

Supert...  
s Wrong with Your Receiving Set; A-B-C Lessons

# Radio Dig

EVERY WEEK PROGRAMS **Illustrate**

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

Vol. VIII

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By Radio Digest Publishing Co.

SATURDAY, MARCH 29, 1924

No. 12

## HOOVER FOR FREE AIR

### KFI, LOS ANGELES, GETS LONDON EAR

MUSIC CROSSES COUNTRY  
AND ATLANTIC

West Coast Station Congratulated by  
English Listeners After Sec-  
ond Attempt

By Strachan McMillan

LOS ANGELES.—London, England, has heard Los Angeles through the avenue of ether. The second attempt to span the continent of North America and the Atlantic ocean by relaying a Radio concert program to Europe through KFI, Los Angeles Examiner-Earle C. Anthony station, has resulted in attaining success.

The program from KFI was broadcast between the hours of 6:30 to 8 p. m., Pacific time. The entire program was picked up by KGO, the General Electric company's new station, recently dedicated in Oakland, Calif. KGO rebroadcast the program across the American continent to WGY.  
(Continued on page 4)



Selina Royle (above), who recently talked about "Her Stage Experience" from WOR, is a member of the cast of "Rust." Left, Hettie Delman, soprano, has appeared several times at WAAM. Helen Limerman (right), soprano, recently heard from WOS, Jefferson City.

### URGES QUICK WAR AGAINST MONOPOLIES

"Who'll Pay for Broadcasts?  
He Asks; Turns Down Li-  
censes on Receivers

Policing Force "Aband"

Secretary Says Need for Vigorous  
Reorganization of Radio  
Regulations Is Urgent

WASHINGTON, D. C.—Senator Dill, of Washington has introduced a Radio bill in the Senate. The bill is identical with the White bill in the House.

WASHINGTON, D. C.—"The need for Radio legislation is imperative, although no law will be a panacea for all Radio ills," said Secretary of Commerce Hoover, appearing recently before the House Committee on the Merchant Marine & Fisheries, in connection with the hearings on the White Radio bill.



### Columbus Checks Light Circuits; Noises Killed

Reception Improved by Fixing of  
Faulty Grounds

COLUMBUS, O.—Radio reception in Columbus has been greatly improved in several sections of the city as the result of the activity of a Radio committee named by Mayor J. J. Thomas recently. The big achievement of the committee has been in the clearing up of several faulty grounds in the municipal lighting circuits which had made clear reception impossible.

Secretary Hoover, during the course of his testimony, and endorsement of most of the features of the White bill, referred several times to Radio monopolies and told the committee that "it is not conceivable that the American people will allow this new born system of communication to fall exclusively into the power of any individual group or combination."

Hoover Talks of Monopoly

"It is urgent," continued the Secretary, "that we have an early and vigorous reorganization of the law in federal regulation of Radio. Not only are there questions of orderly conduct between the mul-  
(Continued on page 4)



# TO FINISH!—N. Y.

## If Mergenthaler Had Been Western Electric, What Then of Free Speech

In Which Is Shown "License" and "Sales Contract" by Which "King Telephone" Hopes to Control the Air and the Sovereignty of Americans

**L**INOTYPE machines and printing presses are sold without licenses restricting their use. They always have been so sold. If a "license" or "sales contract" were foisted on the newspaper and periodical publishers of the United States—a license similar to the one "King Telephone" demands be signed or he will prosecute—the public would have arisen in defense of free speech.

### How "King Telephone" Would Reign!

For the information of readers interested in freedom of speech, freedom of the press and freedom of the AIR, the following regrettable excerpts are made from the "license" or "sales contract" by means of which "King Telephone" would keep his crown. The excerpts are taken from a "license" form for "infringing" broadcasters who happened to use their brains and money in building their own station. The same clauses, however, are embodied in the "sales contract" when the Western Electric (A. T. & T.) sells a complete installation:

#### "License" or "Sales Contract"

"(a) The licensee will not use or permit the use of said station.....except for its own business;

"(b) The licensee will not use or permit the use of the said station.....except for Radio telephone broadcasting;

"(c) The licensee will not use or permit the use of the said station.....for toll or hire or for the service of the public in the transmission or reception of messages;

"(d) The licensee will not sell, lease or otherwise dispose of the said station.....without the written consent of the Telephone company;

"(e) The licensee will not alter, or allow to be altered, the apparatus, in any way whatsoever, to increase the power of said broadcast station beyond its present rated capacity of (number of watts filled in here) watts in the antenna circuit;

"(f) The licensee will not permit the operation of said broadcast station to interfere with the wire or wireless service of the Telephone company."

#### All This for Only \$2,000

And that is what the Telephone company is asking good money for, at the rate of \$2,000 for a 500-watt so-called "infringing" station. No prices have been quoted on 1000-watt stations, allowed by the government but evidently not by "King Telephone," although W. E. Harkness has been asked for this price repeatedly by Radio Digest.

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## Looking Ahead

"What's Wrong With Your Receiving Set" by P. J. M. Clute will be devoted next week to the methods of tuning out interference. How important this article is, is best illustrated by the volume of mail Radio supervisors receive from fans who complain of amateurs, power line hum, X-ray machines, etc., without really knowing that the whole trouble lies in their inability to tune properly. New fans should read this.

How Radio Is Broadcast is the next topic to be taken up by P. E. Edelman in his series of "Thirty-Minute A-B-C Lessons for Radio Beginners." Here he tells how the voice is "squeezed" onto the station's wave, and he tells the whole process so everybody can understand it.

The Mystery Man to Remove His Mask? Watch his next few articles, for that's just what he plans to do. In addition you can count on him next week for another excellent article on wave traps. But who is the Mystery Man? No, you're wrong. Guess again.

Reflex Sets in General will be told about in the continuation of M. W. Thompson's article on this subject next week. And that will end the excellent series "Simple Explanation of Radio for Everybody." Get in on the finish!

More Super-Heterodyne Information—Read H. J. Marx' article next issue. Super-Hets are growing in popularity every week. Get ready to build one now.

Newsstands Don't Always Have One Left

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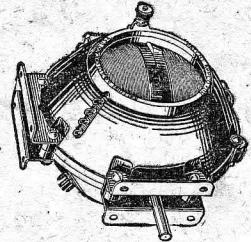
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### Whelan Throws Gauntlet at Feet of WEA F; Huge Scandal Hinted

NEW YORK.—Through action taken by its Board of Estimate, the City of New York has officially declared war on the A. T. & T. company, its alleged monopolistic tendencies and WEA F's supremacy of the air. Not only did the members of the board grant Commissioner Whalen permission to spend \$50,000 for the erection of a powerful broadcasting plant on the Municipal Building, but also instructed the Corporation Counsel to appear in Washington when the Federal Trade commission makes inquiry into the frequently made charge that the Telephone Company is seeking a monopoly of the air.

Commissioner Whalen was jubilant at the message of his plea for funds and was congratulated when someone asked what this meant for the future.

#### Means N. Y. Throws Down Gauntlet

"What does it mean?" roared the commissioner. "It means that the city now can go in and establish a real broadcasting station. It means that we are throwing down the gauntlet and that there will be no fight. The corporation counsel is to be employed to study the subject and to go to Washington if necessary to combat the monopolizing by the A. T. & T. company.

"It means that we will not have to take our religion, our education, or our politics from the Radio Trust, and that the broadcasting station we erect will be as powerful as the one now maintained by WEA F. It means that the city and people of the country generally will be able to listen in to a station that is not operated for commercial gain.

#### Charges \$5,000,000 a Year Gain

"All that is necessary to see what this Radio trouble is all about," went on the commissioner, "is to remember that WEA F gets \$10 a minute for their advertising.

"Multiply that by every minute in the year, because they can be going all the time, and you soon find out why they are so anxious to protect their patents by federal injunction.

"They are going to the same agencies for relief," continued Whalen, "that the B.R.T. (New York subway) used when it operated its trolley line and subways through receivers. If they have the same success as the B.R.T., the control of the air has already passed directly into the hands of the American Telephone and Telegraph company.

Investigation Will Surpass Oil Scandal  
"I have received several favorable comments about the letter I wrote to the Federal Trade commission asking for an investigation. If there is a real investigation of this Radio monopoly it will make the oil scandal at Washington look small.

"The truth is that officials and the people are too gullible. This sort of thing is started in a small way, but soon grows to be a monopoly."

Though it continues to deny the statement that it seeks control of Radio, the A. T. & T. company took another legal step, in direct contradiction of its denials, by filing an injunction suit in Newark, N. J., against the North American company, operators of a system of "wired Radio." This action closely followed the one filed against WHN in New York and made the second of the patent infringement suits.

#### WEA F's Answer Weak

It is learned through sources that are very close to the A. T. & T. company that it is determined to put Radio broadcasting on a "business and economical" basis, and that the suits for alleged infringement of patents are the forerunner of a fight that it expects to be long and bitter.

It is further stated that the company desires to check the unorganized mushroom growth of the Radio industry and "force" a new stage of development. It was not until it determined on this policy that it is deliberately starting the litigation.



# ETHER MEDIUM FOR SENDING THOUGHTS

## WJAZ HAS TRYOUT PROVING TELEPATHY

### Three Famous Psychologists Give Invisible Audience Twelve Tests—Letters Hold Much Promise

CHICAGO.—To prove the existence of thought transmission, or mental telepathy as it is commonly known, Station WJAZ, the Zenith-Edgewater Beach Hotel here, recently had three eminent psychologists for the first time in the history of Radio give a series of tests of international scope, heard as they were over half the world.

At the time of writing, over 6,000 letters from listeners taking the test, have been received and are being tabulated. A test summation, meanwhile, of the earlier letters indicates that the test mental messages in a large number of cases were received correctly or near correctly, thus proving the existence of mental transmission and reception, however undeveloped the sense may be.

Prof. Robert H. Gault of Northwestern university, Prof. Gardner Murphy of Columbia university and Prof. H. B. English of Antioch college conducted the tests.

### Twelve Test Questions Asked

Professor Gault, after an introduction by Gene McDonald, owner of Station WJAZ, announced the first test that he was thinking of a number between one and 1,000. (It was 664.) Letters showed 994 and 499 predominating, while a few got the number correct.

2. The professor thought of script letter over a wild animal (a letter "S" over a walrus). Few received the walrus impression but had the script letter wrong. Zebras led, followed by elephants as the second most popular impression. Practically the whole zoo was represented in the 150 test letters. "L" and "K" were the more frequently reported letters.

3. A horizontal line, crossed by a diagonal one of a certain color (yellow). The order of colors reported was red first, orange second and yellow third.

4. The professor was eating some food (a beet). A few beets, accompanied by numerous other edibles were reported. Ice cream and cake even, were listed.

5. The professor was subjected to pain on one of his arms or hands (pinching himself immediately below the fourth finger on his left hand). Many listeners "observed" this sensation correctly. Pin pricks instead of pinches were often reported.

### Pictures Show Fear of Fire

The sixth and seventh were pictures of a drowning man and a fireman, respectively. Writers often described the feeling of fear and fire. The eighth test provided that listeners were to concentrate on a word, and the three psychologists would attempt to receive it correctly. "Radio" was the word received by the professors, and number of letters showed that this word had been "sent" by numerous listeners in.

Results for the rest of the tests have not yet been tabulated at this time. The ninth test was a drawing. In the tenth listeners were asked to think of a unique experience and the professors would attempt to receive it. The eleventh and twelfth tests were attempts to have half the audience communicate thought to the other half, dividing the audience alphabetically by their names.

## Technical Experts Talk to Milwaukee Experts

MILWAUKEE.—E. T. Flewelling, inventor of the "Flivver Super;" the Mystery Man, inventor of the Milplex circuits; David Grimes, inventor of the inverse reflex, and Harry J. Marx, technical editor of Radio Digest, were guests and speakers at the last monthly meeting of the Milwaukee Radio Amateurs' Club, Inc. Broadcast listeners as well as "key pounders" found the talks well worth hearing.

## FAKE TEETH BREAK SO HE "WIRES UP"

KANSAS CITY.—Radio was recently put to a unique use here by J. C. Rittenhouse. A WDAF program caused him to neglect keeping an engagement with the dentist to have a set of false teeth repaired. In the morning they dropped apart. Undaunted, Rittenhouse sought the trusty Radio set. Tearing a wire from a coil he proceeded to "wire up" the teeth. Radio held till the dentist could be seen.

## FINDS HIS GOLDEN RAINBOW BY RADIO

INDEPENDENCE, KAS.—Radio may prove the means of Charles Faye, of this city, securing a fortune. Recently local Radiophans heard a broadcast from Station KDKX saying that Beaumont, Tex., wished to locate Charles Faye, who had been bequeathed a considerable sum of money and who had been missing several years. Faye was informed. He said he at one time lived in the Texas city and would communicate immediately.

## HERE'S FIRST TRUE RADIO FAN



The first true Radio fan, literally speaking, is the one pictured above in the hands of Miss Mildred Nelson of Philadelphia, whose father has been nursing his hobby along by making some very odd types of receivers. The crystal detector and phone binding posts are on the right, and aerial and ground connections on the left. The inductance is tuned by opening or closing the fan. Mildred's dad also built her a book set, which was shown in the Digest recently. P. & A. Photo

## Telegraph Applause Halts "Moonlight" Show at WHN

NEW YORK.—Radiophans by the thousand who tuned in on Station WHN after all the others had signed off at 11:30 one evening last week, received an exceptional

treat, for the entire cast of "Moonlight" went over to "The Voice of the Great White Way" after the regular performance at the Longacre Theater. The show went on and on for two hours, being delayed every few minutes by the necessity for encores in response to the hundreds of telegrams which poured in.

## HUE FOR TALKS

### Rebel

the revolution has been unsuccessful. The revolution continues.

Yet twice daily Radio, across the border in Spanish, minor successes, of the dynamiting trains or the capturing of towns.

One quiet evening less than a month ago De la Huerta himself talked to a group of 25 of his agents at Galveston. His voice was heard clearly from the broadcasting station at Frontera.

### Radio May Help Rebels Win

"If the rebels win it will be because of Radio," Jose Rementeria, Huertista agent in Houston, said. "Every day I either talk or send messages by Radio to my chief. He tells me the situation in his own words. Interests favorable to us thus are in constant touch with the situation."

On the same day that rebels reported 60,000 volunteers coming to their side, Oregon sources carried a statement to the effect that the revolution was over, train and steamship service reinstated and Huertistas scattered in small bands into the mountains.

Conflicting reports, however, filter across the border daily. The Oregon forces, when first informed of the senate investigation of oil grants in Mexico, instigated a report that De la Huerta had obtained money from oil men and was using this to finance the revolt.

### Huertistas Spoil Oregon Story

That afternoon, speaking by Radio, De la Huerta told his agent in Houston that in a few hours Washington would know the truth.

Late editions of the same papers which had carried the story of Huertistas and oil men's money, Washington dispatches quoted Edward L. Doheny as saying he gave Oregon \$5,000,000 to fight the revolt.

WEAY, the Iris theater broadcasting station, has an auxiliary 50-watt set, which has been converted into a CW Radiotelegraph transmitter for use in daytime work with Frontera, Vera Cruz and sometimes Tampico and Mexico City.

## Rebroadcast Program from Super-Heterodyne

### WJAX IS Picked Up and Re-sent by WHK

CLEVELAND.—An experiment fraught with interesting possibilities was made here recently when part of a program being broadcast from WJAX on a wave length of 390 meters was received on a super-heterodyne receiver at WHK and rebroadcast from the latter station on a wave length of 283 meters with entire absence of distortion or interference.

The output circuit of the super-heterodyne was connected directly to the speech input equipment at WHK and announcements and program numbers were thus broadcast from both stations as if from the same microphone. A great number of broadcast listeners were puzzled at their reception of the same program on such widely separated wave lengths and both stations were flooded with telephone calls asking an explanation. The clarity of reception on both wave lengths was such that the listeners could not tell which station was which.

### Denver Prepares for Show

DENVER.—This city is making elaborate arrangements for its first Radio Show, scheduled for the week of April 9.

THE ANTENNA BROTHERS

Spir L. and Lew P.

Add—One Cell





**LATE MONOPOLY BULLETINS**

WASHINGTON, D. C.—The Radio Corporation of America and other respondents charged with having created a Radio monopoly, have petitioned the Federal Trade Commission for a second extension of thirty days in which to file their answer to the charges. Their answer was due March 25. At the time of writing the commission had taken no action on the second extension request.

WASHINGTON, D. C.—Senator Howell of Nebraska, has introduced a bill in upper house "reaffirming the use of the ether for Radio communication or otherwise to be the inalienable possession of the nation, and for other purposes." The bill, which has been referred to the Senate committee on interstate commerce, is designed to prevent Radio monopolies.

