music. Sun, 6-7 pm, Bible class; 9:30-11 pm, music. Central.

WFAB, Syracuse, N. Y. 234 meters. 100 watts. C. F. Woese. Daily ex Sun, 8:30 pm. Wed, 8:30-11 pm. Sun, 9:30-10 pm, Service; 10-11, orchestra. Eastern.

WFAF, Poughkeepsie, N. Y. 273 meters. 20 watts. H. C. Spratly Radio Co. Temporarily discontinued.

WFAH, Fort Arthur, Tex. 236 meters. 150 watts. Elec. Supply Co. Mon, Wed, Sat, 9-10 pm. Central.

WFAJ, Asheville, N. C. 250 mi. Hi-Grade Wireless Instrument Co. Temporarily discontinued.

WFAM, St. Cloud, Minn. 360 meters. 20 watts. St. Cloud Daily Times. Daily ex Sun, 3:30-4 pm, markets. Mon, Wed, 7:30-9 pm, entertainment. Central.

WFAN, Hutchinson, Minn. 360 meters. 100 watts. Hutchinson Elec. Service Co. Slogan, "Gateway to the Ten Thousand Lakes of Minn." Daily, 11:55 am-12:30 pm, program, news, time, weather. Tues, 8-10 pm, program. Special hours. Central.

WFAQ, Cameron, Mo. 360 meters. 10 watts. Missouri Wesleyan College.

WFAT, Sioux Falls, S. D. 258 meters. 50 watts. The New Columbus College.

WFAV, Lincoln, Neb. 275 meters. 500 watts. Univ. of Nebr. Slogan, "The Home of the Cornhuskers. Daily ex Sun, 10 am, 12:40 pm, weather, news, road reports, Wed, 8:30 pm, concert.

WFI, Philadelphia, Pa. 395 meters. 500 watts. Strawbridge & Clothier. Daily ex Sun, 10:15 am, reports; 1 pm, orchestra; 1:50, reports; 3-4:30, concert; 6-6:30, children's hour. Tues, Thurs, Sat, 8 pm, concert. Sun, 10:30 am, 7:30 pm, church services; 4:30, chapel service. Eastern.

WGAF, Tulsa, Okla. 360 meters. Goller Radio Service.

WGAL, Lancaster, Pa. 248 meters. 10 watts. Lancaster Elec. Supply & Construction Co. Slogan, "Garden Spot of U. S. A." Mon, Wed, Fri, 7:30-9 pm, concert, lecture. Sun, 3-3:30 pm, church service. Eastern.

WGAN, Pensacola, Fla. 360 meters. 50 watts. Cecil E. Lloyd.

WGAQ, Shreveport, La. 260 meters. 150 watts. Glenwood Radio Corp. Daily ex Sun, 12:30-1:30 pm, 6:30, 7:30, music. Sun, 11 am, 7:30 pm, church service. Central.

WGAW, Altoona, Pa. 261 meters. 100 watts. Ernest C Albright. Slogan, "The home of the world's largest railroad shops." Wed, 9 pm. Sun, 10:45 am; 7:30 pm. Eastern.

WGAY, Madison, Wis. 360 meters. 100 watts. North Western Radio Co. Daily ex Sun, 10 am, weather; 4:30, news. Mon, Thurs, 8:30 pm, concert. Sun, 3 pm, music. Central.

WGAZ, South Bend, Ind. 360 meters. 50 watts. South Bend Tribune. Daily ex Sun, music. Mon, Wed, Fri, 7-8 pm, concert. Central.

WGI, Medford Hillside, Mass. 360 meters. 500 watts. Am Radio & Research Corp. Slogan, "Amrad, the Voice of the Air." Daily ex Sat, Sun, 12 m-1 pm, concert. Tues, Thurs, 7-8:30 concert. Wed, Fri, Sat, 7:30-9:00, concert. Daily, 5:30-6:45 pm. Children's Hour, reports, codes, Tues, Fri, 3 pm, Amrad Women's Club. Sun, 4-5 pm, 8:30, church services; 10, concert. Eastern.

WGL, Philadelphia, Pa. 360 meters. 500 watts. Thos. F. J. Howlett. Irregular schedule.

WGR, Buffalo, N. Y. 319 meters. 750 watts. Federal Tel. & Teg. Co. Slogan, "Key City of Industry." Daily, 10:45 am, weather; 12 m, reports; 12:30, organ music. Daily ex Sat, Sun, 12:30 pm, 2:30, 3:30, 4. Daily ex Sun, 6:30, music; 7:30, news. Mon, Wed, Fri, 9-11 pm, concert. Fri, 8:45, road reports. Sun, 3 pm, vesper services; 4, organ. Eastern.

WGV, New Orleans, La. 350 meters. 100 watts. Interstate Elec. Co. Slogan, "Where the Mighty Mississippi Makes a Crescent Near the Gulf."

WGY, Schenectady, N. Y. 380 meters. 1000 watts. General Elec. Co. Daily ex Sun, 12:30-1 pm, 6, reports, time, sports. Mon, Tues, Thur, Fri, 2-2:30 pm, 7:45, concert. Fri, 10:30 pm, special. Sun, 10:30 am, 7:30 pm, church service; 8:30 pm, Symphony Orchestra. Eastern.

WHA, Madison, Wis. 360 meters. 1,000 watts. Univ. of Wis. Mon, Wed, Fri, 7:30 pm, lectures, news, agriograms. Central.

WHAA, Iowa City, Ia. 263 meters. 100 watts. Univ. of Iowa. No regular schedule.

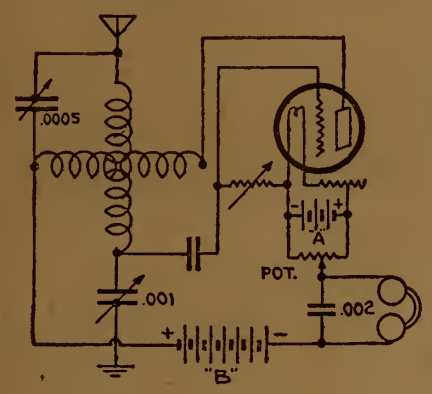
WHAB, Galveston, Tex. 360 meters. 200 watts. Clark W. Thompson Co. Slogan, "The Gateway to the Southwest and Tre

Miloplex X Percolates Even with a Modification

Part XVI—A Split Variometer for Xmas King

By the Mystery Man

TWO weeks ago, I published the log of the King X—some log! Then, instead of keeping many of my good friends in suspense, ran the circuit last week; yet, it seems to me, altogether too many are wondering why I didn't make it another variometer trick (yes, split) as split variometers seem to be quite popular. Well, man, you just can't use a split variometer for everything—you know all brunettes and no blondes makes Jack a dull boy (you know what I mean). The only way to eat beans hain't been decided yet and, methinks, there is yet lacking a decision as to whether one should imitate



a radiator when eating bean "zoop," so why so fussy about split variometers? I'll bring them back very shortly. Keep on insisting and I'll give you a split trick every week because I should worry about a couple of circuits among friends. The A. R. R. L. boys in Kansas City now know that.

A Split-Variometer Circuit

But I am going to give you today a split variometer circuit that is really a joy to play with and incidentally introduce to you W. A. Tripp, Rokeby, Sask., Canada. Rokeby, you know, is so far north they don't give a cuss what time it is. It takes six days for a telegram to reach there and mail, well, methinks they deliver mail only when someone's going up that way. But it's Rokeby, my test station, in charge of a young Tripp. Tripp is a real test station boy I'm saying, and if some of you fellows who build this circuit can't get out of town witn it, blame yourself, because my last letter from Tripp says he has now tripped right across most of Canada also the U. S. A. and brought in Havana, Cuba, which is far enough for a single tube circuit selling for a dime.

Ninety stations from December 3rd to 16th is a dime's worth, or I might as well start scribbling for a Chineso Radio journal. You know, Geo never let a few chunks of ice stop him in crossing the Delaware; Barbara Frietchie broadcast her private opinion to that gang who lost their tea in Boston Harbor and Paul Revere showed some speed (he had a horse) when some dude gave him the high sign with a lantern; so, why should I—Maggie's star boarder—hesitate over a roomer. The circuit do work or Tripp wouldn't drive miles into town to mail me a star report.

Features of Circuit

Look it over—nothing startling—just a fine hard piece of efficiency with both inductive and capacitive feedbacks, and yes, two changes for regeneration. A nickel apiece as it were—this must be bargain week.

Tripp made his record using a 1½-volt peanut tube though a 201-A with 80 to 90 volts on the plate would be the "cat's meow" for it. Still suit yourself; you'll like it.

Another Hook-Up Coming

No, I haven't forgotten. My birthday is the Nth of March, and on that date I'm going to invite a very fine gentleman Radio wizard over to my second floor rear and let him hear my modification of his circuit which created a sensation last year—you know that .006 baby. If he likes it, into Digest it goes; and anyone can make it work. If he don't like it after due and timely listening, then it goes in anyway with his name and mine tied onto it. Well, maybe not my whole name, but the first letter anyway.

But he is going to like it, because it's "Maggie's special," that she demonstrates when company comes. She's some dial spinner demonstrator besides being a darned good cook. You know, when Maggie and Howler decide to have an evening of Radio Golf, Howler howls at every whistle and she whistles at every howl, and I can always tell by the harmony existing when they heterodyne, whether it's a weather report, the menu for Sunday or my good friend "The Red Headed Music Maker" that they are whistling in.

Maggie times roulette fashion; spins a dial, then bets on high or low—sort of a confidence game—all confident that she'll get at least a whistle. And when I suggest that she may be using too much inductance or capacity, her retort always is "Be yourself, capacity and patience are much, very much more important." Funny the intultion—oh, these wimmin! Let's eat.

(TO BE CONTINUED.)

(Actual Size)

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3 ERLA Sockets
1 ERLA Fixed Crystal
1 ERLA .001 Condenser
1 ERLA .002 Condenser
1 ERLA .00025 Condenser
1—180° Coupler, 14 Contact Points, 4 Switch stops, 2 Switch levers, 1 7x18 Panel DRILLED, 3 Dials, 2 30 ohm Rheostats, 1 11 plate Rathbun Variable Condenser, 1 23 plate Rathbun Condenser, 2 Jacks, 6 Binding Posts, 1 Toggle switch.
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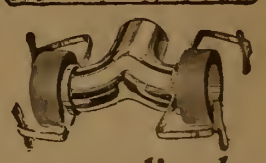

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Radio Digest Illustrated

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Laws Needed

Air Traffic Problems Like Street Traffic

CONTROLLING Radio traffic is something like handling vehicle traffic in a busy city where regulations exist and are observed by all.

Amateur Radio operators and the broadcasters, it appears, have "laid off" each other as far as interference is concerned, but both are now complaining of ship interference, Supervisors of the Department of Commerce point out.

Ship operators report and supervisors agree, that the wave lengths assigned to vessels are not all they should be. The 300-meter wave is not efficient; the 600-meter wave, used for calling and for distress signals, is always in use, and the 706-meter wave can't possibly serve all the vessels operating. So far as is known, it is understood that many foreign ships are not yet equipped to use 706 meters, which throws them on the 450 or 600-meter waves. Consequently the ships have to resort to the 450-meter wave assigned them, which is right in the middle of the broadcasting wave band. They are practically forced to use this wave length for their position reports transmitted between 7:00 and 11:00 p. m. daily.

In an effort to alleviate the interference, the Department of Commerce has asked supervisors to take up the question with owners and operators. They are asked to transmit their position reports before 7:00 and after 11:00 p. m., which, it is believed, would relieve about twenty-five percent of the existing interference off the coasts in the neighborhood of broadcasting stations.

Commenting on the interference situation recently, an official of the Department of Commerce said that the control of Radio traffic was very similar to heavy automobile traffic in the street; regulations have to be laid down aud enforced in the air as well as on the public roads.