The bill sets forth the fact that the ether is the possession of the nation and it permits the president in case of war to terminate or revoke licenses, and makes the licenses available only for a period of two

years instead of the time provided for in the present law or in the White bill now pending in the House.

NEW YORK.—Since the Telephone company and WHN battle started, it is reported by the director of Station WHN, N. T. Granlund, that the phone service at the studio of WHN is practically discontinued by the hour every night. It is also said that when Charles Pope Caldwell, attorney for WHN, is broadcasting the independent broadcaster's side of the question, a peculiar interfering whine also comes on the air on 360 meters.

That the A. T. & T. company would stoop to interfering with its opposition is doubted, but nevertheless the Radio supervisor of this city is investigating the source of the 360-meter howl.

Marcus Loew, owner of WHN has more than 10,000 letters of encouragement, many containing money, to support the fight. The money is being sent back with thanks.

told the committee that he was absolutely opposed to the granting of any licenses for a period of fifty years instead of ten. He said that this would have a tendency to create monopolies in the air. The ether, he said, should be retained to the public. It is not in accord with public interest, Mr. Hoover said, to allow long licensing permits.

Charles Pope Caldwell, of New York city, a former Representative, appeared before the committee and was very em-

phatic in his references to the American Telephone & Telegraph company as the "Radio monopoly."

**Tells How A. T. & T. "Showed Teeth"**

He said that in general his colleagues favor the White bill. In discussing the matter of monopolies Mr. Caldwell said that at a meeting some time ago Mr. Griswold of the American Telephone & Telegraph company stated that his company would drive all of the other broadcasters out of business when they were ready to do

**KFI RELAY TO LONDON**

(Continued from page 1)

the General Electric company at Schenectady, N. Y. Here the program was relayed for its last lap across the Atlantic ocean.

**2LO Reports Success**

At 10 p. m., Pacific time, the Los Angeles Examiner received the following telegram from Station 2LO, London, England, containing announcement of the successful achievement of the carefully planned undertaking:

"KFI program received well via Schenectady and retransmitted from 2:30 to 3 G.M.T. Congratulations."

It was several weeks ago that the first attempt was made. But owing to the activity of an electric storm raging in the middle west and the resultant interference to such an extent that the eastern Radio station was unable to receive clear signals.

He said that Griswold had threatened injunction suits unless the independents did what the company said they should.

Mr. Caldwell spoke several times of the Radio monopoly and referred to the "big five" whom he said were the A. T. & T., Radio Corporation of America, General Electric, Western Electric, and Westinghouse companies.

**Raps Undefined Powers of Secretary**

Mr. Caldwell in speaking specifically of the bill stated that he was of the opinion that the decisions of the Secretary of Commerce as provided for in the bill should be reviewable by the courts. Also he objected to the language of the bill when referring to the Secretary such-and-such-a-thing was to be done "in his judgment."

(Continued on page 8)

**THE BILL**

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monopoly must

er in his testimony of the Secretary said "that it should be kept open free for full individual development and we should assure that there can be no monopoly over the distribution of material." In taking up the matter of payment for broadcasting Secretary Hoover said conclusively that he did not favor the placing of a license on receiving sets. In this connection the Secretary said:

**Asks Who Will Pay for Broadcasts**

"Among other problems is one as yet totally unsolved. That is, how can we secure perpetually full and complete broadcasting service in such fashion that it will support itself otherwise than in dependence upon the sale of manufactured articles or upon advertising. It seems to me we must leave this question to further experience. I do not favor a solution by any license and charge upon receiving sets as is imposed in other countries. So far as I am advised, the United States is the only country which does not impose a license upon or regulate receiving sets." Calling attention to the inadequacy of his facilities for policing Radio the Secretary said:

"One of the great difficulties in the regulative efforts of the department heretofore has been and will continue to be the lack of funds under the appropriations made for that purpose. The attempt to police 20,000 transmitting stations in this country with a total force of twenty-nine inspectors is obviously an absurdity."

**Hoover Opposes Long Term Licenses**

During the course of Commander B. C. Bingham's testimony, Secretary Hoover

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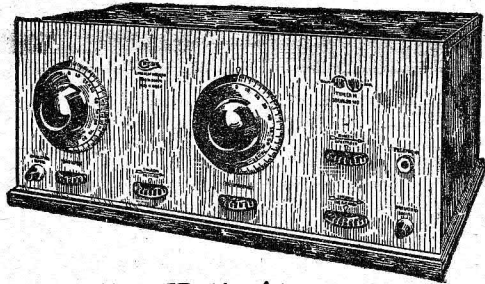
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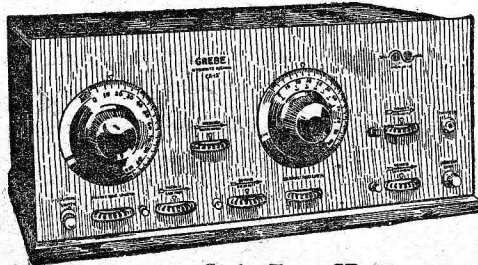
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# BEFORE THEY THOUGHT OF "MIKES"



Extreme left is Elmer G. Johnson, WJAX announcer, who last week was the youth with sunbonnet on head. Extreme right is J. M. Witten, WOS announcer, last week's other baby. Read below.

The little chap above holding onto the frame of his picture is thinking, perhaps, of the day when his voice would be heard thousands of miles. He'd be almost as good looking now, if it wasn't for his mustache. The other little fellow is a westerner. His grown up counterpart said, "Please cross me off the mailing list the week the picture appears as my courage and resistance are both low." Both are announcers whose last names begin with H. Tell you the rest next week.

**Elmer G. Johnson, WJAX**  
**E**LMER G. JOHNSON, of WJAX, the Union Trust company, Cleveland, has been given various titles: "The Man with the Million Dollar Voice," "The Sheik of WJAX," and "The Wave Himself." It is to be hoped that his pleasant voice will bring him even more than a million dollars and, by the way, did you ever notice that Mr. Johnson's announcements of musical numbers are always technically correct? Whether the number is "Andante Sostenu to from Symphonie Gothique," or "Selections from Scheherazade" — Italian, Arabic, or Sanskrit is all the same to this chap. Try pronouncing "Scheherazade" and see if you can get away with it! It's a gift.

During recent hostilities Mr. Johnson was elected to Harvard University to instruct the young idea in how to shoot code via Radio, and they do say he was some instructor, for he is an operator of no small ability. You may have noticed that

he is also able to produce "The Wave from Lake Erie" even though said lake is frozen over clear to Canada. That takes real genius. As for his title "The Sheik of WJAX," Elmer's pleasing voice brings him bales of letters from the lady listeners and it was only natural that less-favored individuals would say "Sheik!" Be that as it may be, long may he wave!

**J. M. Witten, WOS**

**J.**M. WITTEN is the official program director and chief announcer of Station WOS, Jefferson City, Mo., and better yet to tell, a sprightly, handsome, young husband and father. Only good living and looking folks could have such a son. He ran the gamut of his home schools from primary to high, and began working by hardwiring in his father's store of that sort.

Three years and a half he was Sergeant of First Platoon, Co. D 139th Inf., A. E. F.

A shard from a bursting German shell, in Argonne near Baulney, hit him in left knee, from which it is bent and stiff for life. He now rejoices in the happiness and honor of being his wife's husband, and father of a baby, Frances Newton, as well as the fore-runner of good things from WOS.

When WOS announces the "Little Brown Jug," his voice is a bleak sadness only, and you can feel the tears trickling down his cheeks like as if he had recalled a long lost friend. If there is any lack of sym-

pathy for his mighty misery, we have not located it yet.

We have heard sweethearts speaking, the world over, from their inward abundance, but none are sweeter than J. M. W. of WOS. Words are powerless, except to say his is sweeter than maple sugar with old Missouri bee gum honey spread on it.

The pay of marine Radio operators ranges from \$90 to \$150 a month, with all food and quarters supplied.

## Fans' Ballot Ties Can to Volstead

Furthermore, It's a Budweiser Can; "Drys" Lose In WJAZ'S Telegraph Canvass

**CHICAGO.**—Volstead doesn't rate very high in the minds of Radiophans, if the recent referendum on the eighteenth amendment taken by Station WJAZ is any criterion. Establishing a record for the number of telegrams received at any one point in one day, 27,120 listeners paid an average of seventy-five cents apiece to vote "yes" for the modification of the Volstead act, while 10,071 "drys" wired the Zenith-Edgewater Beach hotel station their "nays."

Thirteen thousand telegrams, jammed in the rush to vote on the popular subject, arrived too late to be counted, but carried out the same ratio for and against. "Yours for more dampness in this desert of ours! Mortify the Volstead act!" wired the enthusiast crew of a vessel.

**Milwaukee Wet Eight to One**

Telegraphed votes were all that was necessary to qualify for the referendum, and telegraph the Radiophans did! The ratio of three to one was fairly consistent throughout the country, although in the larger cities the ratio of the wets to the drys ran much higher.

In Milwaukee (probably in reverence to Budweiser) the ratio was abnormally high—eight wets to one dry.

"Neither side can claim this poll was not fair," said Gene McDonald, owner of Station WJAZ. "People don't frame votes at seventy-five cents apiece. The fact that the wet judges themselves decided to throw out the solid wet vote of Fort Wayne (Ind.) shows the spirit of the contest."

The Fort Wayne vote referred to was where five hundred citizens of that city had sent their "yes" in one telegram.

## WHAZ GIVES THRILL TO HAWAII LISTENERS

Station In Troy, N. Y., Hears from Feminine Fan

**TROY, N. Y.**—With "Aloha," greetings from Hawaii, the Paradise of the Pacific, Mrs. C. H. Judd, of Waikane, P. O. Oahu, Hawaii, expresses "Many thanks for the thrill of hearing WHAZ." She reported that two steps of audio amplification brought the program of the Rensselaer Polytechnic Institute station in clearly with the phones, and if NPM, the naval station twelve miles away, had been off the air "I would have had you clearly through the loud speaker."

She continued in her letter to the station here, "Can you imagine how my husband felt when he heard from the Rensselaer Polytechnic Institute? He went to the institute at Troy from Hawaii when a young man in 1884. We heard WHAZ through all the high power so near to us, which very nearly makes Radio impossible for us here. We are 23 miles from Honolulu."

## Dentists Talk from CKY, Canada, on Care of Teeth

**WINNIPEG, MAN.**—CKY, the Manitoba Telephone System station here, has begun a regular series of Tuesday evening talks by dentists representing the Manitoba Dental association. Each talk is fifteen minutes long, and has to do with dental hygiene.

## Elderly WDAF Fan Dies With His Earphones On

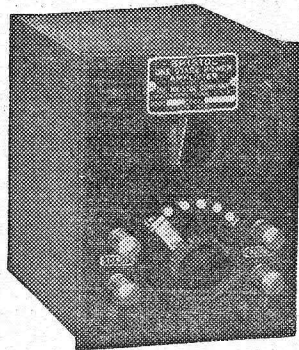
**KANSAS CITY.**—George A. Daniels, 67 years old, died as he had lived—a Radiophan. While Daniels sat with a headset WDAF, the Kansas City Star, death came clamped to his ears listening to Station from heart disease.

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Quality of reproduction such as only the original itself can equal. Speech that is so distinct that the voice heard is the actual voice of the speaker. Music that requires no tolerant imagination to be recognized as music of the finest type.

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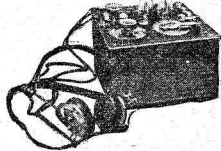

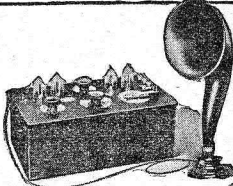
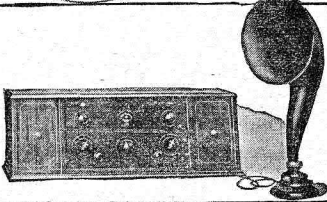
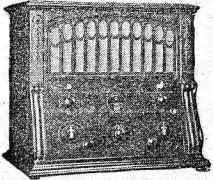
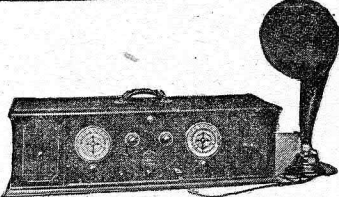
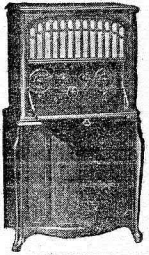


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New Performance Records*

*"There's a Radiola for every purse"*

\$35 to \$425

	MODEL †	PRICE	APPROXIMATE RANGE	TYPE OF ANTENNA	DEGREE OF SELECTIVITY
	<b>Radiola III</b> With two WD-11 Radiotrons* and head telephones.	<b>\$35</b>	Up to 1500 miles with headphones. Local stations on Loudspeaker.	Outdoor or indoor antenna.	Improved selectivity. Minimum radiation.
	<b>Radiola Balanced Amplifier</b> To be used with Radiola III. With two WD-11 Radiotrons.*	<b>\$30</b>	Gives Loudspeaker operation up to 1500 miles under favorable conditions.	Outdoor or indoor antenna.	
	<b>Radiola III-A</b> with four WD-11 Radiotrons,* head telephones and Radiola Loudspeaker.	<b>\$100</b>	Loudspeaker operation up to 1500 miles under favorable conditions.	Outdoor or indoor antenna.	Improved selectivity. Minimum radiation.
	Same without Loudspeaker.	<b>\$65</b>			
	<b>Radiola Regenoflex</b> with four WD-11 Radiotrons,* and Radiola Loudspeaker.	<b>\$206</b>	Loudspeaker operation up to 2000 miles under favorable conditions.	Outdoor or indoor antenna.	Extraordinary selectivity. Non-radiating.
	Same without Radiotrons or Loudspeaker.	<b>\$150</b>			
	<b>Radiola X</b> with four WD-11 Radiotrons.* Loudspeaker built-in.	<b>\$245</b>	Loudspeaker operation up to 2000 miles under favorable conditions.	Outdoor or indoor antenna.	Extraordinary selectivity. Non-radiating.
	<b>Radiola Super-Heterodyne</b> with six UV-199 Radiotrons* and Radiola Loudspeaker.	<b>\$286</b>	Loudspeaker operation up to 2000 miles with internal loop. With external loop up to 3000 miles under favorable conditions.	No antenna. (Concealed small loop built into set.)	Super-selectivity. Non-radiating.
	Same without Radiotrons or Loudspeaker.	<b>\$220</b>			
	<b>Radiola Super-VIII</b> with six UV-199 Radiotrons.* Loudspeaker is built-in.	<b>\$425</b>	Loudspeaker operation up to 3000 miles under favorable conditions.	No antenna. (Concealed large loop built into set.)	Super-selectivity. Non-radiating.

† All Radiolas sold without batteries.

\* Only dry batteries used.

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# FORESEES FALL OF MUSIC BAN POLICY

## PREDICTS STAMPEDE OF WISE PUBLISHERS

H. C. Weasner, Buffalo Composer, Brands A. S. C. A. P. Idea Short-sighted

By Lloyd S. Graham

**BUFFALO.**—The article in a recent issue of the Radio Digest which discussed and indicated the stand that Will Rossiter of Chicago and the firm of Waterson-Berlin & Snyder company of New York, were taking on the subject of broadcasting with the American Society of Composers, Authors and Publishers, of which they were apparently unwilling members, has raised a storm of discussion in this city in various circles.



H. C. WEASNER

There are without doubt thousands of Radio-phans in this city who applauded in spirit the action of the two music publishers, as shown in the article mentioned.

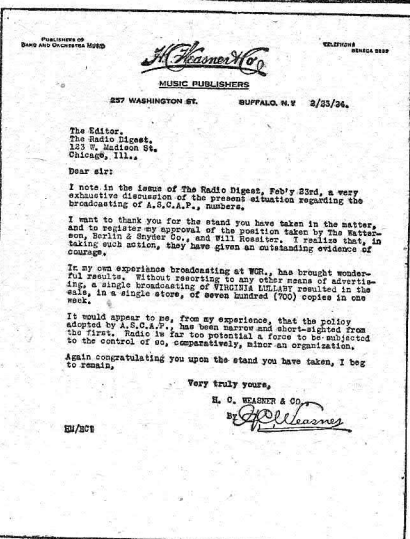
H. C. Weasner, of H. C. Weasner & Co., author-composer-singer-publisher, characterized the action as "the beginning of the stampede of the wise publishers in the American Society of Composers, Authors and Publishers."

### Calls A.S.C.A.P. Policy Short-Sighted

Mr. Weasner predicted that it would lead to the ruin of the society, or the radical alteration of its program of activity against the broadcasting stations at the present time, which would in either case end in the unrestricted broadcasting of musical numbers.

"It is difficult to conceive of a more short-sighted policy than that of the A.S.C.A.P. toward the broadcasters," Mr. Weasner declared. "Merely from selfish interests it has been proved to my satisfaction, at least, that every member of the

# ENDORSES DIGEST'S MUSIC FIGHT STAND



Above is facsimile of letter from H. C. Weasner, Buffalo, N. Y., music publisher, endorsing stand of Radio Digest in opposing the demands of the "music trust."

society is being vitally injured through the fact that the songs of members are not being broadcast.

"No one can predict what the power of Radio will be in the future. Such swift advances have already been made in the science of broadcasting that in any case the next ten years is likely to see progress beyond the dreams of any of us, so that within that time the rules which the A.S.C.A.P. is trying to foist upon the broadcasters in particular and the public in general at this time will appear puny and childish.

### Radio Power to Surpass Press

"We speak of the power of the press. The future will show us a power in Radio for disseminating information which will equal, probably surpass that of the press. It is in a class by itself for giving with equal ease and swiftness information and entertainment. There is not one person in a thousand, even, of those connected with the industry who fully appreciates its possibilities.

"I believe I appreciate the possibilities because of the experience I have had with

songs which I have published and sang from WGR at Buffalo. My 'The Cradle of Gold,' 'Lonesome' and 'The Virginia Lullaby' have met with an astounding popularity even in-remote parts of the country, due, I am frank to say, largely to the fact that they instantly met with favor with the audience that listens to my occasional concert from WGR. I have talked with other independent music publishers and I know that this is also true with them."

### Sheet Music on Air Sells Good

In order to observe the angle of the situation as presented by the sheet-music dealer, the writer discussed the matter with several of them. The result may be summed up by the statement of a girl at one of the biggest sheet-music counters in Buffalo. All of the reports bore along the same line.

"Sure! Radio is a big help to us, and I can see it getting bigger every day. People began to drift in six months ago and ask for songs that I never heard of. Like as not they would get all peeved up and would think I was a dumbbell for being so ignorant. I got so I knew the kind. Always someone who had heard a number that appealed to them by the wild air waves from Podunk, or Chicago, or somewhere by an independent publisher.

"It got so bad we had to do something, so now we always take the name and address of the party and send for the song for them. Usually order extra copies, too, for nine times out of ten the same number appeals to several persons who happen to pick it up."

### Manager Afraid of A.S.C.A.P. "Squeeze"

The manager confirmed what the girl had said, but was for giving her a "bawling out" for saying the things she had until he was assured that his name or the name of the store would not be used.

"You know," he explained, "some of the members of the A.S.C.A.P. are jobbers as well as publishers, and they can make it mighty uncomfortable for us if they think we are giving out anything of that kind." That, pungently, is the sheet-music side of the situation, not only in Buffalo, but in the rest of the country.

### WGR Stands Against "Music Trust"

It is the policy at WGR at this time to stand firmly against any connections or overtures on the part of the A.S.C.A.P. The utmost care is taken to prevent any "trust" song from creeping into any program. Anyone who requests a "trust" song is politely but firmly told that it will be impossible to accommodate them because of the fact that it is copyrighted and the station does not have the permission to use it.

# CINCINNATI GETS HER THIRD PLANT

## STATION ON AIR THREE TIMES A WEEK

### Apartment Hotel Undertakes Broadcasting on 222 Meters; Pat-terns WLAG

**CINCINNATI.**—Cincinnati is to have a third big broadcasting station. The two 500-watt stations already on the air here are WLW, Crosley Radio Corporation, and WSAI, the United States Playing Card company.

The new station will be located in the Hotel Alms, a suburban apartment hotel, and its first program was scheduled to be given March 22.

The new station, call letters to which had not been assigned at this writing, will broadcast on a lower wave length than that of the other two local plants. These send on 309 meters; the new one will operate on 222 meters.

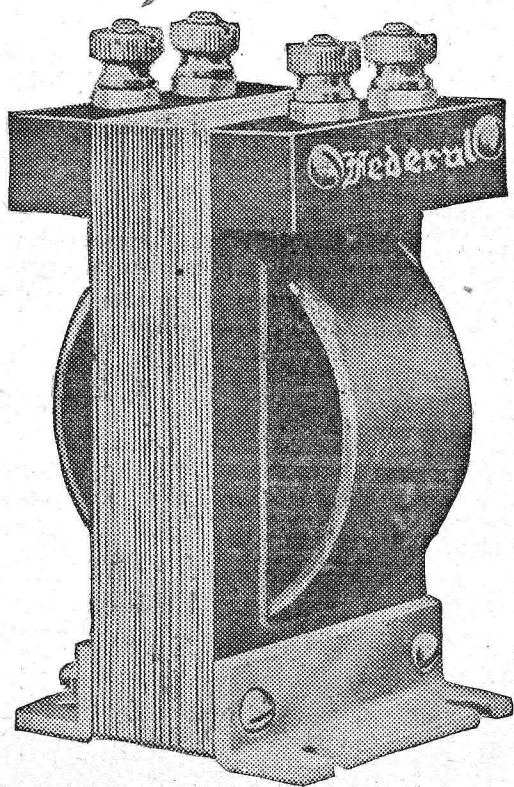
The new station will be on the air on Monday, Wednesday and Sunday evenings, and will be maintained by the Hotel Alms management. The hotel itself will furnish the programs and manage the studio. Harry Breckel will be operator, and Dan Meyers, manager of the Hotel Alms, will have charge of the studio.

The station will be unique in a number of features. It will be operated solely on batteries, and is closely patterned after Station WLAG of Minneapolis, nominated by the bureau of standards as one maintaining most constant wave length.

The sending apparatus will be situated on the fourth floor of the hotel, and the studio on the first. A system of controls will connect the studio with the ballroom of the hotel to permit programs to be broadcast from the latter place as well as from the studio. Jack Keefer's orchestra will be used to furnish dance music on Sunday nights.

### Vacuum Tube Current

Vacuum tube filaments should never be operated with a greater filament current than is absolutely necessary to give maximum signal strength. When this rule is not followed, the tungsten wire forming the filament rapidly diminishes in size and shortens the life of the tube. Under proper use, a tube should give good service for 1,000 hours or more.



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The Sign of Reliable Radio Dealers



**WHITE BILL SPOKESMAN SEES RAILROAD USE OF AIR**

(Continued from page 4)  
He wanted these clauses made specific. C. B. Cooper, representing the Radio Trade association, endorsed what Mr. Caldwell had said. He said that his association wants to support the bill with the changes suggested by Mr. Caldwell. He asked that the committee take particular cognizance of the "Radio monopoly."

**Another Warns of Radio Monopoly**

Raymond Asserson, broadcasting supervisor of New York city, told the committee in some detail of the efforts which have been made by the city of New York to purchase a broadcasting station from the American Telephone & Telegraph company. He was very bitter in his talk against that company as the Radio monopoly and he made several specific charges against it. He said that the city of New York has wanted a station for the past three years but that it has been balked in every effort by the Telephone company.

In connection with the high power equipment now being used by the Telephone station in New York city, Mr. Asserson said it is not using that for experimental purposes, which is its contention in obtaining a special permit from the Department of Commerce. He said that the Telephone company is now making the biggest "steal" in the history of the country. He gave it as his opinion that no ownership of patents would allow such a monopoly as now exists in the Radio field.

**N. A. B. Would Give Advisory Board Power**

Another important witness of the opening hearing was Paul B. Klugh, executive chairman of the National Association of Broadcasters. He told the committee that his organization represents 78 of the leading broadcasters of the country and that

his organization approves the bill "in spirit" but made some recommendations. He said that the N. A. B. did not favor the appointment of the advisory committee as now provided for in the bill. He said that his organization favored the appointment, not by the Secretary of Commerce, of some kind of a board or commission with power to act, rather than leaving the whole matter in the hands of the Secretary.

In connection with the personnel of the advisory committee, Mr. Klugh thought that the amateurs, manufacturers of Radio apparatus, and the broadcasters should all be represented on that committee. Speaking of monopolies he referred to the American Society of Composers, Publishers and Authors as an "iniquitous monopoly."

**Tells of Railroad Possibilities**

One of the interesting witnesses at the hearings was A. R. Belmont, vice chairman of the Radio committee of the American Railway association, who suggested in a few words what the Radio possibilities are for the railroads of the country.

What he particularly wanted in the bill, he said, was to insert a clause which would allow the construction of Radio equipment on "mobile railroad equipment." He said that the railroads of the country have been experimenting with Radio for a long while but that at the present time none of the roads are using it in actual operation.

He pointed out, however, that Radio might be used to keep the trains and stations in communication and even on long freight trains to keep the engineer and the

conductor in touch with each other. This would mean, he said, connecting up the engine with the caboose.

**A. T. & T. Suggests Changes**

E. S. Wilson, Vice President of the American Telephone and Telegraph company, appearing before the committee at the second day's hearings, said that generally speaking his company is in favor of the White bill, but he did make a few suggestions for minor changes.

One of these included the fact that an appeal should be allowed from the decision of the Secretary of Commerce in the matter of granting licenses for broadcasting stations. He also told the committee that he believed that when the Secretary of Commerce is about to revoke a license for any reason, that the offender should be allowed to remedy any violation of the law, before revoking the license.

**Davis Wants Broadcasting Board**

Judge Davis, a member of the committee, at this point asked W. E. Harkness, vice president of the A. T. & T., if he did not favor the appointment of a board or commission to have jurisdiction over Radio communication rather than the Department of Commerce. Mr. Harkness said he had no preference in this matter. Judge Davis, however, said that in his opinion inevitably the government will have to go to something of the kind.

K. B. Warner, secretary of the American Radio Relay League, said that from the standpoint of his association the present law is satisfactory and to that extent it is opposed to the new White bill.

**M.P.P.A. Proves Too Much for Him; Quits**

**Marks Claims Some Members Violated Written Pledges**

NEW YORK.—Edward B. Marks has resigned from the Music Publishers' Protective Association, one of the organizations agreeing with the American Society of Authors, Composers and Publishers in its attempt to collect music license fees from broadcasting stations.

Mr. Marks, a member of the M.P.P.A. since its inception, said that his resignation spoke for itself. His is the first resignation from this body, to which many popular music publishers belong.

Mr. Marks has for some time expressed himself dissatisfied with the conditions as he found them in the organization, and had attacked several members whom he claimed were notorious in their violation of written pledges.

He asked particularly that if the present bill is enacted into a law that a provision be inserted referring specifically to amateur Radio operators, because they will need protection for the future.

With the conclusion of the hearings the bill was referred to the subcommittee on Radio of the merchant marine committee. At the time of writing it was generally believed that the subcommittee would report the bill favorably in a short time, and that it would deal in detail with the monopoly question.

The subcommittee comprises Representatives White, chairman, Lehlbach, Free, Bacon, Davis, Bland and Larsen.

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**The Shamrock Kit List \$20**

THE kit contains two Shamrock balancing condensers and three Shamrock air core transformers, mounted and properly balanced on U. S. Tool condensers. These are exclusive Shamrock achievements.

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Free Our Guarantee of money refunded if the kit is not satisfactory, gives you a free trial over a reasonable period of time.

Gentlemen: Send me prepaid one Shamrock Kit, upon receipt of which I will pay postman \$20.

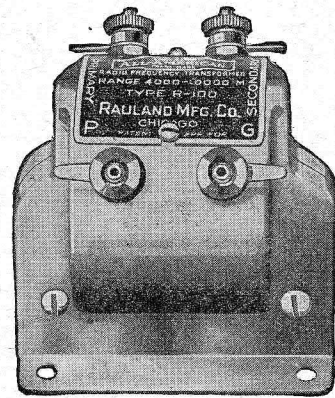
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# OPERATING AND TROUBLE SHOOTING

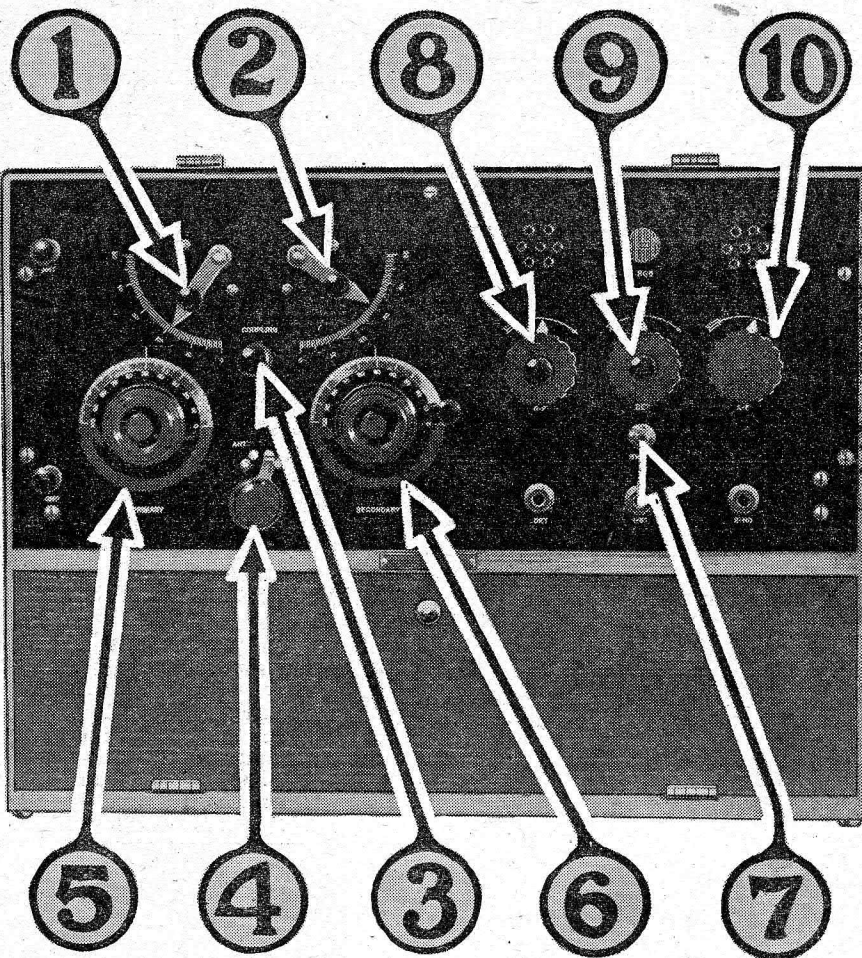
For the Owner of a

## MOON C-2-A RECEIVER

"It gets them all"

"OPERATING and Trouble Shooting" is a Radio Digest feature whose purpose is to study the late models of various standard receiving sets and to show the newly initiated broadcast listener, who has purchased such a set, how he can operate it to get the best there is in it and how he can overcome minor difficulties which may be causing some trouble. On pages 9 and 10 this week the Moon C-2-A Receiver is described. Radiophans with other sets will also find these articles worth reading, particularly the notes on trouble finding.

PLACE your detector tube (UV-200 or C-300) in the left socket next to the front panel. Your other tubes (UV-201A or C-301) should be placed in the other sockets, as they are interchangeable. After the batteries have been correctly connected, as per diagram, a good ground connection must be obtained. Proper reception with the Moon receiving set, without antenna, is dependent on a good ground connection, and too much stress cannot be laid on this point. A ground connection which has been satisfactory for a set



using an antenna may or may not be suitable for the Moon set.

### Ground

We have already mentioned the importance of obtaining a good ground for the proper operation of this set without antenna. The valve stem of a radiator

may make a good ground connection, but a clean connection to the cold water pipe is even better. A metal rod driven 3 or 4 feet into the earth will usually give good results. In any case be sure the ground connection is filed clean and soldered. Paint, nickel plating or rust may

act as an insulator. A copper plate 1/2-inch in thickness, 4 feet square and buried about 3 feet in moist earth with number 14 wire soldered connection, makes the best possible Radio ground: Be sure your ground connection is a good ground connection.

### Aerial

Where an aerial is in use and reception on the ground connection alone is not satisfactory, your aerial (inside or outside) may be used as a counterpoise ground by attaching it to ground binding post number 11, with or without the ground wire. The counterpoise ground connection will be found very effective.

### Tuning

Attach to binding post the wire leading from your ground or counterpoise ground connection. Set coupling number 1 at 55, number 2 at 0 graduation, and number 3 in center. Place primary condenser dial number 5 between 50 and 80. Turn switch number 4 to GND "Antennaless" (if aerial is used with ground connection, attach aerial lead-in wire, which should be number 14 to 18 gauge insulated, to antenna binding post), and turn switch number 4 to ANT (Antenna).