Automobiles have no special privileges as to right of way or speed. In other words, there is no class distinction shown. Regulations provide a speed, the right side of the road, stops at crossings, etc., for trucks, private, public and commercial cars. So the department is trying to regulate the Radio traffic in the air in the same way, and broadcasters, amateurs, commercial shore and ship stations must comply with traffic regulations, keeping in the channels assigned them. Through co-operation alone can the great air traffic be managed successfully.

Listeners-in who complain of interference waste their time, the time of the department and its field force by complaining of interference in general; they must be specific, if aid is to be rendered, it was explained. Unless the call letters, or name of the offender, the time of interference and the nature of the matter sent is given to the department, it is necessary to send a special investigator to the locality, where he has to listen in for several days to find out who is causing the trouble. This entails a great amount of time aud expense; and the field force is small and inadequate to the demands.

Owners of receiving sets who think they hear interference in the silent amateur period, must ascertain if it is an amateur or a ship, for example, and if they cannot read code, they should find an amateur neighbor who can, asking him to listen in and record what is being transmitted. His report can then be forwarded to the district supervisor or the department. Such complaints would aid the department materially. Literally hundreds of valueless complaints are received to one reliable and accurate report of interference. Sometimes receiving sets are supersensitive, it is pointed out, and the interference may not actually be in the air.

It requires a good deal of plugging at times to get the public stirred up to the point of actually doing something in their own behalf. Much has been said on the subject of a monopoly in tubes. Those who buy them think the price far higher than it could be and still insure a fair profit to the manufacturer. You have been reading in this paper of the fine time the city of New York has had shopping around for a broadcasting equipment—and the reasons for making it such a difficult task. Monopoly again! Get busy and prod your congressmen into action. Don't let Radio be hamstruug in its infancy by a single group.

RADIO INDI-GEST

That's How I Need You

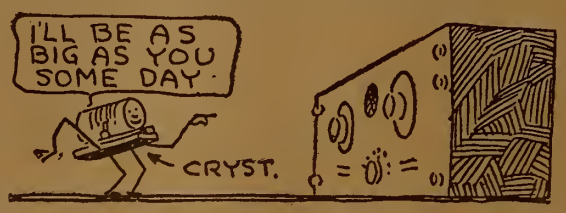
Like a shoestring loves to dangle, like a monkey loves a flea,
Like a rabbit loves to ramble, like a squirrel needs a tree,
Like a girl loves paint and powder, like an Irishman loves stew,
Like a Radio needs batteries, that's how I need you.

Like a Rabbi loves his whiskers, like a drunkard loves a jag,
Like Hungarians love goulash, like Frenchmen love their flag,
Like a sofa craves a lover, and detectives need a clue,
Like an old shirt needs a button, that's how I need you.

Like a Zulu needs a nightshirt, like a newsboy loves his pie,
Like a feather loves to tickle, like a sparrow loves to fly,
Like the Chinese love chop suey, like a moo cow loves to moo,
Like a rooster loves his chickens, dear, that's how I need you.

Like a crystal set needs switch points, like it needs a knob and dial,
Like it grows to be a tube set, in just a little while,
Like you love to sit and listen, when there's nothing else to do,
To the music on the Radio, that's how I need you.

BURT B. BARSOOK.



How Did the Police Solve the Mystery?

Dear Indi: The fellow in Waukegan who mistook his loud speaker for a burgler, emptied his six-shooter on it, then yelled lustily for the police who upon arrival found nothing but the shattered horn, reminds us of the accepted (?) theory as to how Venus de Milo lost her arms:

She was going through her lesser half's pockets and hubby woke up. Result? See Art Gallerics! MAMA HAYMES.

Almost Opera, Almost but—

Pop put the last bit of solder on his Woolwealth assembly, gave it a frantic turn—and immediately heard the dim strains of far away music intermingled with words of some foreign tongue. Imperative commands kept the family quiet —until the hurdy-gurdy and its Italian cranker moved on!
FEDERAL FUN.

Medbury Says—About Radio

(Clipped without permission from John P. Medbury's Column.)

We've had our income tax fibbers, golf prevaricators and now we've got Radio liars. A Radio liar is a man who'll tell you he knows he got Cuba last night because he could smell the liquor over there.

He doesn't realize that it's a wonderful feat to be able to sniff with his ears.

As far as the prohibition office knows, the bootleggers haven't got any broadcasting stations.

They haven't any use for ether except putting it into their beer.

It wouldn't be very appropriate to follow up a children's bedtime story with a wine list.

A man who owns a Radio outfit will tell you anything. He hasn't any more regard for the truth than your wife's lawyer.

A New York Radio bug will swear that he heard from San Francisco, but he doesn't tell you it was by letter.

A Prayer to the Announcers

I sit at my Radio, night after night,
As the programs come in from afar:
I listen to travelogue, lecture or fight,
Or the voice af some grand op'ra star.
And then, between numbers, a voice "takes the air—"
The announcer is now on the line—
"A wire from J. F. Gazooks, of Eau Claire:
"'Your concert is coming in fine!'"

Oh, whether they live in Chicago or Troy,
Or Kalamazoo or Oak Park,
The list'ners who wire unfailingly use
That tiresome bromide remark.
And whether it's opera or lecture or fight,
Or jazz or a singer divine,
Their only expression is, night after night:
"Your concert is coming in fine!"

Oh, fans of the dial and the knob and the tube,
Oh, bugs who turn night into day,
When you wire applause ta a station, please find
Something new, something different to say!
And oh, ye announcers, take pity on those
Who listen each night on your line,
And spare them the forty-third reading of this:
"Your
concert
is
coming
in
F-I-N-E!"

W. S. HAMBURGER.

Were the Words You Heard in Webster's?

Dear Indi: Bill Shakespeare once wrote, "Thou wilt not trust the air with secrets." But of course Bill didn't have a Radio set. I am referring to the "behind the mike" side talk, not intended for the invisible audience, but nevertheless heard by it. FIDDLE D. DIAL.

We're Sorry. We'll Run This Instead

Dear Indi: Funny boy you are. Ask me to write you and I don't see my contrib in print. Wassameaning of it?
MIKE ROFARADS.

Condensed

By DIELECTRIC

Both the editor of Radio Digest and I are agreed that more of you listeners in to broadcast concerts should learn the code, so that you may be specific in meutioning interference from commercial stations. While the wonderful playing of Moritz Rosenthal, one of the world's greatest pianists, was broadcast from station WJZ recently, a large part of the concert was blotted out by lengthy code transmission. That was not an evening performance; however, it shows how desirable a change in wave length for all code messages would be. Now, just to whet your appetite for mastering code, let me recall to you the experience of Miss Orcutt. She understands the meaning of the dit-dahs and because of that fact was able to read a message sent from the Bowdoin, the ship carrying the Macmillan party to the North Pole. Not everyone is able to pick up the ship, but you might try. It's fascinating.

Come on, you broadcast record-breakers, and do your worst, for WOR has set the pace. Quite a few of our American stations have had little difficulty in making their broadcasting heard in several of the European countries, in fact, it has become so normal a thing as to attract but very little attention. The Bamberger station set out to do what no other station had attemped: to span this continent and the Pacific ocean, as well, with music and the human voice. Paul Whiteman's renowned orchestra furnished the music on the last morning of the test and was heard in Japan!

I ventured to pass on the prediction of Senator Marconi that before a great while crystal set owners would be listening to concerts from England. No such stunt has been recorded as yet, although one of considerable interest was reported recently in which these simple sets played a leading part. KDKA broadcast a program of organ and piano music, also a lecture to Boy Scouts and the North Downs receiving station in Great Britain received it distinctly. Immediately it was relayed to all the broadcasting stations in the British Isles with the interesting result that hundreds of owners of crystal sets reported that they heard it clearly.

The great Radio combine in this country, which has been several paces in advance of most of its competitors, has acquired another large holding. After some time and effort to straighten out the tangle existing in China, owing to interests in the United States and Japan jockeying for position, sites for Radio stations were at last secured by the Federal Telegraph Company of California. Recently a new company was formed to include the Radio Corporation of America, known as the Federal Telegraph Company of Delaware. Contracting for the rights and titles in this iumeuse operation iuvolved a sum of $13,000,000. China has never been notably fortunate iu puttiug through progressive measures, but in this case she no doubt will benefit greatly from outside capital taking the bit in its mouth and pushing Radio to a foremost place.

In tuning in some of the broadcasting stations you may have found that the wave length varied at times. It is permissible to step up or down a few meters, but in such case one never knows the exact wave length to which he is tuned. The Bureau of Standards advised all listeners and broadcasting stations of its intention to transmit on certain nights specified wave lengths so that calibration might be done. A great many took advantage of this service to fiud on their dials the proper settings for various frequencies. More recently the bureau has designated as calibrating stations WLAG, the Twin City Radio central, to be its "central" calibratiug station, and KDKA to act in the same capacity for the eastern section of the country. Note this.

Question Is "How Good Is Good Reception?"

Better Quality Cannot Be Taken Out Than Is Broadcast

By E. T. Flewelling

WE HAVE received so many comments, statements, opinions, criticisms, etc., concerning Radio reception and the abillty of various receiving sets that it seems as though a few thoughts and experiences concerning this point may be of interest, and perhaps a little value, to the many newcomers who do not really know what they may expect from the Radio receiver they build or buy. It has been necessary to write so many letters on this subject that no doubt it had best be handled in the form of a few lines in the Radio Digest.

Simplest Form of Set

Let us take the simplest and perhaps most popular form of Radio receiving circuit and see what we may expect from it. Consider first the single circuit, plain regenerative receiver. This receiver works best when it is constructed in as simple a manner as possible, using as few wires as can be, short direct connections, as large inductance as possible with as small a tuning condenser as can be used. Such a circuit has received up to 3,000 miles, but perhaps best up to 200 or 300 miles, at which distance quite reliable receptlon ls possible. It is not the most selective form of circuit, but can be made quite selective by proper balancing of the tuning lnductance, tuning condenser, amount of regeneration used and the aerial with whlch it is used, a short, clean-cut low resistance antenna improving matters very greatly. Such a circuit will often recelve a station from 500 to 1,000 miles distant on the ground alone without any other antenna than the wiring of the set itself, and because of the many powerful broadcast stations now operating in the United States, this is a very good way to check up the ability of the circuit. This last test also applies to any of the forms of regenerative circuit that are in use today, including the many "wonder" circuits. Regeneration, in other words, will accomplish just so much, whether it is in one form or another, quality of reception depending upon how much regeneration, or in other words, how hard the receiver has to be pushed in order to bring ln the stations. The more regeneration used, the poorer the quality of the reception.

After the plain regenerative circuit, we might consider reflex and neutrodyne circuits. These are most often in the form of multl-tube circuits and because they depend so much upon the operating skill, plus constructional features, cannot be accurately compared. They should, however, be able to accomplish considerably more than the plaln regenerator. Reflex circuits depend a great deal for their results upon the use of a good crystal detector, and the person who operates such a circuit and has prlde in it, or on the other hand has trouble with it, will undoubtedly find it a good investment to purchase as many crystals as he can afford so that he can try them out in his set with a view of finding which is the best. Crystals vary greatly and no reflex circuit .can do what it should if it has a poor crystal. The results obtained with a really good crystal are surprising. Reception is inclined to be noisy and somewhat distorted, the amount of these troubles all depending, to an extent, on the operator.

Super-Regenerative Receivers

Our next line might include receivers of the super-regenerative class. Per tube, these receivers are undoubtedly the peer of all. They are noisy owing to the controlling frequency whistle and may be very tricky until one knows what to look for. In this connection, we might say that they are such a new addition to Radio reception that very few people know just what to expect, and therefore the super-regenerator has had very few opportunities to do its best. In other words, trouble with this circuit is quite likely due to our lnexperience with it.