Turn rheostats numbers 8 and 9 all the way to the right, and rheostat number ten half way to the right. Before proceeding, lift cover of set and see that all tubes are lighted. If a hissing sound is heard, turn number 9 lightly until hissing stops. Your set is now ready to tune. Turn tuning dial number 6 to the left very slowly until whistle is heard. This means you are near a station. Turn number 8 to the left until the whistle or howl stops. Readjust vernier on dial 6 for maximum signal strength, and try the effect of changing the positions of numbers 1, 2 or 3.

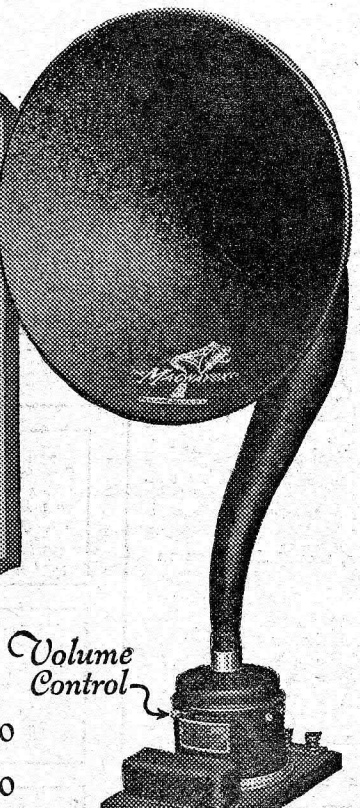
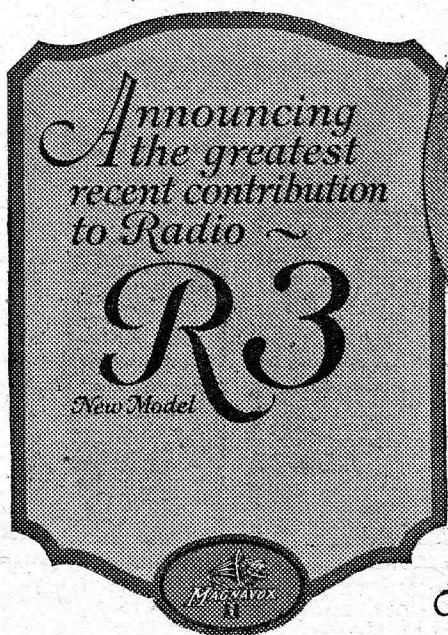
Vary the voltages of the red and green wires on the B batteries until the tubes do not make a hissing or frying sound.

A little practice will make you efficient, and you will soon find it easy to tune in distant stations with complete satisfaction on a Moon receiver.

### DX

After you have been able to tune in your local stations satisfactorily and are familiar with your set, we make the following suggestions for obtaining distant stations: The primary condenser number 5 may be set at 40, 60 or 80. In general

(Continued on page 10)



R3 (New Model), with Volume Control - - - \$35.00  
M1 requiring no battery for its operation - - - 35.00

## MAGNAVOX The Reproducer Supreme

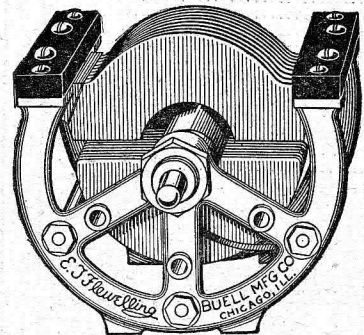
This instrument sets a new and higher standard of adaptability, refinement and economy of operation. With Volume Control (as illustrated) \$35.00 at dealers everywhere.

THE MAGNAVOX CO., OAKLAND, CALIF.  
New York Office: 370 SEVENTH AVENUE  
Perkins Electric Limited, Canadian Distributors, Toronto, Montreal, Winnipeg

### RADIO TALKS

Other things being equal, the volume of output from a vacuum tube will be more or less in proportion to the size of the tube. Then it is plain that we should not expect quite as much amplification from a small tube as from a large one, yet if you match the efficiency of the tube with an efficient receiving outfit you might be pleasantly surprised. *E. J. Flewelling*

## Genuine- E.J. Flewelling Radio Apparatus De Luxe



A condenser so good—you will be anxious to build a new set around it rather than install it in your old set. When you see one you will appreciate it.

**BUELL MANUFACTURING COMPANY**  
2977 Cottage Grove Ave.  
CHICAGO

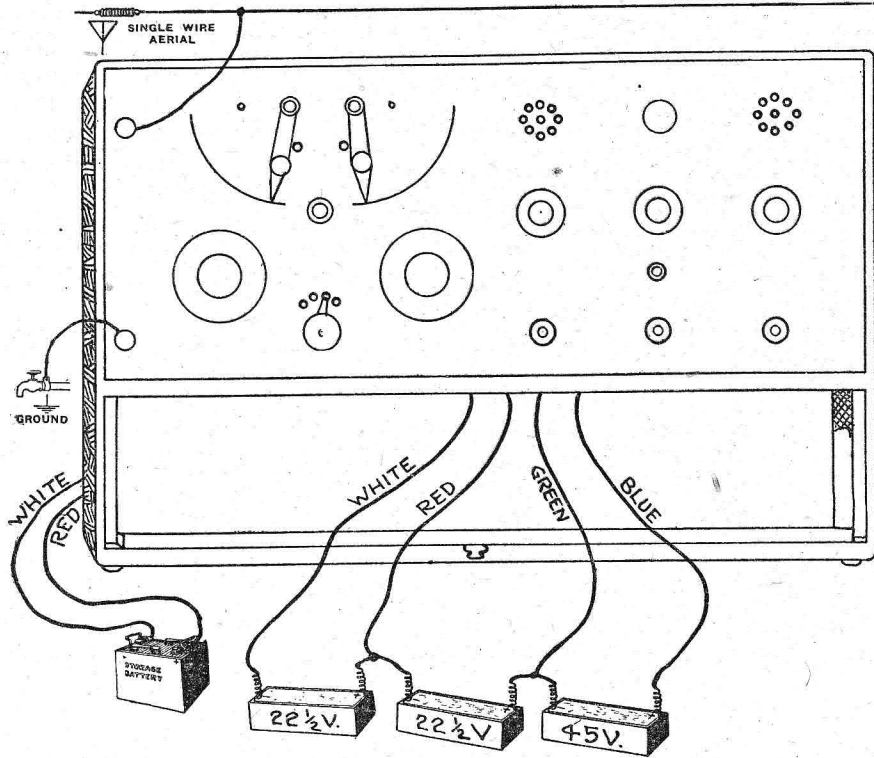


**OPERATION, TROUBLES**

(Continued from page 9)

we have found that number 40 gives the best results. Put your upper left pointer number 1 between 40 and 50, number 3 in the middle position and number 2 between zero and 10. Starting number 6 at zero, turn very slowly with the vernier until your whistle is heard. After clearing up

tive (+) pole of the left-hand battery. The green and red wires are variable connections. The red wire or detector lead is usually found to operate best on the 22½-volt tap of the right-hand battery, but may be varied down to 16½-volts, depending upon which tap the best results are obtained. The green wire or radio frequency lead should be connected to the positive (+) 22½-volt tap of the 22½-volt



the whistle and obtaining signals, the volume can be increased by very slight adjustments of numbers 1, 2, 3, 4, 5 and 8.

**Hook-Up of B Batteries**

Connect the batteries in series, negative or minus (-) pole of battery to the positive or plus (+) pole of the next battery.

The four colored wires found in the battery compartment of the cabinet are the B battery wires, and are hooked up as shown in diagram. In all combinations of batteries the white wire is attached to the (-) minus pole of the right-hand battery and the blue wire to the posi-

battery next. This wire also may be varied to higher or lower voltages, according to results obtained.

**A Batteries**

The two long red and white wires leading from the back of the cabinet are the A or storage battery connections. Attach the red wire to the positive (+) pole and the white wire to the minus (-) pole of the A or storage battery.

Test your A battery frequently to see that it is not below 1200, and that the plates are covered with water.

(ANOTHER SET NEXT WEEK)

De Forest DV3 Dry Cell Tube \$6.50



De Forest DV2 Storage Battery Tube \$6.50

**The More You Know About Radio  
The More You Rely on De Forest**

Without Lee De Forest's discovery of the vacuum tube there would be no radio today. All radio broadcasting, all radio receiving by means of tube sets, rests on De Forest patents.

De Forest has been a pioneer in radio since 1900 and De Forest is a pioneer today. That is the reason for the great success of the De Forest Reflex Radiophone. That is the reason for the success of the new De Forest tubes—DV-2 Storage Battery Tube, DV-3 Dry Cell Tube.

If you want a radio receiving set with a range on indoor loop of from 1,500 to 3,000 miles, depending on atmospheric conditions; if you want simplicity of control, clear reception without distortion and without extraneous noise; if you want operation on either wet or dry cells—see the De Forest Reflex Radiophones at the De Forest agents today.

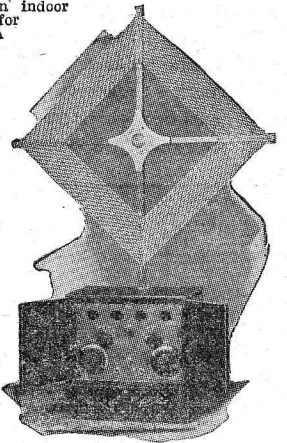
The D-7 A Reflex Radiophone is a three-tube set at \$125.00; the D-10 Reflex Radiophone has a drawer in its cabinet for dry batteries and is a four-tube set at \$150.00. No matter what you pay, you can't get greater radio satisfaction.

Whether you buy your set complete, or build your own from the laboratory-tested De Forest parts, you can rely on De Forest, the greatest name in Radio.

**DeForest Radio Tel. & Tel. Co.**

Dept. R. D. 7 Jersey City, N. J.

De Forest Portable Reflex Radiophone type D-10, which operates on wet or dry cells, has a reception range of from 1,500 to 3,000 miles on indoor loop; has drawer for all necessary A and B dry cells. Price \$150.00, plus approximately 6% for transportation in territories west of Rocky Mountains.



**Radio Catalogs Free**  
Send a postcard for De Forest's Free Radio Catalog with full details and prices on sets, tubes, and parts.

De Forest products are sold only through exclusive agents direct to the public for your protection. The De Forest Company will be glad to hear from representative dealers in various communities who wish to become exclusive De Forest agents.

**SEND NO MONEY  
WE SHIP  
C. O. D.**

**The RADIO-SHACK**

55 Vesey Street - New York City  
Goods shipped C.O.D.  
Just pay the postman

EVERY ARTICLE SOLD ON WRITTEN MONEY-BACK GUARANTEE

**????? IS IT ?**

Be sure your name is on our mailing list for weekly specials. No cost to you.

**SEND FOR IT AT ONCE.**

**SUPERTRON TUBES**

Just received a new shipment. Oh, boy, what an amplifier! Better than ever. At this price they'll go fast. The 201 A's are 6 volt, dry cell or storage battery operated, and the W. D. 12 type uses 1½ volt dry cell. Better get your order in now. Both types. Reg., \$6.50. Special..... **\$3.43**

**VARIABLE CONDENSERS**

Just get these points! 1. Heavy moulded end plates. 2. Phosphor-bronze contacts to heavy binding posts. 3. Processed aluminum plates that retain their alignment. 4. And the list price is double what we ask.

- 11 plate .....\$1.05
- 23 plate ..... 1.35
- 43 plate ..... 1.95
- VERNIER CONDENSER with dial. Same as above.**
- 11 plate vernier.....\$2.65
- 23 plate vernier..... 3.00
- 43 plate vernier..... 3.50

**VARIOMETER**

Let's tell you about the new variometer! First of all, it's moulded. Of course, it has pigtail connections for efficiency. And a positive stop. Split? Oh, yes. Can be split for any circuit. Green silk windings and takes 600 meters. Reg., \$5.50. Special..... **\$3.59**

**SOCKETS**

A new process enables us to offer an unheard of value. By this new method a nickel tube is forced into a moulded base under heavy pressure. This assures perfect contact with the phosphor bronze springs. Easily worth 75c each..... **45c**

**PHONES**

For this sale we are going to let you have TURNEY 3,000 ohms phones for a very low figure. **\$3.45**

**DIALS**

Mahogany colored dials with exceptionally heavy brass bushing. Will dress up your set. Change your dials and make your friends think you have a new set. List, \$1.00..... **50c**

**OTHER SPECIALS**

This Week Only

- Magnavox, New Type .....\$32.50
- 10% Deposit with Order.
- Brandes Talker ..... 8.98
- Hilco Couplers ..... 6.25
- Dictogrand Talkers..\$16.95
- Erla Transformers.. 4.25
- Brandes Phones .... 5.19
- Baldwin Phones .... 8.95

**THE DE LUXE**



A five tube assembly kit which includes everything necessary to build a genuine Hazeltine 5 tube set. Just picture this:

- A drilled and fully engraved Panel
- 3 4" Black Grebe Type Dials
- 3 Genuine Hazeltine Neutroformers, mounted for you on
- 3 Moulded End Quality Condensers
- 5 Bakelite Brunswick Sockets
- 1 60 Ohm Shackton Rheostat
- 1 30 Ohm Shackton Rheostat
- 2 Genuine Heghog or Fitzgerald Transformers
- 20 Feet Bus Bar
- 7 Engraved Binding Posts
- 1 Filament Control Jack
- 1 Single Closed Jack
- 1 Freshman .006 Condenser
- 1 Freshman Grid Leak and Condenser
- 1 Base Board for Mounting

All Parts Guaranteed Perfect

**\$27.75**

**ADDITIONAL ACCESSORIES**

These accessories, added to the above list of parts are ABSOLUTELY ALL THE PARTS NECESSARY FOR A COMPLETE SET IN OPERATING CONDITION.

- 5 Tubes (Type 201A).....\$17.25
- 2 45 Volt "B" Batteries..... 6.00
- 1 60 Ampere "A" Battery..... 10.95
- 1 Pair Phones, 3,000 Ohms..... 3.75
- 1 Antenna Outfit ..... 1.50
- 1 7x24 Cabinet, Mahogany Finish..... 4.95

**\$44.40**

**GOLD BUS BAR**

Most Efficient. Allows high frequency currents least resistance. Used in finest sets. Reg. 15c.

**8c**

**HYDROMETERS**

Very Accurate. Packed in wooden moisture proof box. Reg. 75c.

**39c**

**TUBE PROTECTORS**

Impossible to blow your tubes if you attach these to end of socket for ¼ or 1 amp. tubes.

**29c**

**TRANSFORMERS**

Audio Frequency, well known standard make. Ratio 4-1. Reg. \$5.50.

**\$2.89**

**VERNIER CONTROL**

For any Dial. Makes a Vernier out of any make condenser. Very efficient. Reg. 75c.

**29c**

**JACKS**

Single or Double Heavy Springs - German Silver Contacts. Nickel finish. Reg. 90c.

**39c**

**AERIAL WIRE**

7 strand tinned copper wire gives excellent results on DX work. Reg. \$1.00.

**55c per 100 Feet**

**LITZ WIRE**

Most efficient. A double silk covered wire with 37 strands of No. 38 wire, each strand enameled. Wonderful for Coils, Loops, etc.

**3c per Foot**

**PANELS**

Beautiful high finish panels made by the American Hard Rubber Co.

- 7x10 .....\$0.85
- 7x12 ..... 1.10
- 7x14 ..... 1.20
- 7x18 ..... 1.50
- 7x21 ..... 1.75
- 7x24 ..... 2.00
- 7x26 ..... 2.35

**RADIO CORPORATION PHONOGRAPH UNITS**

Complete with cord and plug, they make a truly wonderful showing in both volume and clarity. List, \$18.00. Special, **\$8.50**





# What's Wrong with Your Receiving Set?

## Chapter V—Causes of Reception Interference

By Peter J. M. Clute

**I**T is doubtful if there is any more difficult problem for the Radio fraternity to solve at the present time than that of reception interference. This condition of affairs, while partly due to the tremendous growth in the number of transmitting stations, may also be variously credited to telegraphic code transmission (government, commercial and amateur), heterodyning between stations, atmospheric disturbances, induction from power circuits, and re-radiation from receiving sets of improper design or operated by unskilled users. On the transmitting end, the chaotic condition of the ether is obviously due to the fact that the air is being used simultaneously by thousands of naval, commercial and private telegraphic stations, spark and otherwise, in addition to hundreds of broadcasting stations.

### Analysis of Interference

A critical analysis of the Radio interference problem discloses the following most troublesome causes:

- (a) Heterodyning between broadcasting stations operating on approximately the same wave length.
- (b) Heterodyning between a broadcasting station and a nearby oscillating receiver.
- (c) Heterodyning between two oscillating receiving sets in the vicinity.
- (d) Interference from Radio telegraph transmitters, especially of the spark variety.
- (e) Re-radiation from nearby oscillating receivers.
- (f) Atmospheric disturbances or static discharges.
- (g) Induction from electric light or power systems in the neighborhood.
- (h) Inductive interference from defective electrical apparatus, or from machines producing high-potential electrical discharges.

In the above outline, an attempt has been made to list the various sources of interference in the order of the severity of their occurrence. While spark transmitters may at times be classed as the primary interference producers, it should be remembered that heterodyning interference is practically continuous, whereas spark interference at its worst is only intermittent in character. This sort of interference wholly or partly spoils the broadcast reception for many of the fans and it is no more than proper that it should be the first variety that should be considered in detail.

In deliberating on the question of interference, it should not be forgotten that although the broadcasting service at present furnishes the most popular diversion for the host of Radiophans, there have long existed other phases or applications of Radio which are considered of vital importance to world commerce. Besides this commercial aspect, it should be remembered that the present advancement of Radio is due in no small degree to the excellent work of some of the Radio amateurs and experimenters. It is, therefore, quite obvious that the question be approached in an impartial and unbiased frame of mind, so that the listeners in may acquire an intimate knowledge of the causes underlying the interference occasionally encountered during reception.

### Heterodyning Interference

If whistles or howls are heard when the receiver is not in oscillation, the cause might be either that two broadcasting stations are heterodyning; or a broadcasting station and a nearby receiving set are heterodyning; or two oscillating receivers in the neighborhood are heterodyning. Two or more stations, operating simultaneously on approximately the same wave length, will produce an audible tone, varying in pitch at times, due to the carrier waves of the stations heterodyning each other. This is also the case when nearby stations are broadcasting at wave frequencies nearly equal to that which it is desired to receive.

It is quite manifest that with hundreds of broadcasting stations on the air at the same time, it will be really difficult to receive broadcast programs and in addition attempt to tune out the numerous heterodyned whistles. Tuning out this sort of interference requires a lot of patience on the part of the operator, inasmuch as most of it comes from the distant stations. The proper choice of receiver to eliminate interference from one station while listening in to the program from another, may be based on the following general considerations:

- (a) The closer a receiving set is to any broadcasting station, the more highly selective it should be in order to preclude the possibility of interference from that station.
- (b) The greater the range over which it is desired to receive and, hence, the more sensitive the receiving equipment is, the higher must be the selectivity to prevent interference.

### Code Interference

Another annoying source of interference may be attributed to Radio telegraph transmitters, more particularly to those of the spark type. In this connection, it must be remembered that ship-to-shore communication is still carried on at wave lengths of about 450 meters, within the assigned broadcasting range, although an order taking commercial code off 450 meters has been issued. It is not an uncommon experience to have a heavy tirade of telegraphic code dots and dashes break in and interrupt a broadcast program. Under these circumstances, the average listener in, not realizing that there are many commercial and naval stations operating on broadcasting wave lengths, invariably aims harsh criticism at the local amateurs.

### Amateur Transmitters

Under the present regulations the air is free to amateurs using wave lengths from 150 to 200, except during the evening broadcasting period, and some amateurs have the special license to operate at wave lengths up to 220 meters. Amateurs may use either spark or tube sets, but are not privileged to broadcast music or entertainment. Owners of tube sets may transmit either International Morse code or voice, except between the hours of

8:00 and 10:30 in the evening. Fans are urged to learn the code in order to identify the various intercepted messages, and thus locate the offenders. As the matter now stands, the fan places the blame on the amateurs without actually knowing who is causing the interference, whereas in the majority of cases it is ship and shore stations carrying on regular commercial traffic on their allotted wave lengths. It is expected that a new allocation of wave lengths will be made for the various classes of transmitting stations, and steps should then be taken to prevent a monopoly of the air by any one of them, whether they are broadcast or telegraph stations. The definite assignment of these wave lengths and the strict enforcement of regulations may be helpful factors in controlling the ether traffic and clearing the air.

### Re-radiation Troubles

Not the least of the causes of all the Q. R. M. in the ether is the bothersome re-radiation from regenerative receivers. By using too much coupling between plate and grid circuits, the adjustment will become critical, with the result that the tube will finally oscillate, thus becoming a generator of high-frequency oscillations. These oscillations, radiated from the receiving antenna system, will be picked

up by receivers in the vicinity and thus create some interference in DX reception.

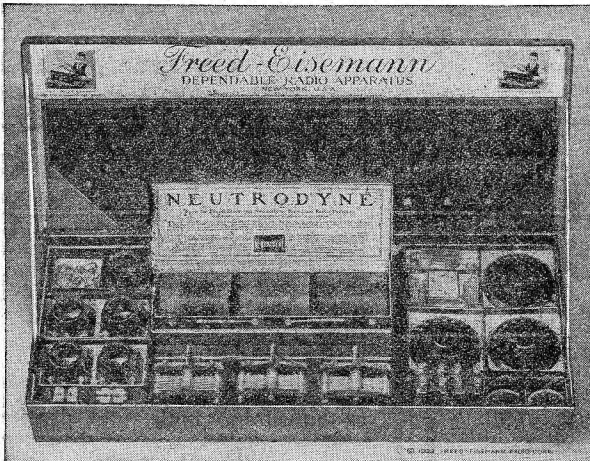
With ordinary CW tube transmitters, the tubes must necessarily be in a state of oscillation before any current will be generated. Hence, oscillating must be set up in the receiver in order to intercept these CW signals. Such a condition may be obtained either by the use of a separate heterodyne or by increasing the amount of regeneration until the tube is oscillating. In this condition, the receiving set becomes in effect a transmitter, the extent of whose interference is contingent upon the degree to which such oscillations are relayed to the aerial.

### Oscillating Unnecessary

It is absolutely unnecessary to have the tube circuits oscillating during the reception of broadcast programs. Furthermore, clear modulated signals cannot be properly received when the set is in a state of oscillation. The worst offender is the inexperienced operator who throws his tubes into oscillation in an effort to pick up the carrier waves of distant stations. This practice of keeping the grid and plate circuits in oscillation, while the wave length of the circuits is varied over quite a wide range, should be discouraged.

Comparative tests have shown that the (Continued on page 12)

# A Freed-Eisemann **KNOCKDOWN NEUTRODYNE RECEIVER**



Unassembled Model KD-50, Freed-Eisemann Neutrodyne Receiver

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

Complete  
with Full Instructions  
**\$80**

Dealers Write for Name of  
Nearest Distributer



Front View KD-50, Neutrodyne Being Assembled

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

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

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

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

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



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

*Freed-Eisemann Radio Corporation*

SPERRY BUILDING

MANHATTAN BRIDGE PLAZA

BROOKLYN, N. Y.



### FIXING WHAT'S WRONG

(Continued from page 11)

single-circuit receiving set, using a tickler coil for feedback, is the strongest radiator of high-frequency oscillations. The double-circuit receiver, with tuned plate and with part of the secondary inductively coupled to the plate variometer, is a close second. Even the three-circuit receiver may radiate sufficient energy to cause interference when the vacuum tube circuits and the primary circuit are in approximate resonance. In order to cut down the re-radiation from a single-circuit receiver when in a state of oscillation, it is advisable to use a variometer to tune the plate circuit instead of the regular tickler coil. While it is true that much of the re-radiation interference at present, in the form of whistles and squeals, can be traced to single-circuit regenerative receivers, this is generally due to the lack of tuning experience on the part of the operator. A two-circuit receiver manipulated by the same operator would undoubtedly give out as much interference. In fact, any regenerative receiver will re-radiate interference if it is improperly handled. To master the correct procedure in tuning requires no more effort than the highly undesirable one referred to above, and more satisfactory results will be obtained.

#### Atmospheric Disturbances

Every Radiophan is familiar with the crackling, scratching and sometimes snapping noises due to atmospheric disturbances, which cause such distracting interference to reception. The elimination of the noises, variously called "strays," "atmospherics," or "static," is one of the baffling problems of radio yet to be solved. Many intricate circuits and arrangements have been devised to offset the effect of static disturbances in commercial radio communication, but although interference from this source is thereby greatly reduced, it cannot be entirely eliminated by present means.

Atmospheric disturbances are more severe during warm weather, but even during the winter months when a change of weather is imminent, or during mild periods, static discharges will take place. At times, it is possible to hear such disturbances even when occurring at considerable distances, although they are most bothersome when propagated in the immediate vicinity. The intensity of this sort of interference varies in different parts of the globe, being at its maximum in the tropics and falling off considerably in the temperate zones.

#### Electric Waves

The most troublesome sort of static is that due to electric waves in the ether, similar in nature to radio waves, and caused by atmospheric disturbances in space. Lightning flashes caused by the sudden discharge of heavy accumulation of small static charges set up powerful disturbances in the ether. Obviously, not all lightning discharges flash to earth, many of them occurring inside of or between clouds. The resulting effect is the emission of electric waves, which are reproduced by induction in the receivers, causing interference to good reception. Since the waves thus propagated are so similar to radio waves in nature, the problem of the complete elimination of static presents very great difficulties.

Electrical disturbances, originating at sources which have no connection with radio communication, are often times the cause of reception interference unknowingly attributed to static. Inductance interference of this sort may be due to sparking of electric motors or generators, caused by improper brush contact, poor commutation, burnt-out coils or heavy overloads. The high-potential discharges from x-ray machines produces intermittent interference which is exceedingly difficult to eliminate, although it may be considerably reduced by shielding the machine and grounding the shield. Electric arc welding outfits and arc lamps also create similar disturbances.

#### Interference from Power Lines

Induction from power or lighting lines carrying alternating current produces a humming noise in the receiver, distorting the reception. The receiver installation should be made as far removed as possible from any lighting circuit in the room, and the antenna should be installed as nearly as possible at right angles to any nearby power lines. All these sources of interference, although producing electrical disturbances with only small amounts of energy, are very bothersome in their effect upon sensitive radio receivers.

(TO BE CONTINUED.)

#### Watch Your Jacks

Jacks frequently cause great trouble by reason of one of the contact leaves or springs failing to make contact, or being so closely spaced that a spark discharge takes place.

The contact points of the best jacks are made of silver. Atmosphere in a home where small amounts of gas fumes are present will corrode these contacts. Sea or salt air will cause corrosion very quickly during the summer time.

## SUPER VALUES

WHAT'S NEW IN RADIO?

# SUPER-HETERODYNE

Improved Type

Write for Prices and Details, for Parts to Build the Finest Broadcast Receiver Known

### Hazeltines Neutrodyne

The ultimate receiver for local and long distance Radio concert reception

THE MOST TALKED ABOUT SET OF TODAY

1. SIMPLICITY (A child can operate it)
2. SELECTIVITY (You can tune out local stations)
3. STABILITY (Always ready to entertain)
4. DISTANCE (Average range about 2000 miles)
5. NOISELESS (No squeals, no howls, no whistles)

Complete Parts for Building This Master Receiver **\$49.65**  
AS LISTED BELOW, ONLY.....

Stock No.	Quantity	Description	Price
201 A.	1	Bakelite panel, 24x7x <sup>3</sup> / <sub>8</sub> , drilled and engraved	\$ 6.50
202 A.	1	Baseboard, 23x8	.75
203 A.	5	Standard sockets	1.05
204 A.	3	Neutroformers	15.00
205 A.	2	Neutrodons	1.50
206 A.	2	High ratio transformers	11.10
207 A.	1	A battery switch	.75
208 A.	3	4" Pathe dials, taper knob	2.10
209 A.	1	Plain rheostat	1.00
210 A.	1	Fada type 150 A. vernier rheostat	1.25
211 A.	7	Eby engraved binding posts	1.40
212 A.	1	Closed circuit jack	\$ 0.80
213 A.	1	3 spring automatic jack	1.00
214 A.	27 ft.	Spaghetti tubing	2.10
215 A.	27 ft.	Bus bar	.25
216 A.	2	Condensers, .006 mfd.	1.00
217 A.	1	Grid leak, 2 megohms	.50
218 A.	1	Grid leak and condenser, .00025	.60
219 A.	1	Package screws, nuts, terminals, etc.	.10
220 A.	1	Fada instruction book	.....
			<b>\$49.65</b>

#### Accessories Necessary to Complete Set for Operation

Stock No.	Quantity	Description	Price
221 A.	5	Bonded tubes	\$22.00
222 A.	1	Loud speaker, genuine Baldwin type C unit	12.75
223 A.	4	Columbia or Red Seal A battery	1.60
224 A.	2	45 volt B batteries	\$ 9.00
225 A.	1	Set complete aerial equipment	2.00
			<b>\$47.35</b>

#### OUR SPECIAL COMBINATION OFFER

To each purchaser of the parts and accessories for the HAZELTINE NEUTRODYNE RECEIVER at the low price of \$97.00 we will, without cost to you, ship a Genuine HANES-ZENER special hand rubbed solid mahogany cabinet. Value \$10.00. Each of the above parts are of the highest standard grade, and carry the HANES-ZENER guarantee and can be purchased separately at our special prices.

Special for This Week Only **\$105.00**  
WESTERN ELECTRIC 10A LOUD SPEAKERS  
List Price, \$161.00. Our Price.....

#### Genuine P. L. Original RESISTANCES

48,000 OHMS.....	\$1.00	100,000 OHMS.....	\$1.00
------------------	--------	-------------------	--------

We Are Prepared to Supply Dealers. Write for Our Proposition.

### Reinartz Circuit Complete

	List Price	OUR Price		List Price	OUR Price
Reinartz Coil.....	\$2.50	\$2.00	3 Switch Levers with Knobs.....	\$0.75	\$0.35
One 7x10x <sup>3</sup> / <sub>8</sub> Radion Panel.....	1.25	1.00	One Baseboard for Mounting.....	.75	.40
National Bakelite Socket.....	1.00	.40	One Fixed Phone Condenser.....	.40	.25
Vernier Rheostat.....	1.50	1.00	One Single Jack.....	1.00	.25
Two 23 Pl. Var. Condensers at \$3 each.....	6.00	3.00	Blue Prints with complete instructions for assembly and mounting.....	.50	.50
Switch Points and Nuts.....	.80	.40	Regular Price.....	\$19.05	
Six Switch Stop Points and Nuts.....	.40	.20			
Freshman Grid Leak and Condenser.....	1.00	.65			
Seven Binding Posts.....	.70	.35			
25 Ft. Tinned Bus Bar.....	.50	.30			

**OUR PRICE \$11.05**

All the necessary screws, nuts and miscellaneous small parts which are necessary to complete the set are included in the above prices. Any part in either of these circuits may be purchased independently at the advertised cut prices.

### COCKADAY Four-Circuit Receiver 3000 MILES

Parts as specified by Mr. Cockaday

- 1-Cockaday Coil
- 2-Amsco 26-Plate Condensers
- 2-Amplex Grid-Densers
- 1-Bradley Leak, 1/2 to 10 meg.
- 5-Melco Sockets
- 1-Amsco 6 ohm Rheostat
- 3-Amsco 20 ohm Rheostats
- 1-Pacent Single Jack
- 2-Pacent Double Jacks
- 2-Amertran Transformers
- 1-Como Push-Pull Transformer—Input
- 1-Como Push-Pull Transformer—Output
- 2-Switch Levers
- 11-Switch Points
- 2-Switch Stops
- 1-Dubilier Condenser—.0005
- 1-Durham Variable Grid Leak
- 3-Lavite Resistances—48,000 ohms
- 1-Amsco 400 ohm Potentiometer
- 1-7x24 Panel
- 1-3"x2 1/2" Sub Panel
- 1-12"x12" Panel

**Our Price \$59.00**

We Have Just Received a New Shipment of THE NEW MODEL D. N. K. & K. PHONES MADE IN GERMANY

**Our Price \$6.50**

WE GIVE A 20% DISCOUNT on All Standard Radio Apparatus Not Listed Above

All Mail Orders Shipped Promptly Send Money Order, Including Postage The Radio Mail Order House—Known for Low Prices

WRITE FOR OUR CATALOG "B"



1480 Broadway, Corner 42nd St., New York City



## WHOLESALE RADIO SERVICE COMPANY

9 Church Street  
New York City

Formerly at 39-41 Cortlandt St., New York City.

#### NEUTRODYNE SPECIALS

Here's your chance to buy the two best known makes of Neutrodyne Receivers at a real saving!