There are three well-known forms of super-regeneration—the Logwood method, the Armstrong method and the Flewelling method—three different methods by which super-regeneration is accomplished. Noisy though they might be, this noise is controllable by the operator and the results often obtained are enough to raise the hair on the head of the average person. The wrlter is thinking at this moment of the first distant station that was ever received on the Flewelling circuit. It was on a Sunday evening and the receiver was being tried on a ground alone when, much to our disgust, the local station, ten miles distant, came pounding in so loudly that we were able to put the phones on the table and hear it about 30 feet away. The surprise came when instead of announcing that it was the local station as we had expected, I was told that it was WOC at Davenport, Iowa, about 900 miles distant. This is a form of action often displayed by the super-regenerator and a great deal of fun and excitement is often to be had with its use, as it is quite impossible at times to tell from the volume just what station ls being received, distant stations often coming in with an audibility quite equal to that of nearer ones.

Radio Frequency Circuits

Let us turn now to the forms of Radio frequency circuits in popular use for broadcast reception. Radio frequency reception as ordinarily thought of necessitates the handling of extremely high frequency currents, and it is not to be expected that the average person can appreciate just what this means or what difficulties it offers. Stop and think a moment of a motion that reverses its action one million times in a single second. It is moving so fast that it is beyond the human mind to conceive it. It is an extremely feeble thing as well as being extremely fast, and it has a million and one peculiar characteristics, especially lf we keep in mind the action of direct current or low frequency alternating currents. We must forget these slower actions and remember that we are dealing with something that, even in its simplest principle, is beyond our comprehension. Therefore, if we are to obtain the results we should from Radio frequency amplification, we must take into consideration the very minutest detail in the construction of a Radio frequency set. This even extends to the size and location of the binding posts, etc.; the socket, for instance, most frequently offered on the market being absolutely useless in a Radio frequency set. Radio frequency reception properly handled gives us the cleanest-cut reception and of a quality most pleasant to hear; and if we do not begrudge a tube or two, will excel any other known form of circuit. Properly handled and constructed, it is the peer of all and reception with it is dependent almost entirely upon the number of tubes used and the strength of the transmitting station. This brings us to another point ln the consideration of reception.

It is well to remember that we cannot take out of our receiver any better quality than the transmitting station puts into it. In other words, if the transmitting station is of poor qualiy, then our reception will be poor, but as there are so many good transmitting stations in operation today, it will not take one long to ascertain just how good his receiver is.

Surrounding Conditions Considered

Seasonal and local conditions, too, must be taken into consideration. If we are located in proximity to trolley wires, high tension electric lines, etc., we will find hums, clicks, etc., interfering with our reception. Winter brings with it all kinds of freak reception, receiving distances being lnvarlably greater than in the summer and of far better quality, owing to the general lack of static disturbances.

There is another point that should be taken up, and that is to answer the question as to why Jones, who has a receiver identical with ours, accomplishes so remarkably better work than we. This would be explained if Jones were a cleverer or better operator than we, but if he is not, we must look for another solution, and the following suggestions may help in tracing the cause of the trouble. Jones might be better located than we are even though he is only 100 yards distant from us; he might have a better aerial or a better ground. Any one of these things might be responsible for the difference, but as the great majority of sets are regenerative and use a soft tube as a detector, we might find also the cause of the difficulty here. It is a fact that de-

(Continued on page 30)

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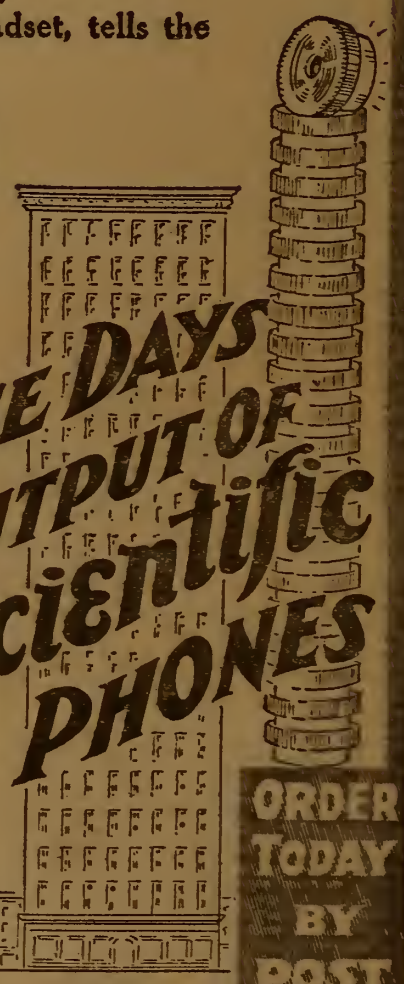

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Simple Explanation of Radio for Everybody

Chapter IX, Part I—Audio Frequency Amplification

By M. W. Thompson

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

Chapter X—Loud Speakers.

Chapter XI—Dry Cells and Storage Batteries.

OUR DISCUSSION so far has been entirely on the apparatus required for the picking-up of the mysterious invisible and inaudible Radio waves and the changing of them into waves that affect our sense of hearing as music and speech. An aerial, a ground connection, tuning apparatus, head receivers and a single vacuum tube used as a detector will bring in local stations and those situated hundreds of miles away. When this has been accomplished, one or two of us may sit down and enjoy the varied programs at their disposal which is most fascinating for a while, and then—man's vanity begins to prod his contentment and mar his enjoyment.

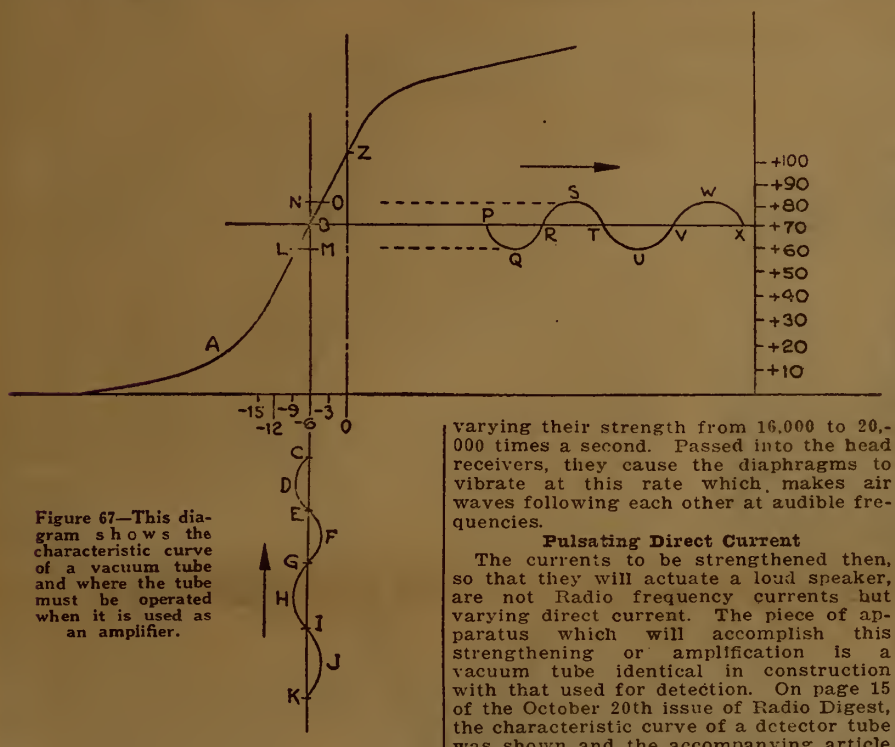

Figure 67—This diagram shows the characteristic curve of a vacuum tube and where the tube must be operated when it is used as an amplifier.

Whether he made it himself or purchased the single tube outfit that "brings 'em in," he wants to show it off—wants his friends and relatives to see what his set will do, and invites them to do so. Then he finds that he must give up the precious head receivers for a while and that they must be taken off and readjusted for size as they are passed around. Which gives rise to a great yearning within for something that will enable a whole roomful of people to enjoy the entertainment. So, down to his Radio dealer he goes for information and finds that what he now needs is audio frequency amplification.

After the signals have passed through the detector, as explained in Chapter III, Part II, they are no longer currents changing their direction of flow at the Radio frequencies of one to three million a second, but are now direct current flowing continuously in one direction and varying their strength from 16,000 to 20,000 times a second. Passed into the head receivers, they cause the diaphragms to vibrate at this rate which, makes air waves following each other at audible frequencies.

Pulsating Direct Current

The currents to be strengthened then, so that they will actuate a loud speaker, are not Radio frequency currents but varying direct current. The piece of apparatus which will accomplish this strengthening or amplification is a vacuum tube identical in construction with that used for detection. On page 15 of the October 20th issue of Radio Digest, the characteristic curve of a detector tube was shown and the accompanying article explained how the tube must be operated at the bend or "knee" of the curve. Figure 67, herewith, shows where the tube must be operated to function as an amplifier.

Before discussing this curve, let us consider how this second tube must be connected to the detector tube (see Figure 68). This circuit from the antenna and ground to the points A and B is the usual nonregenerative hook-up. While three methods of coupling amplifiers to the detector, and to each other, are possible—by resistances, by impedances, and by transformers—we show, and will discuss here, only the transformer method, which is recognized as the simplest and most satisfactory and is almost universally used.

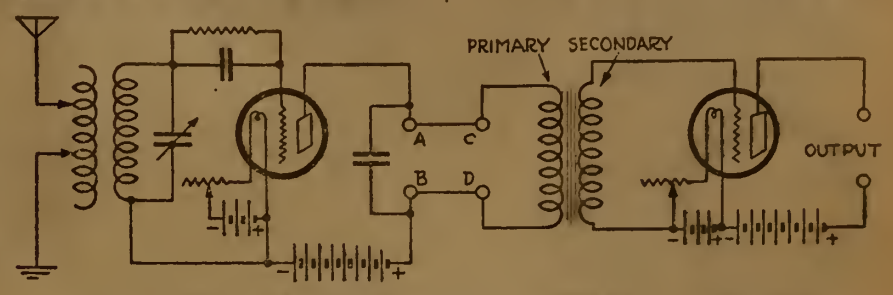

Figure 68—A step of audio frequency amplification is added to a two-circuit receiver.

The Audio Frequency Transformer

In Figure 68, points A and B are connected to C and D, which are the input terminals of an audio frequency transformer. Such a transformer consists of an iron core, made either of iron wire or thin flat strips, on which are wound several layers of fine wire, called the primary, and several thousand additional turns, called the secondary. Through the primary flows a steady current, from the B battery, of about 22 volts. Since only changes in a current are passed from a primary to a secondary, this steady unvarying flow does not affect the secondary. If, now, incoming signals cause this current to vary by one or two volts, this change causes a current in the secondary which has a voltage bearing the same ratio to the change as the ratio of turns between primary and secondary windings. Thus, if it is a three-to-one transformer and the secondary has three times as many turns as the primary, the voltage in the secondary will be three when the changes in the direct current in the primary is one volt more or less than normal.