FADA 160 Neutrodyne, Regular Price \$120.  
Our Price **\$105**

FREED-EISEMANN NR5 Neutrodyne, Regular \$150.  
Our Price, **\$129.50**

The WRS NEUTRODYNE completely built in a beautiful mahogany cabinet, ready to operate (without tubes or batteries)..... **\$59.50**

FADA 5 TUBE Neutrodyne in a real mahogany cabinet, ready to operate (without tubes or batteries), only..... **\$85.00**

**20%** We'll give you a discount of 20% on all merchandise not listed in this adv. It will pay you to write us!

#### COCKADAY 3 TUBE SET

- |                                |                              |
|--------------------------------|------------------------------|
| 1 Cockaday Coil                | 4 Switch Stops               |
| 2 Jefferson Audio Transformers | 1 .00025 Mica Condenser      |
| 2 17-Plate Condensers          | 1 2 Meg. Grid Leak           |
| 2 Switch Arms                  | 16 Ft. Bus Bar               |
| 1 7x18 Panel                   | 8 Binding Posts              |
| 1 Double Circuit Jacks         | 1 .001 Mica Cond.            |
| 1 Single Circuit Jack          | 2 3" Bakelite Dials          |
| 3 National Sockets             | 1 7x18 Base Board            |
| 3 Rheostats with Dials         | Blue Prints and Instructions |
- \$19.50**

#### REINARTZ 3 TUBE SET

- |                                   |                        |
|-----------------------------------|------------------------|
| 1 Reinartz Coil                   | 1 .00025 mfd. Cond.    |
| 1 23 Plate Condenser              | 8 Marked Binding Posts |
| 3 30 ohm Rheostats                | 12 feet Busbar Wire    |
| 3 Bakelite Sockets                | 3 Switch Arms          |
| 1 7x21 Panel                      | 12 Switch Points       |
| 1 7x21 Baseboard                  | 6 Switch Stops         |
| 2 Jefferson Shielded Transformers | 2 Double Jacks         |
| 1 2 Meg. Leak                     | 1 Single Jack          |
- Blueprints and Instructions  
**\$17.75**

#### RADIOLA VI A Six Tube Set

This is the Radio Corporation 6 Tube Set that receives over distances up to 2,000 miles on a loop! With an outside antenna transatlantic work is certain. Three stages radio and two audio! In original sealed cases. Regular \$275.

OUR PRICE **\$85**

Act Quickly!

#### COCKADAY 4 TUBE SET With Push-Pull Amplifier

This is the set that Cockaday described as being able to receive over distances of 3,000 miles. You can't build anything better. (Parts are those specified by Cockaday.)

- |                                   |  |
|-----------------------------------|--|
| 1 Cockaday Improved Bakelite Coil | 2 Switch Levers                          |
| 2 Amsco 26 Plate Ver. Condensers  | 11 Switch Points                         |
| 2 Amplex Gridensers               | 2 Switch Stops                           |
| 1 Bradley Leak                    | 1 Dubilier Cond. .0005                   |
| 5 Melco Sockets                   | 1 Dubilier Cond. .00025                  |
| 1 Amsco 6 ohm Rheo.               | 1 Durham Var. Leak                       |
| 3 Amsco 20 ohm Rheos.             | 3 Lavite Resistances, 48,000             |
| 1 Pacent Single Jack              | 1 Amsco 400 ohm Potentiometer            |
| 2 Pacent Dble. Jacks              | 1 7x24 Panel                             |
| 2 Amertran Trans.                 | 1 3x2 1/2" Sub-Panel                     |
| 1 Como Push-Pull Input            | 1 12x12 Panel                            |
| 1 Como Push-Pull Output           | 1 7x24 Baseboard                         |
|                                   | Blueprints, Wire, etc., with each order. |

**\$57.50**

#### COCKADAY 1 TUBE SET

The complete parts for this popular set have been reduced to..... **\$9.95**

Mail orders promptly filled and sent C. O. D. if you wish; we can pay postage on all orders over \$5.00. In dealing with the Wholesale Radio Service remember that you are buying

RETAIL AT WHOLESALE PRICES



# 30 Minute A-B-C Lessons for Radio Beginners

## Chapter II—Radio Energy in Everyday Terms

By P. E. Edelman

**I**N this series of articles the story of Radio will be told in so simple a manner that the uninitiated can follow theory and practice whether he knows anything about electricity or its application to broadcasting and reception or not. The series will consist of twenty-four additional chapters, of which the five next will be:

Chapter III—How Radio Is Broadcast.  
Chapter IV—What Radio Inductances Do.  
Chapter V—What Condensers Are Good For.  
Chapter VI—Uses of Resistance in Radio.  
Chapter VII—Essentials of Radio Electricity.

**R**ADIO may be understood with reference to commonly known things in daily life because the complicated art is made up from understandable principles.

The Sun is the original broadcast station, sending waves recognizable as light and heat and comprising tremendous energy. Human beings take a small fraction of such heat energy, convert and control it in suitable form; then use a tiny amount of it to enjoy broadcasting.

How does Radio fit in with other forms of energy? Heat is a motion in material and can be felt. Light is a much faster wave motion which can pass through space. Sound is a slow wave motion

energy, and an artificial apparatus eye or ear must be used. Radio energy is a

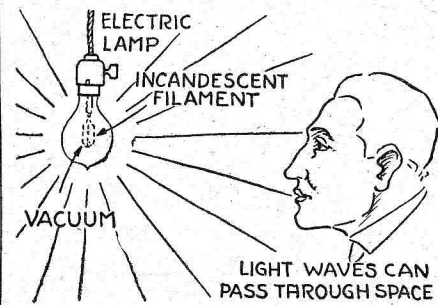


Figure 4.

wave motion which can be considered as extremely long light waves.

### Radio is Like Light

Figure 4 illustrates a familiar source of artificial light. Light rays from the hot filament in the lamp pass through the space in the vacuum bulb and can be seen by the eye. Light is a commotion in space in regular wave forms recognized as the colors of the rainbow. There are some kinds of light which the eye

compared to the greatly larger Radio wave lengths. Radio light or Radio energy travels at the rate of 186,000 miles per second. Referring to Figure 5, it is well known that light does not pass an opaque wall, while Radio goes right through. That is why broadcasts go into a building or room.

Now, the longest light wave lengths are recognized as the dark reds, and if the eye could see still longer wave lengths, we could see Radio.

### Difference of Radio and Sound

The difference between sound waves and light, or Radio waves is illustrated in Figure 6. An electric bell is put in an evacuated jar from which the air is pumped out. The eye can see the bell ringing but the ear cannot hear it, as sound does not pass through space but

As you talk, little undulations or puffs of air move out from your lips in an

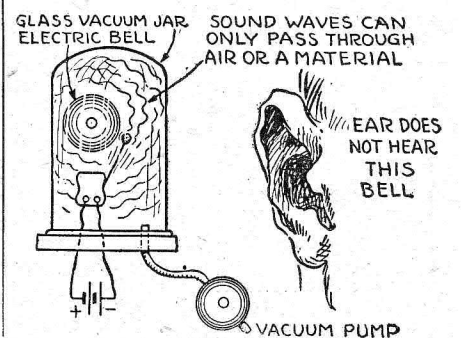


Figure 6

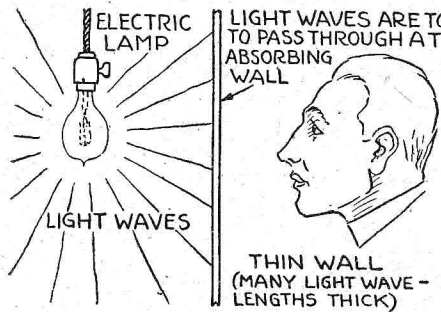


Figure 5.

through the air or material, which can be heard. But nature has not provided a sixth sense to directly recognize Radio

lengths of light are all extremely small

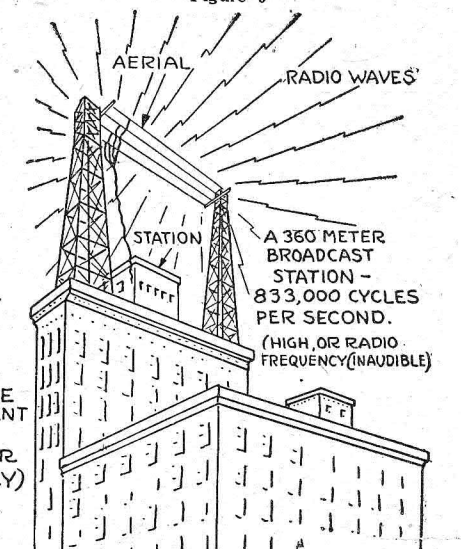
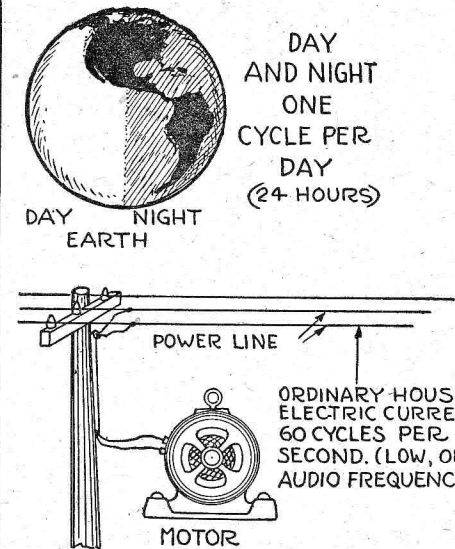


Figure 7.

requires a material conveyor. Sound waves are also of such length that they cannot readily pass through thick walls.

assortment of wave lengths governed by your vocal cords. These are recognized (Continued on page 22)

## BRINGS IN EVERYTHING

### BEAUTIFUL MAHOGANY NEUTRODYNE

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

**PAY NO MONEY**  
Just Pay the Postman

\$48.50

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FREE BLUE PRINT

**The above Neutrodyne Complete ready to wire following parts:**

5 Tubes.....\$25.00	2 22½ Volt B Batteries.....\$ 6.00
1 10 Ampere Storage Battery.....18.00	Loud Speaker.....\$86.00
1 DeLux Homecharger.....18.00	.....12.50
1 Headset.....12.00	<b>TOTAL.....\$98.50</b>
1 Complete Aerial Equipment.....1.50	
1 45 Volt B Battery.....5.50	

**The above parts and equipment complete would cost you \$147.00! Our Price \$125.00**

### It Works—NEUTRODYNE—All Standard Parts

2 Rheostats, 30 ohms.....\$ 2.00	2 Transformers, All American.....\$ 9.50
1 Rheostat, 6 ohms......90	9 Readem Binding Posts......85
3 Air Core R. F. Transformers, mounted on condensers, and 2 balancing condensers.....20.00	1 8x26 Mahogany Panel.....3.64
1 Potentiometer, 1850 ohms.....1.85	4 Bezels......80
3 Jacks, Carter.....2.70	3 Dials.....4.50
1 Condenser......40	1 Baseboard......50
1 Grid Leak......65	24 ft. Square Bus Wire......60
5 Sockets, Kellogg's.....5.00	<b>Total.....\$53.89</b>

**Panel not mounted or drilled, only \$45.50 with blueprints FREE**

### CABINET FOR YOUR REFLEX NEUTRODYNE

Same Cabinet as shown on page 26, Radio Digest, March 8th issue

**With Baseboard, High Mahogany Finish—Fine Cabinets 9x14x8. \$5.98**

List \$12.00. Only.....\$5.98

7x16x8—Same quality.....\$5.98

### A Few Left—BALDWIN UNITS

Genuine Baldwin Type C unit with mica diaphragm, list, \$6.00. Only.....\$3.19

ONLY TWO TO A CUSTOMER

### Special Sale on Webster Condensers, Fine for Super-Heterodyne

Variable Condenser, .0005 (Same as 23 plate).....\$2.98

Variable Condenser, .001 (Same as 45 plate).....\$2.98

list, \$5.50. While they last—Bargain at.....list, \$6.00. Big buy at.....

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All Orders Mailed Promptly. No Stamps Accepted. Send Check or Money Order.

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Quality Merchandise at Low Prices

## Economical Radio House

4600 LINCOLN AVENUE, CHICAGO

We Personally Guarantee All Goods

## A Record of Achievement

The remarkable performance of the Moon C-2-A Receiver under difficult conditions of reception, as outlined in the examples below, shows very clearly its universal utility as a radio instrument of high calibre and special adaptability.

**In the Home:** Using only one wire as a ground attached to a water pipe, the Moon Model C-2-A has brought in stations as far distant as 1,800 miles. Consistent reception of stations 1,000 miles away is always possible.

**On a Railroad:** The first transcontinental radio equipped train over the Canadian National Lines carried a Moon set using a terrapose ground. Stations up to 1,100 miles distant were brought in throughout this entire trip.

**On a Steamship:** A Moon set installed on the S.S. Fort Victoria of the Furness-Bermuda Lines on the regular run from New York to Bermuda was able to bring in stations as far as 1,450 miles away. This reception was obtained in the middle of the summer when the static was at its worst.

**In a Mine:** A test under the auspices of the Scranton Times was held on January 17th in the furthest depths of the Pine Brook Mine. The Moon Model C-2-A brought in stations 500 miles distant as well as the local station which was broadcasting a special program for the test.

All of the above results were obtained with volume sufficient to operate a loud speaker. The Moon Model C-2-A has proven that even under the most severe conditions "It gets them all."

Manufactured by

# MOON

Moon Radio Corporation

501 Steinway Ave. Long Island City N. Y.

Sold by

# MOON

Bunnell Radio Corporation

Long Island City N. Y.

## C-2-A RECEIVER

"It gets them all"



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

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

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

Storage Battery Aids

When using a storage battery, damage from spilling acid on floor or carpets can be avoided by getting or making a small box, about 3 inches larger all around than the battery. Paint or stain the outside to match the furniture. Paint the inside with several coats of heavy paint, or

asphaltum paint, if possible. Leave no open cracks. Put casters on the bottom of the box. It will keep the battery safe, acid off the floor and afford a place to keep a receptacle for the hydrometer and a small bottle of distilled water, all together and safe.

This makes it very easy to move the box to one side in order to clean the floor.

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.

RADIO AT N.Y. PRICES Daily Parcel Post MAIL

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: R. G. Dun, Bradstreet, or Corn Exchange Bank, New York City.

INSULATORS These are very strong strain type Insulators. D158 Moulded insulator shown above. Each.....10c; Dozen.....\$1.10

JACKS AND PLUGS Jacks are polished nickel constructed with pure silver contacts. D118 One spring open circuit.....\$ .39 D119 Two spring closed circuit..... .49 D120 Round plug as illustrated..... .49

DIETZEN SUPER HEADSET D181 2200 Ohms.....\$2.95 Reg. Price, \$5.00 per Pair. Since we are wholesale distributors for this wonderful headset we pass this bargain on to you. The Tone quality is of unusual volume. These phones can be used as a loud speaker unit. Sold with a money back guarantee, if not satisfactory.

WAVE TRAP Simplifies tuning. Eliminates interfering stations, thereby improving the selectivity of your set. Selects between conflicting stations. Special while quantity lasts. D131 Each.....\$4.95

MISCELLANEOUS D163 Spaghetti Tubing, per yd.....\$ .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..... .75 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 Switch Arm Tapered Knob..... .19

Moulded Bakelite Variometer or Variocoupler D79 Each \$4.95. List.....\$7.00 A high grade instrument. Takes in the wave lengths from 250 meters to 800 meters. Table or Panel Mounting.

RADIO FREQUENCY TRANSFORMERS D70 Tri-coil for 201A or 301A tubes.....\$1.95 D71 For 199, 299 or W.D.11 and..... 1.95 D72 Erla AB1..... 3.75 D73 Erla AB2..... 3.75 D74 Erla AB3..... 3.75 D75 Erla Reflex..... 4.65

DOUBLE PHONOGRAPH ATTACHMENT This attachment fits all phonographs; will take any headset. It converts your phonograph into a loud speaker. D132 Double attachment.....\$ .85 D160 Single attachment fits any single phone unit to be used on phonograph..... .49

HONEYCOMB COIL MOUNTINGS D140 2-coil mounting.....\$2.85 D141 3-coil mounting..... 3.79 D142 Single coil mounting..... .40 D143 Receptacle for single coil mounting..... .50

STANDARD BRAND HEAD PHONES D134 Brandes Superior.....\$5.25 D135 Dictograph..... 6.75 D136 Baldwin Type "C" Double..... 9.85 D137 Baldwin Type "C" Single..... 4.95 D138 Western Electric..... 10.50 D139 Dietzen Navy Type, 3000 ohms..... 4.95 List Price \$8.00.

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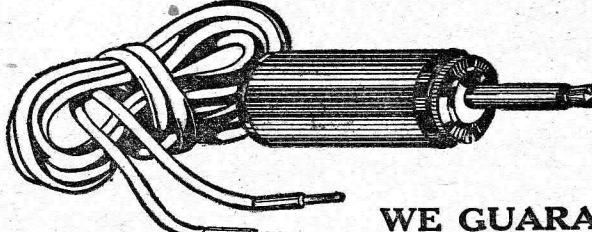
MAXIMUM VOLUME?