The Characteristic Curve

The question at once arises, why a different number of turns; why not an equal number in both primary and secondary? Which brings us to the characteristic curve of Figure 67. The line C to G represents one cycle of a current that will later produce an audible note in the head receivers. In Figure 67, the line

(Continued on page 26)

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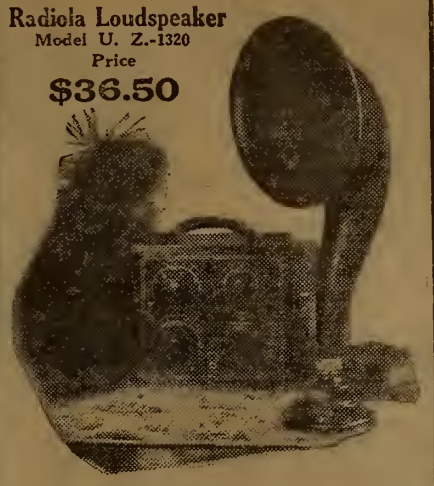

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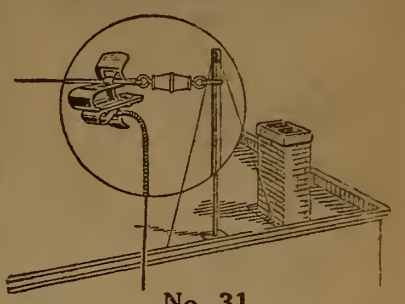

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Variable Condensers

$7.00 value,	43 Plate Vernier	$3.95
6.50 value,	23 Plate Vernier	3.45
6.00 value,	11 Plate Vernier	2.95
1.75 value,	3 Plate Vernier	1.15
4.30 value,	43 Plate NOW...	1.75
3.70 value,	23 Plate NOW...	1.45
3.30 value,	11 Plate NOW...	1.35
2.25 value,	5 Plate NOW...	1.25

All merchandise GUARANTEED by us to be of BEST QUALITY

509 S. State St.
Dept. D-6
Chicago, Ill.

CHICAGO RADIO LABORATORY

All mail orders shipped to you PROMPTLY

509 S. State St
Dept. D-6
Chicago, Ill.

Honeycomb Coils

1,500 Turns	$1.50
1,250 Turns	1.50
1,000 Turns	1.25
750 Turns	1.00
250 Turns	.75
150 Turns	.60
100 Turns	.50
75 Turns	.40
50 Turns	.40
35 and 25 Turns	.40

Automatic Electric Headsets

$10.00 VALUE

$3.65

Salvage Means

SAVE - SERVICE - SATISFACTION

When you select those parts for that set you are building from our enormous radio stocks you are assured of these 3 things:

1. You have saved money through the hundreds of radio bargains made possible by our enormous buying power.
2. Your order has been filled intelligently by men who are qualified radio experts.
3. You have bought the best radio part procurable for the money. It is guaranteed brand-new. It is guaranteed to give perfect satisfaction in service.

You'll get much better results with those far-away stations if that set is built with Salvage Parts!

Western Electric VT-2 Tubes

$7.45

Complete parts for

2-Stage Amplifier

To amplify Ultra-Audion, Reinartz, Flewelling, Knocked-Down Short-Wave Receiver, Crystal or any receiving set so that loud speaker or phonograph can be used in place of headset.

Reg. Price	Consisting of	Our Price
$1.05	7x9 Formica Panel (other suitable size)	$ .95
4.75	High Ratio All-American or Thordarson Transformer	3.95
4.50	Low-Ratio All-American or Thordarson	3.95
2.20	2 Howard Rheostats	2.00
2.00	2 Bakelite Sockets	.90
3.00	3 Double Pacent Jacks	1.50
1.30	13 Binding Posts	.65
.30	Baseboard	.15

$21.00 Value — Our Price $12.95

Complete parts for

Wave Trap

Consisting of	Our Price
6x6½ Mission Finished Oak Cabinet	$ .95
6x6½ Formica Panel Drilled and Engraved	.50
Specially Wound Wave Trap Coil	1.95
23-Plate Variable Condenser	1.35
Bakelite Dial	.25
4 Binding Posts	.20

Construction Sheet FREE

Very Special $5.25

Single Tube Hook-Up

Consisting of	Our Price
6x10½ Drilled Panel	$ .95
23-Plate Condenser	1.35
Variocoupler	.95
Rheostat	.35
John Firth Socket	.35
Freshman Grid Leak and Condenser	.65
2 Bakelite Dials	.50
Switch Lever	.25
3 Binding Posts	.40
Switch Points and Stops	.15
Baseboard and Instructions and 25 ft. Hook-up Wire	.25

Our Price $5.95

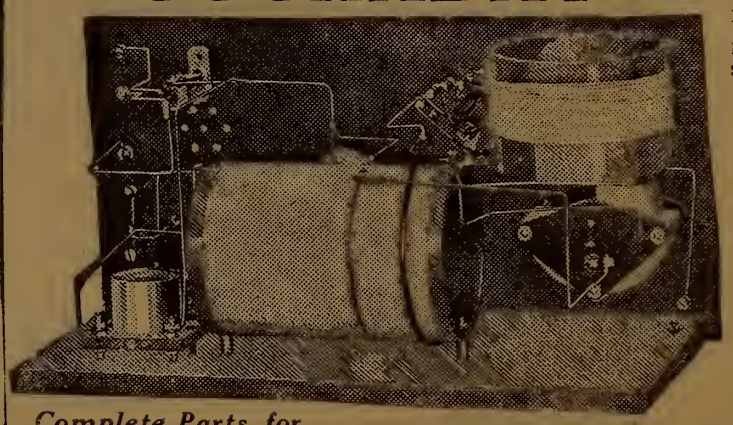
Complete Parts for

Power Transformer

1 Set of Push and Pull Thordarson or All-American Power Transformers	$13.00
1 Double Firth Socket	.70
1 Howard Power Rheostat	1.50
8 Binding Posts	.40
5 Switch Points and Stops	.10
1 Switch Lever	.25
1 Cutler-Hammer Filament Switch	.60
1 7x10 Panel	1.05
Baseboard and Instructions for Assembling and Mounting.	

Our Price $16.95

COCKADAY



Complete Parts

Regular Price EACH	Consisting of	Our Price EACH
$3.00	1 Cockaday Coil	$1.95
1.00	2 Bakelite Dials	.25
1.00	1 John Firth Socket	.45
1.00	Freshman Grid Leak and Condenser	.65
1.50	1 Howard Ver. Rheostat	1.35
1.00	1 Pacent Double Circuit Jack	.50
.80	8 Binding Posts	.05
.02	7 Switch Points	.01
.50	1 Switch Lever	.25
	1 7x14x⅛ Formica Panel	1.44
	Blueprint and Wire	1.00
	1 Baseboard	.25
3.30	2 23 Plate Condensers	1.45

Our Price $11.95

Complete Parts for

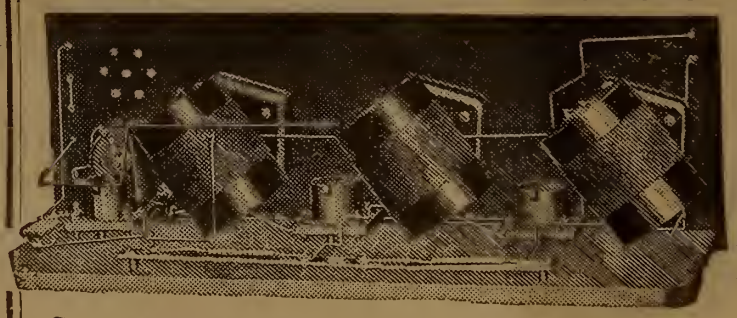
Regular Price	Consisting of	Our Price
$1.89	7x18 Formica Panel	$1.70
1.00	Bakelite Socket	.45
1.50	Howard Ver. Rheostat	1.35
3.30	23-Plate Var. Condenser	1.45
3.10	11-Plate Var. Condenser	1.35
1.50	3 Switch Levers	.75
.80	2 Dozen Switch Points	.40
3.00	1 Schoonhoven Reinartz Coil	1.95
1.00	Freshman Var. Grid Leak and Condenser combined	.75
.80	8 Binding Posts	.40
.30	25 Feet Tinned Wire	.15
.50	Baseboard for Mounting.	.25
1.00	Blueprint with Complete Instructions for Assembly and Wiring	.50

Regular Price $21.69 — Our Price $11.45

Complete parts for Detector and two-step with Vernier Condensers $29.95

REINARTZ DETECTOR

HAZELTINE NEUTRODYNE



Complete Parts

All Parts Licensed Under Hazeltine Patents

1 7x21x3/16 drilled Formica panel
1 Howard rheostat
3 4-inch Radion dials
3 John Firth bakelite sockets
8 Binding posts
3 23 plate variable condensers
1 Wave control neutroformer
2 R. F. amplifying neutroformers
2 Grid neutralizing condensers
1 .00025 micon grid condenser
1 Marco variable grid leak
1 Baseboard for mounting
25 feet tinned copper bus bar wire and complete instructions for assembling and wiring.

3 Tube Our Price $28.60

4 Tube $44.65 5 Tube $46.25
(Freed-Eiseman or Fada Neutroformers)

Complete Parts for

	Regular Price
2 R. F. Transformers	$12.00
2 A. F. Transformers	10.00
1 Varicoupler	7.50
1 Condenser	5.00
1 Rheostats	4.40
1 Potentiometer	1.50
5 Tube Sockets	1.75
2 Four Point Phone Jacks	1.00
1 Two Point Phone Jack	.35
1 Grid Leak (1 meg.)	.25
1 Grid Condenser (.00025 Mf.)	.40
2 Fixed Condensers (.002 Mf.)	.80
7 Binding Posts	.35
C-H Switch	.60
1 Panel 7"x28"	3.92
	$49.92

Our Price $43.95

RADIO'S LATEST MARVEL, the SUPERTUNER

Complete Parts for

Erla Single Tube Reflex

Consisting of	Our Price
1 Variocoupler	$3.45
23-Plate Variable Condenser	1.45
2 Erla Sockets	1.30
1 Erla Reflex No. 1 Transformer	4.45
1 Erla A. F. Transformer	4.85
1 Erla .002 Mica Condenser	.30
1 Erla .001 Mica Condenser	.30
1 Erla .00025 Mica Condenser	.25
1 Erla Fixed Crystal Detector	1.00
1 Howard Rheostat	1.00
2 Bakelite Dials	.50
8 Binding Posts	.40
1 Dozen Switch Points and 4 Stops	.30
2 Switch Levers	.50
1 6½x14x⅛ in. Formica Panel.	1.37

Our Price $20.90

Flewelling Circuit

Reg. Price	Consisting of	Our Price
$1.26	6x14 Formica Panel	$1.10
3.30	23 Plate Var. Condenser.	1.45
3.00	3 .006 Micon Condensers	2.25
1.85	CRL Variable Grid	1.35
.40	Remler Grid Leak	.25
4.00	2 Coil Adjustable Honeycomb Coil	2.65
.75	50 Turn Honeycomb Coil.	.40
.80	75 Turn Honeycomb Coil.	.40
1.20	2 Remler Coil Mounts with Straps	.80
1.00	1 Socket	.45
1.50	Howard Vernier Rheostat	1.35
1.00	1 Bakelite 3" Dial	.25
.80	8 Binding Posts	.40
.30	1 Baseboard	.20
1.00	1 Blueprint with Complete Instructions for Assembly and Wiring	.50

$22.16 Value.

Our Price $12.45

Autoplex Circuit

	Our Price
9½x13¼x⅛ inch Formica Panel, drilled and machined	$1.89
9½x13¼x⅛ inch Mahogany Cabinet with hinged top	2.95
1 John Firth Socket	.35
1 Frost Plain Rheostat	1.00
2 Moulded Autoplex Variometers	7.30
2 3-inch Bakelite Dials	.50
6 Binding Posts	.30
1 Single Circuit Pacent Jack	.35
1 1250 or 1500 Turn Honeycomb Coil	1.50
1 4x4x⅛ inch Formica subbase panel drilled	.25
1 2¼x2¼x⅛ inch Formica Panel, Coil, clamp drilled	.07
1 Complete set of machine screws necessary for assembling the various parts	(no charge)
1 Hookup for assembling and wiring	(no charge)
4 Lengths sq. bus bar wire for wiring	.10

Our Special Price $16.45

How and Why of Super-Heterodyne Receiver

Chapter I—Fundamentals of the Circuit

By H. J. Marx

THE Radiophans of yesterday, with their five tube neutrodynes, superdynes and reflex circuits, have now become post-graduates and knock at the inner sanctuary of Radio's "Holy of Holies," the Super-Heterodyne. Some have worked hard with plenty of patience and are well qualified but, unfortunately, there are many who have barely been able to handle the circuits that have come before. Yes, there are in addition numerous others who, after building or even purchasing a simple Radio receiving circuit, decided that not only did they want the best there was, but also to build it themselves. Ambition is to be commended, but little do they realize that, where heretofore they were merely assemblers of manufactured apparatus, now they will find that the assistance of manufacturers is lacking.

Parts Difficult to Obtain

Yes, complete details of super-heterodyne circuits have been available for some time, but on analysis some interesting facts are brought to light. Some are entirely too complicated by innumerable controls, while others call for apparatus not available on the market.

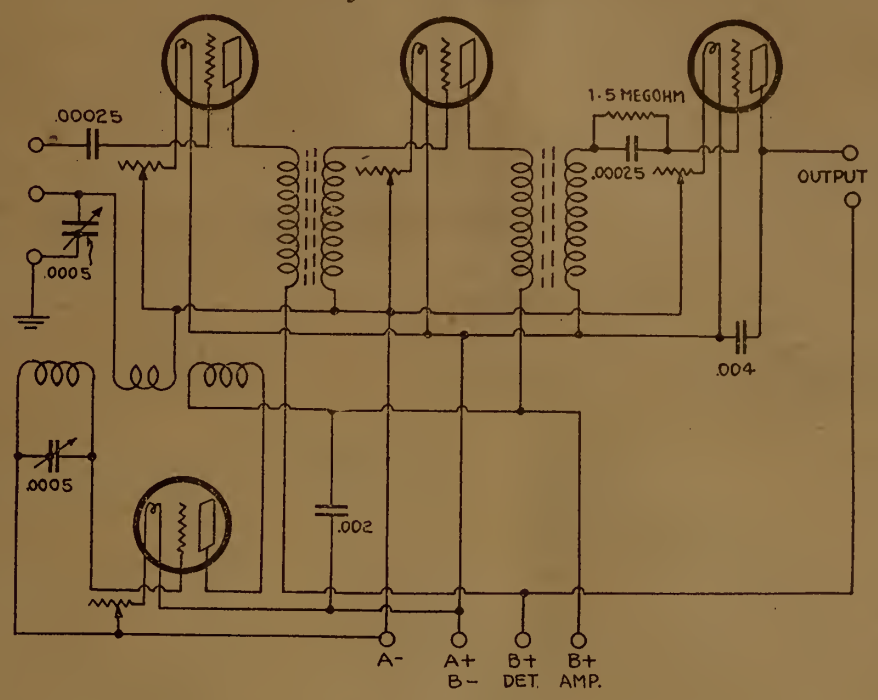
The odds are somewhat against the fan when he starts out to build the Rolls-Royce of Radio receivers, but credit is due him for the attempt. Before building a receiver of this type, it naturally becomes the wisest course to first investigate some of the fundamentals of the circuit. Most fans know in a hazy manner that Armstrong had something to do with it, but whether or not it has anything to do with super-regeneration he cannot tell.

Amplifying Frequencies

It is not so long ago—yes and even now—fans wondered what was the difference between Radio and audio frequency. Then we discovered that broadcasting covered a wave length range of about 300 to 500 meters. This is equivalent to a frequency range of 1,000,000 to 600,000 cycles, and is known as Radio frequency. Amplification of the wave at this frequency is known as Radio frequency amplification and takes place before the detector or rectification.

In passing through the detector the frequency is lowered to the range of audibility or becomes an audio frequency amplification after the detector and therefore is known as audio frequency amplification. The problems of audio frequency amplification were fairly simple in solution. Radio frequency amplifiers were not so easily worked out. For shorter wave lengths, it was found difficult to efficiently couple the various stages. Either the efficiency was too low or covered too narrow a wave length band.

Better efficiency in Radio frequency amplification was found in wave lengths of about 3,000 meters or more. This is equivalent to 100,000 cycles or less. That meant that maximum efficiency was not possible unless the wave length was raised to 3,000 meters, or ten times the present broadcasting wave length. But then transmitting stations had their wave lengths assigned to them by the government and the ideal range was assigned for other uses.



Obviously this held up matters for a while. Major Armstrong, however, conceived the idea of receiving the transmitted wave at its high frequency, and convert or combine it with one of lower frequency, which would permit higher efficiency in the amplifying stages before detection.

This wave length range to which the original wave is raised runs from 3,000 to 10,000 meters, which is equal to 100,000 to 30,000 cycles. Because of the fact that it comes between what we know as Radio and audio frequencies, it has become known as "super-audible" or long wave amplification.

Special Transformers

The ordinary Radio frequency transformers cannot be used for this form of amplification, since they are not designed for operation at this low frequency. Special super-audible or long wave transformers are required. The transformers are designed to respond to some wave length between 3,000 and 10,000 meters. All the transformers used in on set must be designed for the same frequency.

In some cases the step-up ratios are changed or occasionally the last stage uses tuned transformer coupling.

Oscillator

This conversion to the higher wave length is accomplished by means of a separate circuit known as an oscillator. This oscillator circuit, through its tube, is a source of oscillating current the frequency of which is controlled. Its circuit is coupled to the main circuit so that the incoming wave combines with and modulates the oscillating circuit. The oscillator circuit control is then tuned so the resultant frequency is the same as that at which the super-audible transformers give maximum efficiency. The main circuit, of course, is tuned at its source for the transmitted wave or station desired.

After the last stage of super-audible amplification, detection takes place in the usual manner. Audio frequency amplification then can be applied as usual.

A Simple Circuit

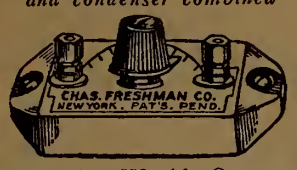
A simple four-tube circuit is shown in the illustration. This circuit is designed for use with the tapped loop, details of which will be given later.

The first tube is commonly spoken of as the first detector, the one below it is the oscillator. The second tube on top is a super-audible amplifier. The last tube on the right is the second or real detector.

The oscillating circuit is inductively coupled to the grid circuit of the first tube. Details of construction of this oscillator coupler and the super-audible transformers, with more advanced hook-ups, will be covered in the next week's issue, as well as the question of shielding and panel layout.

(TO BE CONTINUED.)

FRESHMAN
Variable Grid Leak
and condenser combined



Accepted the World Over as the
STANDARD UNIT
FOR EVERY TUBE SET

It is the most compact; the most efficient; the most readily adapted to ALL grid circuits and the only one which is entirely sealed and always remains unaffected by any climatic conditions. It is the

ORIGINAL
VARIABLE GRID LEAK

and although it has been steadily improved and made better, there never was a time when it was not the

BEST ON THE MARKET

Complete with either .00025 or .0005 Freshman Condenser..... $1.00
Without Condenser..... .75

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

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Radio Condenser Products
106 SEVENTH AVENUE, NEW YORK

No Visible Antenna !
Y-E-T
There is no outside aerial and sets bring in coast to coast

Why Bother with Outdoor Aerials?

Inexpensive and Simple—No Loss of Efficiency

ORDER NOW! Total Cost Not Over $2.50
Complete Instructions $1
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Cold Winter Nights

WON'T find you on the roof fixing the aerial—removing snow and sleet, exposing yourself to sickness, if you use

ANTENELLA
(No Aerial or Antenna Needed)

A light socket plug that eliminates all outside wiring, lightning arresters and other inconveniences. Merely plug Antenella in any light socket—connect it to your set—and you can enjoy the best in radio in any room in the house.

At your dealer's—otherwise send purchase price and you will be supplied without further charge

Now Only
$1.25

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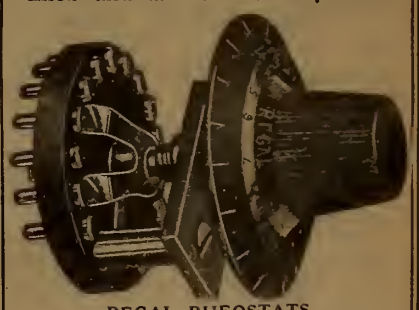
Regal
Radio Apparatus
That Lives Up to Its Name
REGAL
Laboratory-Tested Apparatus
Regal Inductance Switch No. 164

A complete assembly of switch points in one unit. No more drilling holes in panels. No more chipped panels. No more messy soldering back of panels. Mounted on panel with one threaded bushing and nut.

Complete with handsome knob and dial..... $1.50



REGAL RHEOSTATS

"REGAL" RHEOSTATS are known the world over for their high quality. Smooth, positive contact. One thread bushing only for mounting.

Vernier, 6 Ohms	$1.25
Vernier, 30 Ohms	1.25
Regular, 6 Ohms	1.00
Regular, 30 Ohms	1.00
Junior, 6 Ohms	.75
Junior, 30 Ohms	.75
Potentiometer, 200 Ohms	1.50
Regal Audio Frequency Transformer, 3½ to 1	4.25
Regal Audio Frequency Transformer, 5 to ½ 1	4.50

If your dealer does not carry Regal Products, write us direct, sending dealer's name.

American Specialty Co.
115-220 Holland Ave., Bridgeport, Conn.

RADIO FOR EVERYBODY

(Continued from page 23)

C to G represents this current at the point where it is in the secondary of our audio-frequency transformer. If each point, C, D, E, F and G, is carried upward to the point where it strikes the characteristic curve and then projected at a right angle to the right, we get the line P to T which represents the changes in the plate circuit of our amplifier tube. Study of this figure will show that the line P to T swings farther away from normal at the points Q and S than does the line C to G at points D and F. That is what amplification really is doing—causing greater voltage changes. You can now see why the ratio of turns in the transformer is three to one instead of one to one; we wanted the points D and F to swing as far from normal as possible (the grid voltage to go up and down as much as possible), and our transformer made this voltage change amount to 3 volts in the secondary instead of but 1 volt. Understand, however, our transformer did not create energy; as the voltage is increased three times, the amperage or current is divided by three.

Another question at once comes up: Why not make the transformer ratio ten or twenty to one? The answer is that physical characteristics of the materials in a transformer, and phenomena discovered in connection with transformers, limit the efficient ratio to 4.5 to 1 if the transformer is exceptionally well designed and made, and 3 to 1 if less care is given to design and materials. There are transformers on the market of higher ratio, but the excess ratio is of no use and may cause distortion.

In Figure 67, the line C to G has been extended to the point K, while the line P to T is extended to X. It will be noticed that the distance C to E is but half the distance G to I, which would be the case if CG represented a note of 300 cycles per second and GK represented a very low note of but 150 cycles. This is mentioned to bring out the point that these two different frequencies are different only in their number per second; their swing from normal is the same amount when coming into the tube at CK and they are amplified or strengthened equal amounts as shown by the line PX.

The Single Current Source

The circuit shown in Figure 68 contains two filament or A batteries and two plate or B batteries. Early experimenters naturally connected their current sources in this way, but among other improvements which time has developed is the practice of using a single A and a single B battery.

(TO BE CONTINUED.)

Headset Troubles

If there is a rattle in one of the phones, carefully remove the shell cap and the diaphragm, and see that there is no dust or filings between the magnet and the diaphragm. Filings will "stick" to the magnet sometimes, and as the diaphragm vibrates, will cause noise. In putting in the phones, see that the colored cord goes to the positive terminal of the B battery and the other to the plate of the last tube.

POST CARDS

A neatly printed post card for acknowledgment to broadcasting stations your reception of their entertainments. 2 dozen, 25 cents, postpaid. D. J. Spangler, Elkhart. Ind.

STORAD

"B" BATTERY

Dimensions: 4¾"x13¼"x6"

24 VOLT UNIT

The Ultimate Battery for "B" Circuit Work

Voltage of the Storad "B" Battery is constant and steady. 3 to 6 months' service on one charge. Rechargs cost is very slight. (We can furnish charger at small cost.) A Storad will lsst for yssrs and pays for itself in less than a year. Capacity 2250 M. A. H.

USE A STORAD STORAGE "B" BATTERY

It has extra heavy 2"x1"x¼" plates and large acid circulation.