Take the Advice of Experts and Use THE ORIGINAL AUTOMATIC



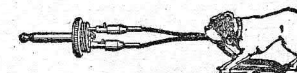
BULL DOG GRIP TELEPHONE PLUG

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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

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COMSCO CONDENSERS

The Most Ingenious Variable Air Condenser Ever Conceived

Plain—11 Plate \$2.00, 17 Plate \$2.25, 23 Plate \$2.75, 43 Plate \$3.50 Vernier—16 Plate \$4.00, 26 Plate \$4.50, 46 Plate \$5.50

ASK FOR COMSCO AT YOUR DEALER

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

GENERAL INSTRUMENT CORP.

123 Liberty Street NEW YORK CITY



# 56 PROGRAMS FOR EIGHT DAYS

## Tuesday, March 25

**CKAC, Montreal, Can. (Eastern, 425), 7:00 p. m.**, Kiddies stories in French and English; 7:30, Rex Battle and his Mt. Royal Hotel Concert Orchestra; 8:30, Variety entertainment; 10:30, Joseph C. Smith and his Mt. Royal Hotel Orchestra.

**KDKA, E. Pittsburgh, Pa. (Eastern, 326), 12:20 p. m.**, Lenten services, Trinity Church; 6:15, Dinner concert, Grand Symphony Orchestra; 7:15, "Educational Advantages of Pittsburgh," Dr. John C. Bowman; 8:15, "Justice from the Autobiography of Benjamin Franklin"; 8:30, Program, Schenley High School, Introduction, Prof. Edward Sourain; Prologue, Eric Mantle; Nancy Fast, pianist; Mance Gray, reader; Vocal solo, R. L. Blaker; Talk, Milton Sussman; James Trotter, organist; 9:00, Program, American Legion; Trio of the KDKA Little Symphony Orchestra; Jane Land Granger, soprano; 11:30, Concert.

**KFI, Los Angeles, Calif. (Pacific, 469), 6:45-7:30 p. m.**, Concert presented by George J. Birkel Music Company; 8:00-9:00, Concert by Ambassador-Lyman's Coconut Grove Orchestra; 9:00-10:00, Examiner Concert; 10:00-11:00, Vocal and instrumental concert.

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

**KFMF, Sheppard, Ia. (Central, 266), 12:30 p. m.**, Noon-day concert for women.

**KFSG, Los Angeles, Calif. (Pacific, 278), 3:30-4:30 p. m.**, Concert features for "Shut-ins"; 7:00-7:30, Children's program; Bible story; 8:00-9:30, Musical program and evening service, Sister McPherson, director.

**KGO, Oakland, Calif. (Pacific, 312), 8:00 p. m.**, "Come Out of the Kitchen," KGO Players; Bohemian Trio.

**KGW, Portland, Ore. (Pacific, 492), 12:30 p. m.**, Concert, Civic Music Club of Portland; 3:30, Talk, Jeanette P. Cramer; 7:45, Talk for farmers, Oregon Agri. College extension service.

**KHJ, Los Angeles, Calif. (Pacific, 395), 12:30-1:15 p. m.**, Program presented by Major and His Orchestra from the Rendezvous; 2:30-3:30, Matinee Musicale, courtesy of Southern California Music Co., N. W. Devereux, director; 6:45-7:30, The Weekly Visit of the Sandman and Queen Titiana; Marguerite Hauber, soprano; 8:00-9:30, Program featuring compositions of Beatrice Fenner; 9:30 p. m., E. P. Murphy, in "The Go-Getter."

**KPO, San Francisco, Calif. (Pacific, 423), 1:00-2:00 p. m.**, Rudy Seiger's Fairmont Hotel Orchestra; 2:30-3:30, Thomas Alexander; Sam Redesky, pianist; 4:30-5:30, Rudy Seiger's Fairmont Hotel Orchestra; 5:30-6:30, Children's hour, stories for children, "Big Brother," Book of Knowledge; 6:30-7:00, Cleveland Six; 7:00-7:30, Rudy Seiger's Fairmont Hotel Orchestra; 8:00-10:00, Play, "The White Headed Boy," Players Club of San Francisco; 10:00-11:00, E. Max Bradford's Palace Hotel Orchestra.

**KSD, St. Louis, Mo. (Central, 546), 3:00 p. m.**, "Martha," San Carlos Opera Company.

## Headliners of the Week

**T**RAVELING as all Radiophans do nightly through the ether, distant points no longer seem very distant. However, although New Zealand may seem very near, perhaps you will be interested in knowing something about this queer little island. Tune in for WMAQ Tuesday. WGI schedules a Welsh program whatever that may be.

Mrs. Whiting Williams who is one of the finest soloists in the United States and Europe will play from WJAX Thursday. Our correspondent will not let us tell you how much money she usually gets for playing, but it is a great deal. Look out for the cops! If you have a guilty conscience and have not paid your income tax, stay off of WBAP. Fifty of 'em will be on the air at once. WIP promises on this evening a "Big Surprise," and no one not even a reporter can find out what it is. There is only one way to satisfy your curiosity.

Mah Jong has become so famous that Friday and Saturday Mr. and Mrs. Lei Lun Wong will give you lessons over WIP. All boys should get WJZ tonight and their boxing gloves ready for Carl Temple is giving a series of lessons in boxing.

Saturday is the birthday of one of America's and in fact one of the world's greatest announcers. (We are under the impression, although it is a question, that he is a bachelor). Tune in for WSB at 2:00 a. m. It is rumored that he will tell his age.

Sunday an artist from across the water will face WJAZ's microphone. Mia Likora Giermann, a contralto from the Prague Opera of Czechoslovakia will sing for you. These Sunday evening programs of WJAZ are always very good.

Please be warned about Tuesday. Don't you know why? It is April 1st and WLW for one promises to fool you unless you are careful.

**WLAG, Minneapolis-St. Paul, Minn. (Central, 417), 10:45-11:15 a. m.**, Household hints; 11:35 a. m.-12:00 p. m., Surprise hour; 2:00-2:30 p. m., Woman's Club; "Interim Committee on State Reorganization," W. I. Nolan; 2:40-4:00, Daylight concert; 4:00-4:30, "Oh, You Brute," WLW Players; 5:30-6:00, Children's stories; 6:00-6:15, "Gate Crashers," Billy B. Hoke; 6:15-7:00, Dinner hour concert; 7:30-8:15, Farm lectures, Fruit, When and How to Use It," Paul C. State; "Tomato Gardening," Thomas Libby; "Value of Farm Lands," B. B. Gislason.

**WLW, Cincinnati, Ohio (Central, 309), 4:00 p. m.**, Topics of Interest to Women; 10:00, Special dance program, Greenland's Orchestra; Pete Collins and his Hawaiian Entertainers; Ernest Moore, cornetist; Irene Wilson, accompanist; Orpheus String Quartet.

**WMAQ, Chicago, Ill. (Central, 447-5), 4:30 p. m.**, Items of Interest to Women; 4:30, Pupils Glenn Dillard Gunn School of Music; 5:00, Weekly Child Life talk for children; 7:00, "A New Chemical Industry," Dr. H. E. Barnard; "Political and Economic Progress of New Zealand," Lella M. Blomfield; Group songs, Harry Mickleburgh, baritone; 8:00, Talk, Harry Hansen; 8:40, La Salle Orchestra; 9:00, Lyon & Healy program; Milton College Glee Club.

**WMC, Memphis, Tenn. (Central, 500), 8:30 p. m.**, Dr. George L. Powers; St. John's Methodist Male Quartette; 11:00, Frolic, Stanocola Fellowship Club, J. L. Whitaker, director.

**WOAW, Omaha, Neb. (Central, 526), 6:30 p. m.**, Carl Lamp's Orchestra; 9:00, Banjo, mandolin and guitar music; Mrs. Margaret R. Burns, soprano.

**WOC, Davenport, Iowa (Central, 484), 12:00 m.**, Chimes; 3:30 p. m., "Tonsillitis," A. G. Hinrichs; 5:45, Chimes.

**WOO, Philadelphia, Pa. (Eastern, 509), 11:00 a. m.**, Organ recital, Mary E. Vogt; 12:02 p. m., Wyanamaker's Crystal Tea Room Orchestra, Robert E. Golden, director; 4:45, Organ recital, Mary E. Vogt.

**WOR, Newark, N. J. (Eastern, 405), 2:30-2:45 p. m.**, Recital by Clara Altmann, contralto; 2:45-3:00, Recital by Mrs. J. Walter Force, soprano; 3:30-3:45, Clara Altmann; 3:45-4:00, Mrs. J. Walter Force; 6:15-6:30, Halsey Miller and His Orchestra; 6:30-7:00, Man in the Moon Stories; 7:00-7:15, Halsey Miller and His Orchestra.

**WSB, Atlanta, Ga. (Central, 429), 4:00-4:30 p. m.**, Howard Theater overture and prologue; 5:30, Bonnie Barnhardt's songs and Burgess bedtime story; 8:30-9:00, Vick Myers' Melody Orchestra; Mary Everitt, balladist; 10:45-11:45, Gate City Four, male quartet.

**WTAS, Elgin, Ill. (Central, 286), 8:30-midnight.** Guyons Paradise Orchestra, playing 40 dance selections; Bob Allen, baritone; Lucky Wilber, accompanist; Jimmie Egbert, composer; Charlie Dale, accompanist.

**WWJ, Detroit, Mich. (Central, 517), 8:00 a. m.**, Setting-up exercises, R. J. Horton; 9:45, Fred Shaw, pianist; 12:00 m., Edward Barnes, LeRoy De Turk, vocalists; 8:30 p. m., News Orchestra; Vocal numbers, W. D. Leitch, John Konetzky.



Ivan Francisci, Director of the Hotel Cleveland Orchestra, who has a striking resemblance to the Italian patriot and novelist, d'Annunzio. Mr. Francisci will be heard from WJAX, Thursday, March 27.



Francis J. Sadlier, who will be heard on Tuesday evening, March 25, from WJAX. Mr. Sadlier, is shown here as "The Toreador" in Carmen. Lillian Crawford (above), will be heard on the same program. Miss Crawford has as charming voice as you would expect from such a dainty little lady.



**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; 7:00-7:30, Dinner concert, Joska DeBabary's Orchestra; Clyde Duerr's Orchestra; 8:00, Program; 8:45, American Farm Bureau Federation, "The Importance of the Dairy Cow," John D. Hollowell; "What Kind of Horses Does the Market Want," G. E. Wentworth; 8:45-9:30, Otis Jester, soprano; Joseph Izzo, futeist; Franz Polsty, violinist; Sam Goldstein, tenor; William Lloyd, baritone; Mme. Emma Roe, accompanist; Sallie Menkes, accompanist.

**WAAM, Newark, N. J. (Eastern, 255), 7:00-7:30 p. m.**, "Star Spangled Banner"—Jimmy Clark and His Broadway Melody Entertainers; 7:30-7:45, Arline Felker, concert soprano; 7:45-8:00, John O'Malley, Irish tenor; 8:00-8:15, Eleanor Nelson, society entertainer; 8:15-8:30, Arundel Cotter of the Wall St. Journal talking on William H. Woodin of the American Car & Foundry Co. in the fifth of his talks on "Men of Prominence in Finance and Industry"; 8:45-9:00, Brandoff String Quartette; 9:00-9:15, Rose Shelby, soprano; 9:15-9:30, Rudolph Lorbach, saxophonist; 9:30-9:45, Marie Kimball, soprano; 9:45-10:00, Chas. D. Goldfarb, baritone; 10:00-10:30, American Warblers' Harmony Aggregation; 10:30-11:00, George Williams, John Hill and the Trianon Melody Ensemble; 11:00-11:30, Ed Bradley's "Melody Boys."

**WAAW, Omaha, Neb. (Central, 360), 8:00 p. m.**, Religious program, direction the Rev. Titus Lang, Gross Evangelical Lutheran Church, Omaha.

**WBAN, Minneapolis, Minn. (Central, 417), 12:30-1:30 p. m.**, Classical musical program; 7:00-7:30, Musical, Minneapolis Boy Scouts.

**WBAP, Fort Worth, Texas (Central, 476), 7:30-8:30 p. m.**, James E. King's "University of Eskota" band; 9:30-10:45, Monthly program by the Fort Worth Harmony Club.

**WBVA, Columbus, Ohio (Central, 390), 12:00 m.**, Piano music, Ila Lorbach Owens.

**WBZ, Springfield Mass. (Eastern 337), 7:00 p. m.**, "The Art of Investment," Donald McClench; "Ornamental Planting of Trees and Shrubs," Herbert W. Headle; 7:30, Bedtime story for the Kiddies; 7:40, Mrs. Charles Weston, coloratura soprano; Story for Grown-ups, Orison S. Marden.

**WCAE, Pittsburgh, Pa. (Eastern, 462), 4:30 p. m.**, The Sunshine Girl; 6:30, Dinner concert, William Penn Hotel; 7:30, Uncle "Kasbee"; 7:45, Popular numbers, Ben Fields; Thelma Fields, accompanist; 8:30, Smiling Collegians Orchestra.

**WCAL, Northfield, Minn. (Central, 360), 9:45 a. m.**, St. Olaf College chapel services.

**WCX, Detroit, Mich. (Central, 517), 6:00 p. m.**, Dinner concert; 10:00, Red Apple Club.

**WDAF, Kansas City, Mo. (Central, 411), 3:30 p. m.**, Joseph Black's Sexton Cafe Orchestra; 6:00, Travelogue, E. O. Moffatt, information man; Fritz Hanel's Trianon Ensemble; 11:45, Nighthawks.

**WDBR, Philadelphia, Pa. (Eastern, 395), 11:45 a. m.**, Daily Almanac; 12:02 p. m., Organ recital, Stanley Theater; 12:30, Arcadia Cafe Concert Orchestra; 2:00, Arcadia Cafe Concert Orchestra; 7:30, Dream Daddy's bedtime stories.

**WEAF, New York, N. Y. (Eastern, 492), 11:00 a. m.**, Board of Education; 11:15, Motion picture talk; 4:00 p. m., Greenwich Village Inn Orchestra; 4:40, Mary Howard, soprano; 5:00, Children's Stories; 7:20, "The New Citizenship"—a talk; 7:30, Thornton Fisher; 7:40, Harry Jentes, pianist; 8:00, Talk, "Fudia Tea"; 8:10, Anita Dietrich Knepf, soprano; 8:30, Brooklyn Daily Eagle News Digest; 9:00, Talk, "Public Relations of Eastern Railroads"; 9:20, Wing Tabor Wetmore in characterizations; 9:30, Edna Crowe, pianist; 9:45, Debate on Capital Punishment.

**WFI, Philadelphia, Pa. (Eastern, 395), 1:00 p. m.**, Meyer Davis Bellevue Stratford Hotel Orchestra; 3:00, Piano solos, Carolina Hoffman; 6:00, "Sunny Jim, the Kiddies' Pal"; 6:30, Meyer Davis Bellevue Stratford Orchestra; 10:10, Charlie Kerr and his Symphonic Dance Orchestra at Majestic Hotel.

**WGI, Medford Hillside, Mass. (Eastern, 360), 3:00 p. m.**, Amrad Women's Club program, Descriptive musicale, Chickering & Sons Co. on the Ampico in the Chickering; 3:45, "Tuesday Tea Talk," David McGregor Cheney; 6:30, Meeting, Amrad Big Brother Club; 7:00, Evening program, "Africa from Cape Town to the Congo," A. S. Flint; Welsh program.

**WGR, Buffalo, N. Y. (Eastern, 319), 12:30-1:00 p. m.**, George Albert Bouchard, organist; 2:30-4:00, The Radio Dealers' Musical Program; 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.**, "Indian Pottery," Mrs. Russell Magee; 6:30, Dinner music, Instrumental Trio; 7:45, Albert Guerrero, pianist; Raia Valero, soprano; Edward Allen Rice, violinist.

**WHAA, Iowa City, Ia. (Central, 484), 8:00 p. m.**, Prof. Edwin Ford Piper of the English department, University of Iowa, will read some of his poems.

**WHAS, Louisville, Ky. (Central, 400), 4:00-5:00 p. m.**, Selections, Strand Theater Orchestra; Selections, Walnut Theater Orchestra; Selections, Alamo Theater organ; 7:30-9:00, Concert, Henry M. Schilling and his orchestra; Pianologues, Mrs. Stanley Thompson; Pianologues, Mrs. Lee Gibson; Reading, An interesting Historical Episode.

**WHB, Kansas City, Mo. (Central, 411), 2:00 p. m.**, Ladies' hour of popular music by Sweeney Radio Orchestra; 7:00, W. C. T. U. talk; Piano solos, George Parish; 8:00, Program, Manard girls' class of Independence Boulevard Christian Church.