It has glass jars, which eliminate cell leakage and allow observation of battery condition.

It will hold its charge for many months at constant voltage.

It prevents many noises in the set ordinarily blamed to static and aids long distance reception.

All Batteries Shipped Dry

SEND MONEY WITH ORDER OR SHIPPED C. O. D.

$7.25 (East of Miss. River)

Write for Dealer Proposition

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MERITONE

Loud Speaker

INSURES clear volume and perfect reproduction as loud as most of the higher-priced loud speakers. The horn is of a special fibre composition, mahogany japanned, with nickel finished rims and base to conform with the U. S. Navy standards. The phone clamp is made of nickeled phosphor bronze, and is adjustable to any phone made. With two stages of amplification, clear, natural tones are reproduced perfectly and without distortion.

$2 POSTPAID

At $2 postpaid this is a remarkable value that you should not overlook. Send check, money-order or cash with order.

MERIT SALES COMPANY

518 North Eutaw Street, Baltimore, Md.

Infinite Adjustment

for ALL TUBES!

DESIGNED to permit infinite adjustment of currents used in vacuum tube. Gives absolute control of electronic flow and finest tuning possible. Fil-Ko-Stat will bring in DX you never heard before and shut out noise.

30 ohms full resistance.
No adjustment to puzzle.
No discs to break.
No Carbon Powder.

$2 AT ALL DEALERS

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Made and Guaranteed by
DX Instrument Co. Harrisburg, Pa.
Radio Stores Corp.. 218 W. 34th St,, New York
Sole International Distributors

The Reader's View

Radio Music Helps Theater

Being a reader of your good little paper, I thought you might be interested in giving the music trust a concrete example of what happened in my home.

On Thanksgiving evening, our local station WHAM broadcast the entire performance of the "Blossom Time" musical show direct from the Lyceum Theater from 8:15 till after 11:00. My family enjoyed the performance so well that a great desire to see the show in physical form presented itself so the next morning found me at the box office buying three tickets, which I am sure I would not have done, had I not been so well pleased with the Radio performance.

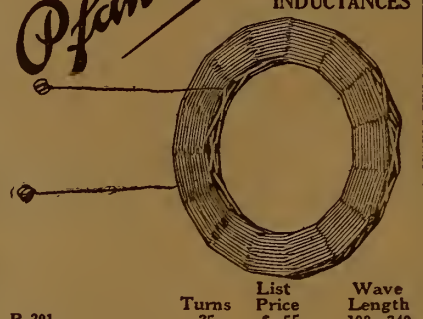
I have said nothing to the local station about this nor have I any commercial interest in music or the Radio; I do feel, however, that I represent those who have a greater interest than any—the public, the listener if you please, or audience. To me my own experience is a concrete example of the return I am sure will come to the Music Trust from a more liberal policy.—Benjamin Gerks.

Freezer Motors Interfere

After reading your article by Mr. Campbell of WWJ, on interference caused by regenerative receivers, I am prompted to write you on some real A.R.M. I judge that the article is a feeler for a law to prohibit such sets. But why not have a law to force proper installation of electrical apparatus such as motors? Just across the street we have an ice cream parlor which is using a refrigerator system to cool the cream, and if you would like to hear some real noise, just come around when that motor is in operation.—Geo. Krause, Cleveland, Ohio.

Pfanstiehl

PURE INDUCTANCES



	Turns	List Price	Wave Length
P-201	25	$ .55	100- 340
P-202	35	.59	125- 470
P-203	50	.65	170- 650
P-204	75	.74	220- 960
P-205	100	.90	300-1300
P-206	150	1.10	470-1980
Pfanstiehl Ultra-Audion		.95	
Pfanstiehl Reinartz		1.75	

Pfanstiehl Tuning Unit, consisting of 2 Spider Web Coils with mechanism for supremely sensitive adjustment..... $5.00

At all good dealers or direct on receipt of purchase price.

PFANSTIEHL RADIO SERVICE CO.
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SUPERTRAN

Audio-Frequency Transformer

Assures a range of unusually long distance, and preserves the natural tone of Broadcasting, both vocal and instrumental, as when transmitted through the Microphone.

Used with any amplifying tube on the market with excellent results.

Price $6.00

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

FORD MICA CO., Inc.

14 Christopher St. New York

YOU DON'T NEED TUBES OR ANY SPECIAL CRYSTAL TO RECEIVE CONCERTS FROM DISTANT STATIONS!

You can hear them on your CRYSTAL SET if you fix it up the right way. People using my methods hear programs clearly from stations 400 to 1,000 miles away. **No Tubes, Batteries, Amplifying Apparatus or Special Crystals required—necessary changes often cost less than One Dollar!**

Using my plans, a boy in Horton, Kansas, hears KDKA, WDAF, WHV, WAW, WOC, WOS and WSB. Another at Pueblo, Colorado, hears WOAW, KFI, WBAP, KYW, and KDKA. A man in New York City writes: "Have tested out your Crystal Set and results very satisfactory, no trouble in locating KDKA, WSB, and WDAF." A man in Philadelphia hears KDKA, WOC, WGY, WJAZ. A man in Kansas City hears both KHJ and WGY. A boy in Cortland, Nebraska, hears WAW, WOC, KSD, WOS, WOAI, WJAZ, WLAG, WTI, and WSB. All these records and hundreds more on my Crystal Hook-Up **Without Tubes.**

You may have everything you need and just have it counected up wrong. Send self-addressed envelope for picture of my set, and further information, or $1.00 for Complete Copyrighted Instructions. Satisfaction guaranteed or money refunded.

LEON LAMBERT

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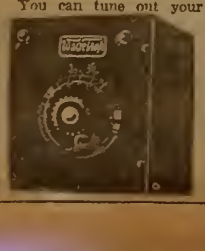
HEAR ONE STATION AT A TIME

The FERBEND TRADE WaveTrap MARK PATENT APPLIED FOR STOPS INTERFERENCE

Unmounted Ready for Panel Mounting only $6.00 Postpaid

You can tune out your local station with the Ferbend Wave Trap, the original wave trap, made especially to tune out interference. That's the reason it gives unparalleled results. Prove it for yourself.



Mounted on formica panel in mahogany finished cabinet 6x5x6, $8.50 postpaid.

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Selective Three Tube Single Circuit Receiver

Part III—Operating Instructions

By Fred Grill

THIS third article will deal with the instructions for operating the completely assembled receiver as described in previous articles.

The results set forth in this article are not to be taken just for granted but they are the actual achievements of the set as described. This circuit, as I have said before, is not a trick circuit and it does not employ an excessive number of parts so as to make the construction very difficult and the operation almost impossible to the average Radio layman. Of course, the circuit cannot be expected to work to the perfection as stated here unless you follow the plan of construction and use the designated parts. If you use a .004 condenser instead of the .001, or some such foolish substitution, you cannot expect the set to work as well as it would if the parts are used exactly as stated. I am, however, open to suggestions and would like very much to hear from anyone who thinks that he has made some improvement in the circuit. You may try various values for the condensers, and the coil also may be of another size, but the writer has given his honest and sincere opinion in the values for the different parts.

Testing Battery Circuits

After the set has been completed you should first try the detector tube socket to see if the A battery circuit is complete. This should be done with a 6-volt bulb of some sort, but under no conditions use a perfectly good audion unless you have the line protected with fuses made for the purpose. After the detector, you should try the first and then the second step of the audio amplifier. After this put on the detector B battery and again test the filament line. Do the same thing with each amplifier. After this is completed and the line is found to be good, plug in the phones on the detector jack.

Should the testing tube be burned out when the B battery is added, you will know that there is a short circuit of some kind and that the B battery is being fed into the filament circuit. You should trace out the wires and after you have found where they are short-circuited, you should disconnect them and put them in their proper places. A good remedy for this is the taking of extreme precaution in the connecting of the set for the first time. If you do, I assure you you will never have to repeat the operation.

Starting Operation

Assuming that all connections are correct, put the first tube in operation. Set all dials at the zero position and after inserting the plug in the detector jack turn on the detector tube. A rotation of the plate variometer should produce oscillations of some sort. If no oscillations are produced reverse the A battery leads and you will in all probability find yourself on the big right road once again. Now turn back the plate variometer to the zero position after you are sure the set will oscillate and then vary the inductance until a station is heard. The inductance tuning is accomplished solely by the variation of the two switch arms that are directly connected to it.

After a station is heard you should rotate the grid dial until the station is at the loudest point on the scale. After this, turn the dial on the plate variometer until the signal becomes "mushy" from the oscillations set up in the detector circuit, then turn the plate variometers back just below the oscillation point and the signals will become clear. The detector tube rheostat should also be used in conjunction with the tuning of the plate variometer as the oscillations will be more pronounced when more filament current is supplied.

When you are satisfied that the signal is at its peak on the detector, light up the amplifier tubes to normal brilliancy and plug in the loud speaker on the last stage. The signal that was just heard on detector now should be heard in the loud speaker. If the signal is weak, just return the plate circuit because you will find that the signal will not be heard at the same peak on the phones and on the loud speaker. This is due to the fact that the phones are not of the same impedance as the loud speaker and a slight variation of the plate circuit will be found necessary to correct the loss.

Signals on Loud Speaker

After you have tuned in the signals on the loud speaker to its peak, try variations of the detector tube B battery supply. When the best voltage is found, leave the clip at that point. The C battery used in the grid circuit of the last tube should next have attention. The battery for this circuit should be from 3 to 6 volts, depending upon the tubes, and mainly upon the amount of B battery used. However, try the C battery on all voltages and let it remain where the signals are best.

This circuit also has a strong appeal to the fans who are interested in the extreme DX that is possible on a straight audio set; that is, a set which employs no amplification of the Radio frequency type.

This set will not work equally well in all localities. He who lives in a city and has an aerial strung around the room concealed by a picture moulding cannot, of course, expect to have his set accomplish what a similar set will do for someone else with a good aerial out in the country.

Tests made in New York City with an aerial of about 100 feet about 15 feet from the roof of an apartment house revealed the following results:

M	WLW	Cincinnati
M	WSAI	Cincinnati
X	WLAG	Minneapolis
X	WOAW	Omaha
N	WJAX	Cleveland
N	WDAP	Chicago
M	WMAQ	Chicago
X	KYW	Chicago
N	WJAZ	Chicago
X	WSB	Atlanta
X	WDAF	Kansas City
M	WOC	Davenport
N	KDKA	Pittsburgh
N	WGY	Schenectady
N	WBZ	Springfield, Mass.
N	WGI	Medford Hillside
N	WFI	Philadelphia
N	WOO	Philadelphia
N	WIP	Philadelphia
N	WDAR	Philadelphia

Stations marked X were heard only with phones; stations marked M were heard on loud speaker but once or twice, and stations marked N were heard on loud speaker nightly when on the air.

I cannot guarantee anyone results with the set as built by him, but I can and will say that under favorable circumstances the set will bring in all the stations mentioned above, and with careful operation many new ones will be added because the above is but a part of my log. Many intermediate stations have been omitted, because of their less importance.

During an evening's trial in a part of New Jersey with a fair-sized acrial and a cold water pipe ground, quite a few distant stations were tuned in by me, the greatest distance being PWX, Havana, a station that was not audible in New York, yet here in the country it could be heard from a loud speaker about 20 feet away. This will show the real DX that is possible under favorable conditions.

Recording Dial Settings

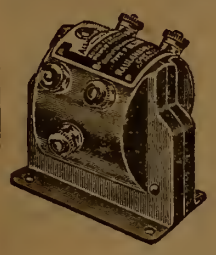
One should have a chart and put down the markings of all the distant stations that are received and in a moment he will then be able to pick up any station that is broadcasting at the time, should he be in possession of the correct dial settings.

The tuning at first may seem rather difficult, but in a week or so you will acquaint yourself with this particular type of set, and the average Radiophan will be able to secure as good results as the experienced operator.

Next week will bring the fourth and probably the concluding article on this set.

(TO BE CONTINUED.)

Mr. Dealer!!



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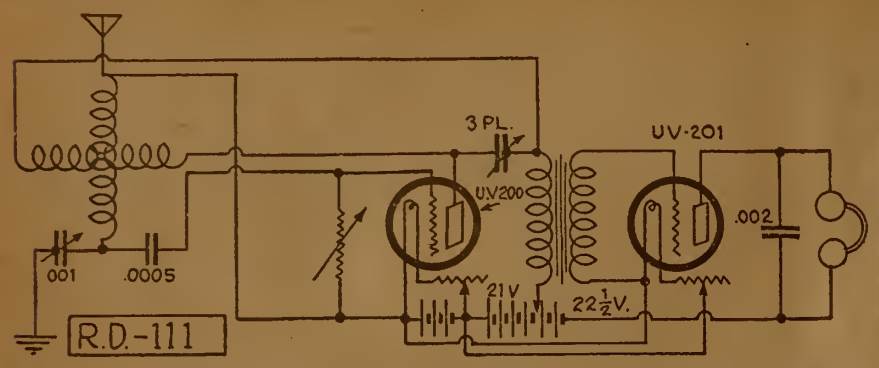

MR. O. P. KLEIN of Leduc. Alta., has his own ideas of an amplified Miloplex. Read what he has to say: "My compliments to the self-styled 'Mystery Man' for bringing out the Miloplex hook-up, because it is the best yet published. And it sure was a pleasure to read his write-up.

"But allow me to submit the 'New-born colt Plexy II', shown in R. D.-111. I was at first a little skeptical to try out this new hook-up, because my last hook-up as published brought local station out louder than a good many I tried out. In fact I started with Miloplex III, and I discovered that with detector tube only it was not as loud as my own hook-up. But with one stage of amplification added it brought out everything the writer claimed for it; it brought in the distant stations better than my own.

"Now the brushing and grooming started first. With Miloplex III and then II. I can tell my mystery brother that he isn't the only crazy Radio fiend, and if it took him nine months he accomplished something. It took me a whole week before I got any results. But I also discovered that in the dark hours of the night, in prowling for the missing link, Miloplex II had more volume and did sharper tuning. But, oh my, what a volume of oscillation his circuit produced with one stage of amplification. But after I had harnessed number III I made up my mind that number II had to come. And I was also sure that negative A was at the root of the trouble.

"Now here was the new-born colt 'Plexy II' just rarin' to go but without a bridle. To put on this bridle caused an occasional short across my A battery that made me hold my breath for my tubes.

"But at last the colt grabbed the bridle firmly between his teeth, and where do you suppose? Well, I'll tell you the secret—just at the beginning where the first waves enter your set. Just allow me to say that a good many well designed sets fall down by attempting to bring negative A into the set with a fixed or variable condenser. I say none of them will work perfectly. They will all fail either in not bringing one tube out with full volume or they will surely fall down when you attempt amplification, because they oscillate as an open circuit.

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(Continued on page 30)

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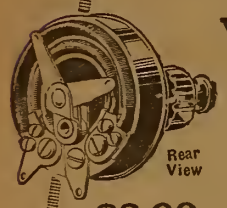

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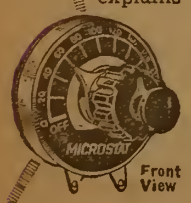

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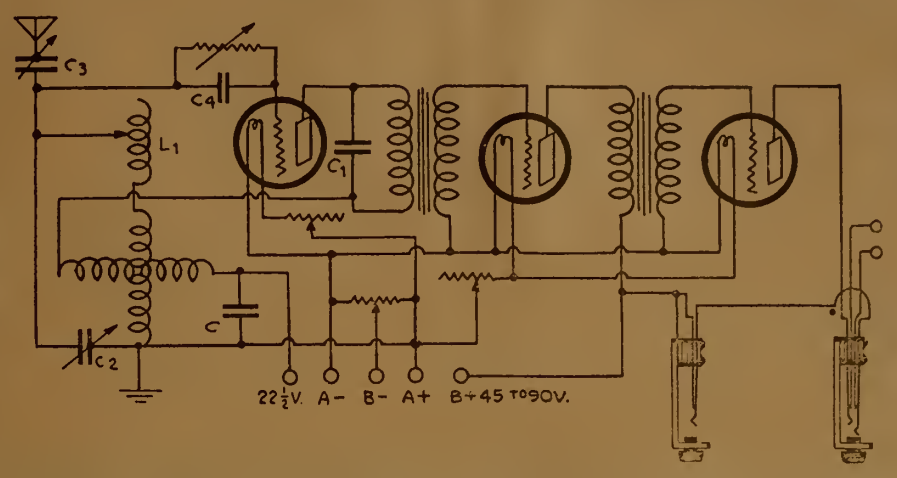
Flexible Single Circuit of Selectivity

Oscillates Over Entire Range of Wave Lengths

A selective single circuit which is flexible and will oscillate over the entire wave length range is shown in the illustration. This is not always true of home-made single circuit sets using feedback.

HOOK-UP WITH SPLIT VARIOMETER



WORKSHOP KINKS? EARN A DOLLAR—

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

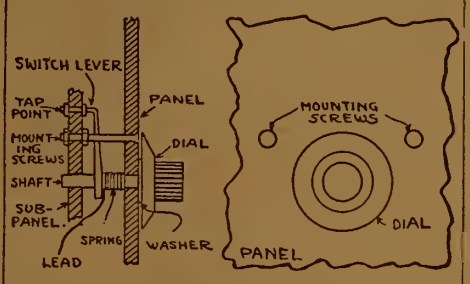
RADIO KINKS DEPARTMENT,
Radio Digest,
123 W. Madison St., Chicago

Of course, the load coil L_1 of 60 turns, plate condenser C_2, and the potentiometer may be eliminated, but it is in these that selectivity comes in. The load coil L_1 is tapped every twelfth turn and one tap is taken in the middle of the stator of the variometer and halfway between that and the outside. It will be found that different stations may be picked up with different combinations of inductance and capacity, and this aids selectivity. Be sure to attach the ground to the lead from the variometer and not to the free end of the load coil. If this is done, the load coil does not have to be placed in an inductive relation to the other parts of the tuning elements, but may be connected in any place that is convenient, as around the variable condenser.

On this set C_3 is a 23 or 43-plate conductor, C_4 fixed .00025 with variable grid leak. I have heard from seventeen states and almost every night I get from one to four new stations. I have caught WGY and WOO, and heard regularly this summer KFI and KHJ in California, WGM and WSB in Atlanta, and WJAZ, WDAP, KYW and WMAQ in Chicago as well as many stations between here and these border stations. All these stations come in very clearly and on a good night I can hardly stand to have the phones on my head. I have the whole set in a cabinet with a 14 by 18-inch panel. Two holes in the back of the panel bring in the aerial and ground wires so that no wires show at the front. —J. B. Owen, Blair, Okla.

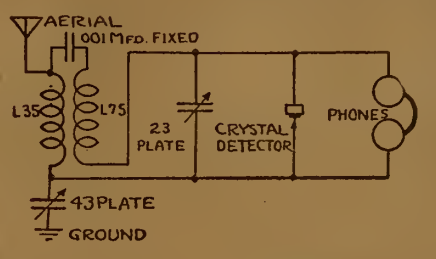
Back Panel Switch Mount

I am deep in the Flewelling circuit. I think it a sure one for getting results. In making a few small sets for my friends I found that some of them objected to having the switch points on the front of the panel. The cross section shows the construction of a small back panel mount containing the switch points. The switch lever is attached to a ¼-inch shaft by drilling a hole through the shaft and cutting down the switch blade end to enter the hole, where it is soldered in place. The flexible connection for the ground is also inserted in this hole. A spring is placed between the blade and the main panel. A washer is placed on the outside of the panel to keep the dial from rubbing and a smooth working switch will be the result.—Paul Garman, Louisville, Ky.



Crystal Set Hook-Up

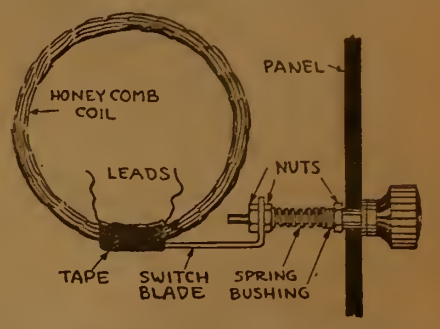
The hook-up shown in the illustration is original with me. It works loud on local stations and is capable of receiving music and speech at a distance of about 80 or 90 miles. WGY of Schenectady comes in very nicely.—Harold Weiler, Highlands, N. Y.



Some causes for noises in Radio sets are: run-down A or B batteries, leaky or punctured phone or grid condensers, poor or insufficient grid leak, poor connections, an excess of soldering paste, which causes corrosion, and defective phone cords.

Honeycomb Coil Mount Made of Switch Lever

Procure a tap switch and remove the blade. Drill a hole in the panel to take the shaft of the knob and assemble on the panel. Bend the part of the blade with the hole in it as shown in the illustration. Fasten the honeycomb coil to the blade with tape. The knob of the switch may be used for turning the coil in either direction. Another mounting can be made in the same way. When two coils are used, as in the Flewelling circuit, they can be placed far apart.—Harold Weiler, Highlands, N. J.



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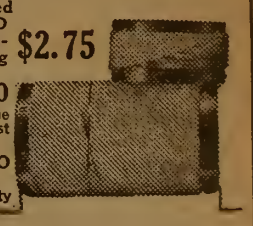

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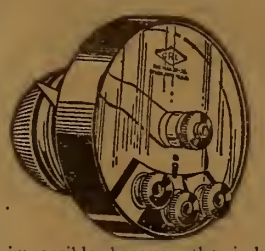

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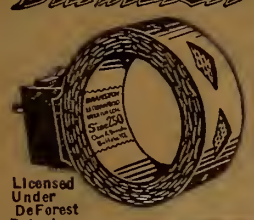

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Dealer or Agents Wanted Everywhere

GOOD RECEPTION

(Continued from page 23)

tector tubes vary greatly. Their action is quite tricky at times, and it seems as though the more tricky a soft tube is, the better it acts as a detector. If Jones happens to have one of these tricky tubes and we do not, he will be able to give us cards and spades and still beat us when it comes to either local or DX reception. His distances and his audibility will be much greater than our own. As an example of this, the writer might state that he has about a dozen soft detector tubes, and out of this dozen, there is only one tube that stands out as preëminently the best. The same set will do many times better work with this tube than it will with any of the others, and it is easy to convince the average person that it is really a wonderful set, far beyond the average, when this tube is used. If you are a bug on long-distance reception and lots of it, then look to your detector tube.

Audio Frequency Amplification

Audio frequency amplification must be considered in connection with the quality of reception, and as this subject has been touched upon in previous articles it would be best to refer the reader to them.

The moral, if there is any to be derived from the above, is this: If you wish good reception and plenty of it, know your set even down to the minutest detail. Do not waste time changing from one type of set to another. Any of the forms now available will give, the writer believes, reception far beyond the expectation of its owner if it is constructed properly and if the detector unit in it is of the highest grade possible to obtain.

Radio reception at its best might be comparable to the phonograph, but it has the advantage that we do not hear the same thing over and over again, that we may pick our program to suit our mood and that it is a means of supplying valuable information and news items. We should enter into the game of Radio reception with a mind perfectly free from prejudice; we should be thankful that we are able to accomplish such a wonderful thing and we should discount or forget the minor flaws and troubles that accompany it.

The ideas expressed in this article are amply supported by the various manufacturers in the Radio field who are most earnestly endeavoring to give the public Radio material of the highest and most efficient types. This is quite in contrast to the situation of a year or so ago. It is the writer's belief that the public should co-operate by specifically calling for the better grades of apparatus.

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NEW-BORN COLT

(Continued from page 28)

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"After giving 'Colt Plexy' the last rub down and taking off a few of the trimmings because he is not able to carry as big a load as the 'King' by way of potentiometer and the .002 condenser, the colt is now away to a good start, and will show that he can 'go some.'"

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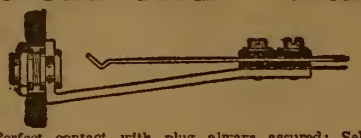
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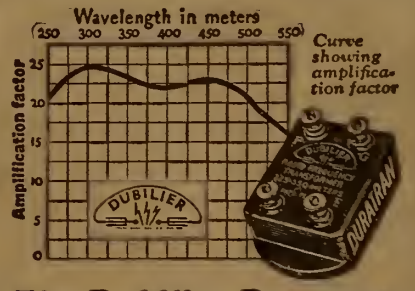

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A boy of eight learnt 10 consecutive letters in 5 minutes.
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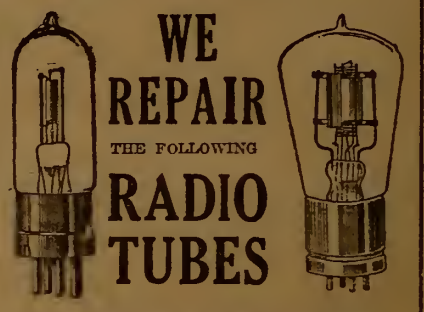
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WD-11	3.50	WD-12	3.50
DV-6	3.00	DV-6A	3.50
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Tells you why and shows you how. Sent on receipt of 10c or packed with each Bremer Tully Vernier Tuner.

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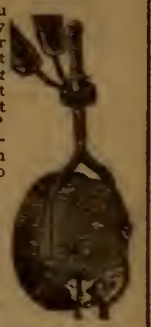
"RED-HEADS" are *guaranteed* radio phones. You run no risk when you buy them. Money back if, after 7 days' trial, you're not satisfied that they're the *best* receivers on the market at the price. Why not act *right now* and get a pair? It'll mean getting the *maximum* from broadcasting from the day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

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"Red-Heads" sent prepaid on receipt of price if you are unable to get them at your dealer's.
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Questions and Answers

Not a Copp Circuit

(05779) WCH, East Akron, Ohio.

I am using the Copp circuit with a homemade coupler and 23-plate vernier condenser. The coupler consists of 60 turns on primary and 36 on the secondary, diamond-wound, and 180 degree coupling. The aerial is the umbrella type, 12 legs, each 8 feet long, with lead-in from a central point, located in the attic. This combination is giving fine results, but I cannot tune above 411 meters.

I have tried various condenser capacities up to a .002 fixed condenser in parallel with the 23-plate and umbrella, antenella, and outdoor aerials, single and in combination, without the desired and expected result. I am so located that I cannot get more than 70 feet horizontal with a 30-foot lead-in on my outdoor aerial and this makes practically no difference in my set. My ground is a number 14 wire, 12 feet, to a cold-water pipe.

I prefer the umbrella aerial as I believe it is non-directional, but would like your advice as to what I can do to get wave length.

I would go to any length to get results—even to building a new set, although this one is a dandy within its limits. It is selective, as I can pick up or tune out either Birmingham, Ala., or Providence, R. I., both on 360 meters, by turning my condenser's vernier less than three degrees.

Please do not suggest an outdoor aerial longer than 70 feet with 30-foot lead-in as it would be impossible.

A.—We are of the opinion that the circuit of your description is that of a single circuit, regenerative rather than a standard Copp circuit, in which case it may be loaded to accomplish higher wave lengths by merely increasing the number of turns on the primary coil.

However, if you are not positive of the hook-up employed, we would suggest that you submit a diagram so that we may be able to advise you more authoritatively.

De Luxe and Tubes

(05851) FL, Superior, Wis.

Will you please advise me if UV-199 tubes can be used in Reflex De Luxe in May issues of Radio Digest?

Can a 1,850-ohm potentiometer be used instead of a 400-ohm.

Is the range on loop alone nearly as good as with aerial?

Can I use my old variocoupler with 80 turns in primary and 40 turns on secondary?

Are DeForest Radio frequency transformers good enough for this set?

Where wires in a diagram show crossed or with a dot at the cross should they be spliced or can they be run to binding posts on nearest instrument and fastened there? I aim to have this De Luxe as near perfect as possible, and any or all information will be appreciated.

A.—The UV-199 tubes can be used in the Reflex De Luxe circuit.

An 1,850-ohm potentiometer can be substituted for that of 400 ohms, and is recommended.

The receiving range with regulation aerial will be about one-half greater than with the loop aerial.

We would recommend the lattice-wound type of variocoupler as more effective than that of your description.

It is advisable to use a special Reflex type of Radio frequency transformer, although the DeForest type can be employed with fair results.

The conventional symbol of crossed wires in circuit does not indicate connection. If a dot or circle is shown at intersecting points connection is indicated; however they can be made to binding posts, as suggested, the chief consideration being to keep all leads as short as possible.

Radio Digest issues of May 5, 12, 19 and 26, inclusive, afford an exhaustive treatment of the circuit under discussion, and will be helpful in its construction.

Miloplex

(05528) SP, Jacksboro, Tex.

Say, Mystery Man, come here quick! I have just finished constructing your Miloplex number 2 with two steps of audio, turned on the juice and turned this dial and that for about one hour, while she blowed and whistled. Then friend wife said, "What is the matter, boy?" For an answer I plugged in a Murdock loud speaker and we could hear a program from WPAD, Chicago, all over a five-room house. Now I have got that off my chest, will you please tell me how to add Radio frequency to this brain child of yours?

A.—We are pleased to note your success and enthusiasm for results obtained with the Miloplex circuit. We told you so!

The circuit is to be taken through a series of developments of which descriptive details will be given in Radio Digest, and the matter of Radio frequency amplification, if demonstrably advantageous, will have attention in due time.

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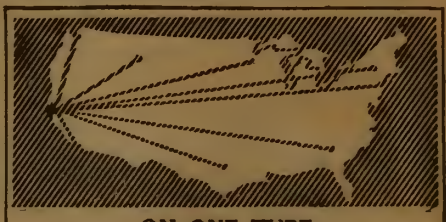

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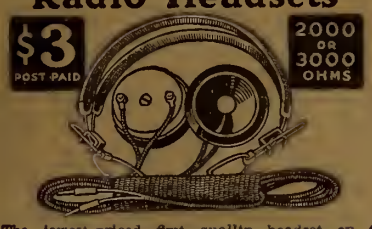

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3/32"	THICK	1¢ PER SQ. INCH
1/8"	THICK	1 1/2¢ PER SQ. INCH
3/16"	THICK	2¢ PER SQ. INCH
1/4"	THICK	2 1/2¢ PER SQ. INCH
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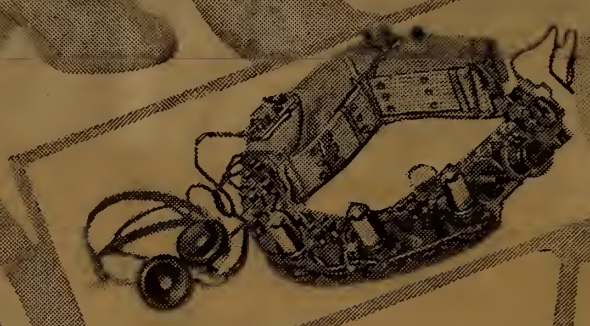
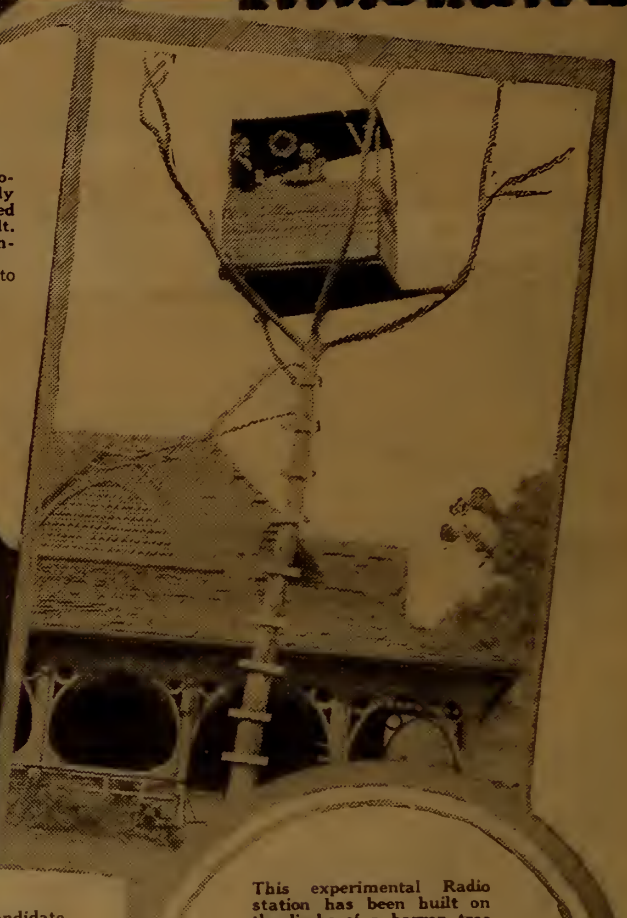
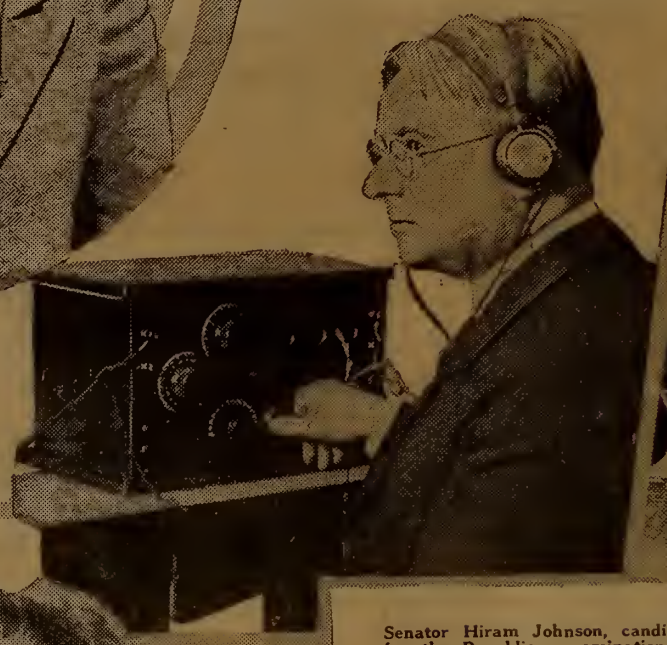
Radio Illustrated

This portable Radio set is intended for juveniles and may be connected to any electric light socket to receive messages. Eight people may listen in at once and receive at a distance of five miles. The instrument can easily be carried around in the pocket.
© Keystone



A devoted hiker who is also a Radiophan missed his set on his lonely strolls, so he built this self-contained receiver which he wears like a belt. The aerial rolls up in a strip of canvas as shown to the right.
Gilliams Photo





Senator Hiram Johnson, candidate for the Republican nomination for President, while in New York to confer with his campaign managers, listened in to President Coolidge's message to Congress at his headquarters.
Fotograms Photo

This experimental Radio station has been built on the limbs of a barren tree by two embryo scientists of Oakland, Calif., who are making observations and experiments there. The laboratory is 23 feet above the ground and is approached by steps which the boys built on the tree. The ingenious youngsters work after school hours in the improvised station which overlooks Lake Merritt.
© Keystone

This darling little four-year-old girl sends her picture with her compliments to the Radio Digest, saying she is a real Radiophan and reads the Digest after her father gets through with it. Her name is Helen Grimes and her home is in Des Moines, Iowa. She certainly seems to know what she's doing when she turns the knob.