**WIP, Philadelphia, Pa. (Eastern, 509), 1:00 p. m.**, Organ recital, Karl Bonawitz; 4:00, Ed. J. Castell, of Chamber of Commerce, addressing Ice Cream Convention; 6:05, Dick Regan and his WIP Symphony Orchestra; 8:00, QQM Club of Supplee Middle Company of Philadelphia, Pennsylvania Railroad Glee Club, direction G. C. Hartel; 10:15, Ted Weems and his Cafe L'Aiglon Orchestra.

**WJAX, Cleveland, Ohio (Eastern, 390), 7:30 p. m.**, Bedtime story, E. G. Johnson; 7:45, Vocal and instrumental numbers, members Francis J. Sadlier Studio; Dance program, Neal D. Stamard's Orchestra.

**WJAZ, Chicago, Ill. (Central, 448), 10:00 p. m.-1:00 a. m.**, Elizabeth S. Worth, pianist; George Arnott, baritone; Louise Mueller, soprano; Oriole Orchestra.

**WJY, New York, N. Y. (Eastern, 405), 7:30 p. m.**, Nariuska, pianist; 8:00, Bertha Brainard, Broadcasting Broadway; 8:15, "Trial by Jury," Brooklyn Light Opera Society; 9:00, Leonida Leonard, pianist; 10:00, "The American Sportsman," Frank Winch; 10:15, Ruth Burns, violinist; Florence Oetler, accompanist; 10:35, Josephine M. Evans, contralto.

**WJZ, New York, N. Y. (Eastern, 455), 1:00 p. m.**, Hotel Ambassador Trio; 2:00, New York Board of Education program; 3:00, Afternoon Auditorium Concert; 4:00, Harper's Bazaar Fashions; 4:15, "Right Habits of Reading," Prof. Howard Driggs; 4:45, "The Home Beautiful," Dorothy Ethel Walsh; 5:00, Irving Oberlander, baritone; 5:15, Joel Coffey, pianist; 7:00, Jack Nelson, popular songs; 7:15, Supper music, Paul Specht's Alamac Hotel Orchestra; 8:15, "How Business Conditions Affect You," Bernard Lichtenberg; 8:30, Doris Doe, contralto; 9:00, "In Brightest Africa," Carl E. Akeley; 9:15, U. S. Navy Band, talk, Rear Admiral Hugh Rodman; U. S. Navy Band; 10:30, Dance program, Hotel Astor Dance Orchestra.

**WKAR, East Lansing, Mich. (Central, 280), 7:00 p. m.**, "Landscape Gardening," Prof. C. P. Halligan; 7:15, "Home Demonstration," Mrs. Louise Campbell.

**CKAC, Montreal, Can. (Eastern, 425), 1:45 p. m.**, Mt. Royal Hotel Concert Orchestra; 4:30, Mt. Royal Hotel Dance Orchestra.

**KDKA, E. Pittsburgh, Pa. (Eastern, 326), 12:20 p. m.**, Lenten services, Trinity Church; 6:15, Dinner concert, Pittsburgh Athletic Association Orchestra; 8:00, "Broadcasting from Your Home," L. O. Marsteller; 8:15, "The Ships that Shaughnessy Built," Charles Latus; 8:30, Concert, Rosenbaum Company.

**KFAE, Pullman, Wash. (Pacific, 330), 7:30 p. m.**, Concrete Construction for the Farm., Prof. L. J. Smith; "Keeping Household Accounts," Dean Florence Harrison; Katherine Fowler, pianist; "Clothing Problems," E. Belle Alger; "Care of the Infant," Dr. D. T. Ford; Marimbaphone duets, Chelah and Regina Cooper; Dramatic readings, Leone Webber; Alice Pike, soprano.

**KFI, Los Angeles, Calif. (Pacific, 469), 6:45-7:30 p. m.**, Detective stories, Detective Nick Harris; Concert; 8:00-9:00, Evening Herald concert; 9:00-10:00, Examiner Concert; 10:00-11:00, Concert, Hollywoodland Community Orchestra; 11:00-12:00, Concert, the Ambassador-Lyman's Coconut Grove Orchestra.

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

**KFMF, Sheppard, Ia. (Central, 266), 7:30 p. m.**, Program of popular and old-fashioned music.

**KFSG, Los Angeles, Calif. (Pacific, 278), 2:30-4:30 p. m.**, Divine healing service, conducted by Aimee Semple McPherson; 7:00-7:30, Children's hour; Bible story; 8:00-9:30, Concert features and Bible service by Sister McPherson.

**KGW, Portland, Ore. (Pacific, 492), 12:30 p. m.**, Concert, Darby's Orchestra; 3:30, Children's program; 8:00, Concert, Columbia Theater All-Artist Orchestra, Harry Linden, director; 9:00, "The Advertising Campaign," James Albert; 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, courtesy of Southern California Music Company, N. W. Devereux, director; 6:45-7:30, Children's program; Bedtime story; 8:00-9:00, Program through courtesy of Long Beach Woman's Lyric Club; 9:00, Program by Fryor Moore's Trio; Letha Journey Probst, reader; Burkman Brothers' Hawaiian Quartet.

**KPO, San Francisco, Calif. (Pacific, 423), 1:00-2:00 p. m.**, Rudy Seiger's Fairmont Hotel Orchestra; 2:30-3:30, Swan Nielson, baritone; 4:30-5:30, Rudy Seiger's Fairmont Hotel Orchestra; 5:30-6:30, Children's hour, stories for children, "Big Brother," of KPO, Book of Knowledge; 6:30-7:00, Rudy Seiger's Fairmont Hotel Orchestra; 8:00, "Your Boy and Mine," Elinger; 8:10-11:00, E. Max Bradford's Versatile Band; Mr. Carey, blind composer, and his artists will sing.

(Continued on page 16)



# "COME OUT OF THE KITCHEN"

## Where to Hear Concerts

THESE are the stations for music lovers to dial, and you can hear, providing you dial correctly and read the programs carefully, everything from jazz to opera.

**Tuesday:** KDKA, KFI, KFSG, KGO, KHJ, KPO, KSD, KYW, WAAM, WAAW, WBAH, WBAP, WBZ, WCAE, WCX, WDAF, WDP, WDR, WDF, WFAA, WFI, WGI, WGY, WHAS, WHB, WIP, WJAX, WJAZ, WJY, WJZ, WLAG, WLW, WMAQ, WMC, WOAW, WOO, WOR, WOS, WSB, WTAS, WWJ.

**Wednesday:** KDKA, KFAE, KFI, KFNF, KFSG, KGW, KHJ, KPO, KSD, KYW, PWX, WAAM, WAAW, WBAP, WBZ, WDAF, WDP, WDR, WDF, WFAA, WFI, WGI, WHAS, WHB, WIP, WJAZ, WJY, WJZ, WLAG, WLW, WMAQ, WOC, WOO, WOR, WOS, WSB, WTAM, WTAS, WWJ.

**Thursday:** CKAC, KFI, KFSG, KGO, KGW, KHJ, KLZ, KPO, KSD, KYW, WAAM, WBAH, WBAP, WBZ, WCAE, WCB, WCB, WCX, WDAF, WDP, WDR, WDF, WFAA, WFI, WGI, WGY, WHAS, WHB, WIP, WJAZ, WJY, WJZ, WLAG, WLW, WMAQ, WMC, WOAW, WOC, WOO, WOR, WOS, WSB, WTAS, WWJ.

**Friday:** KDKA, KFAE, KFI, KFSG, KHJ, KGW, KPO, KYW, WBAH,

WBAP, WBAV, WBZ, WCAE, WCAL, WCX, WDAF, WDR, WDF, WFAA, WFI, WGI, WGX, WHAS, WHB, WHK, WIP, WJAZ, WJY, WJZ, WLAG, WMAQ, WMC, WOAW, WOC, WOO, WOR, WOS, WSB, WTAS, WWJ.

**Saturday:** CKAC, KDKA, KFI, KFNF, KFSG, KGO, KHJ, KPO, KSD, KYW, PWX, WBZ, WCAE, WCAL, WDAF, WDP, WDR, WDF, WFAA, WFI, WGI, WHAS, WHK, WIP, WJAZ, WJZ, WLAG, WMAQ, WMC, WOAW, WOC, WOO, WOR, WOS, WTAM, WTAS, WWJ.

**Sunday:** CKAC, KFI, KFNF, KFSG, KPO, KHJ, KYW, WBAP, WCAE, WCAL, WDAF, WDR, WDF, WFAA, WGI, WGY, WHAS, WHK, WIP, WJAZ, WLAG, WOC, WSB, WTAS.

**Monday:** KDKA, KFAE, KFI, KPO, WAAM, WAAW, WBAH, WBAP, WBAV, WBZ, WCAE, WCB, WDAF, WDR, WDF, WFI, WGI, WHAZ, WIP, WLAG, WLW, WMC, WOAW, WOC, WOO, WOR, WOS, WSB, WTAS.

**Tuesday:** KPO, WHAS, WOAW, WAAW, WDAF, WIP, WOO, WLW, WGY, WSB, WTAS.

"Smokes": 7:20, "Sciences Up to Date," Scientific American; 7:30, "Health-o-gram," Rev. B. M. Head; Musicales.

WGR, Buffalo, N. Y. (Eastern, 319), 12:30-1:00 p. m., George Albert Bouchard, organist; 2:30-4:00, The Radio Dealers musical program; 6:30-7:30 and 11:30, Vincent Lopez, Hotel Statler Orchestra; 7:30, Digest of the day's news; 9:00, Concert, direction of J. P. Quinn.

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

WHA, Madison, Wis. (Central, 360), 7:30 p. m., "How Electricity Has Influenced Civilization," Charles E. Ringley.

WHAS, Louisville, Ky. (Central, 400), 4:00-5:00 p. m., Selections, Walnut Theater Orchestra; Strand Theater Orchestra; 7:30-9:00, Concert, Mme. Cara Sapin, director; Reading, "An Interesting Historical Episode."

WHB, Kansas City, Mo. (Central, 411), 2:00 p. m., Ladies' hour of popular music, by Sweeney Radio Orchestra; 7:00, Musical numbers, "Sandy" Sinclair Entertainers.

WIP, Philadelphia, Pa. (Eastern, 509), 1:00 p. m., Gimbel Brothers' Tea Room Orchestra, Ray Steen, director; 3:00, Hotel Walton Concert Orchestra; 6:05, St. James Hotel Dinner Dance Orchestra; 7:00, Uncle Wip's bedtime stories.

WJAZ, Chicago, Ill. (Central, 448), 10:00 p. m.-1:00 a. m., Helen Hawk, pianist; Helen Greim, pianist; J. Henry Welton, tenor; Oriole Orchestra; 12:00 midnight, Weekly Bowdoin program.

WJZ, Newark, N. J. (Eastern, 455), 12:00 m., Lenten service, Trinity Church, Rev. P. N. Wazgett; 1:00 p. m., Schraff's luncheon music; 2:00, New York Board of Education program; 3:00, Jeanette Schneider, pianist; 3:15, "Book Reviews," Grace Isabel Colbron; 3:30, Thomas Dunn, baritone; 3:45, Marie Kimball, soprano; 4:00, Women's Wear; 4:05, Thomas Dunn; 4:20, Faith Van Volkenberg, vocal, original interpretations; 4:30, Tea concert, Hotel Commodore Orchestra; 5:30, Prof. Herman H. Home; 7:00, "Adventures of Peter," Florence Smith Vincent; 7:30, Dance program, Irving Selzer and his celebrated Cafe Boulevard Orchestra; 7:45, "The Progress of the World," Review of Reviews talk; 8:00, Dance program, Irving Selzer and his celebrated Cafe Boulevard Orchestra; 8:30, "Public Welfare," Honorable Bird S. Coler; 8:45, Samuel S. Aronson, pianist; 9:00, "Weimar—Musical and Literary," Wert Barnitz; 9:15, Samuel S. Aronson, pianist; 9:30, New York Delta Upsilon Glee Clubs; Anna Welch, harpist; 10:30, Dance program, Emil Coleman and his Trocadero Orchestra.

WKAR, East Lansing, Mich. (Central, 280), 7:00 p. m., "Botany," Dr. E. A. Bessey; 7:15, "Farm Crops," H. L. Rafter.

WLAG, Minneapolis-St. Paul, Minn. (Central, 417), 1:35 a. m.-12 m., Surprise hour, 2:00-2:30 p. m., Woman's Club; "Dressmaking," Myrtle Saperston; "Work for Women," Mildred Rosenstiel; 2:40-4:00, Daylight concert, Red Cap Orchestra; 4:00-4:30, Magazine story reading; 5:30-6:00, Children's stories; 6:00-6:30, "Indian Legends," J. Bryan Bushnell; 7:30-8:15, "Drama Buttermilk, Its Value and Use," N. P. Collins; "Why It Pays to Build Permanently," H. R. Straight; 9:15, Business message; 9:30, musical.

WLW, Cincinnati, Ohio (Central, 309), 4:00 p. m., Program, "Shut Ins," Wurlitzer Concert Company; 8:00, Program, E. Kahn's Sons, Lyric Minstrels, Eschberger Orchestra.

WMAQ, Chicago, Ill. (Central, 447.5), 1:00 p. m., Speeches, Chicago Association of Commerce; 4:20, Items of interest to women; 4:30, Pupils, Cosmopolitan School of Music; 7:00, George Faulkner, story lady; 7:30, Weekly lecture from Northwestern University; 8:40, La Salle Hotel Orchestra; 9:00, Talks, Chicago Charities; 9:15, Program, Gunn School of Music.

WOC, Davenport, Iowa (Central, 484), 12:00 m., Chimes; 3:30 p. m., "Is Art Superior to Nature?" C. A. Russell; 6:30, Sandman's visit; 7:00, "Organization of Farm Bureau Women," Lulu Tregoning; 7:15, "Getting the Most Out of Life," Dr. Newton C. Carpenter; 8:00, Margaret Patnee, pianist; Suzanne Thompson, pianist; Helen Bluer, pianist; Charlotte Thompson, pianist; Elizabeth Dunne, pianist; Doris Larson, Mrs. W. F. Peterson, harpist; Choral class, Eileen Moore, soprano; Evelyn Griffin, soprano.

WOO, Philadelphia, Pa. (Eastern, 509), 11:00 a. m., Organ recital, Mary E. Vogt; 12:02 p. m., Wanamaker's Crystal Tea Room Orchestra, Robert E. Golden, director; 4:45, Organ recital, Mary E. Vogt; 7:30, Haven Casino Orchestra from Hotel Sylvania, Vincent Rizzo, director; 8:45, WOO Orchestra, Robert E. Golden, director; 10:03, Walter Miller and his Ritz Carlton Orchestra.

WOR, Newark, N. J. (Eastern, 405), 2:30-2:45 p. m., Recital by Katherine Granberry, soprano; 3:30-3:45, Katherine Granberry; 6:45-7:00, Ernie Crickett's Paramount Record Orchestra; 8:00-8:15, Talk, Paul McGinniss; 8:15-8:45, Joint Program by Beth Trezgaris, contralto, and Douglas, violinist; 8:15-9:00, Arthur Murray, Ballroom Etiquette; 10:00-11:00, Gotham Entertainers of New York.

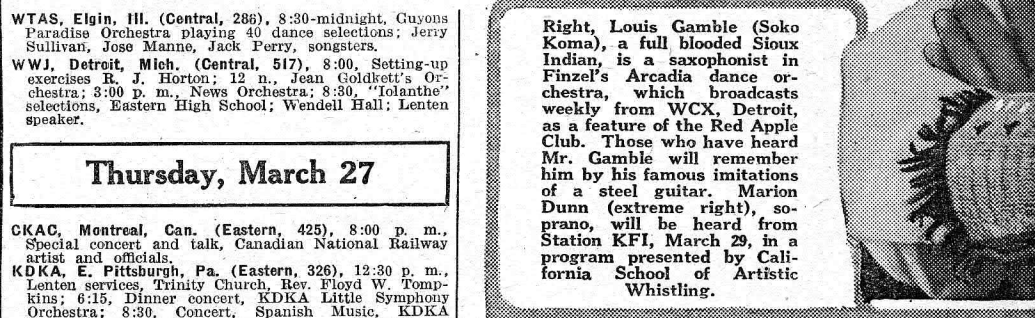
WOS, Jefferson City, Mo. (Central, 440.9), 8:00 p. m., "Forest Protection Week, and Arbor Day," H. F. Major; 8:20, Old-time "addlin'" program, Famous String Trio.

WSB, Atlanta, Ga. (Central, 429), 4:00-4:30 p. m., Howard Theater overture and prologue; 5:00, Vick Myers' Melody Orchestra; 5:30, Bonnie Barnhardt's songs and Burgess bedtime story; 10:45-11:45, "Come to Atlanta," program, Junior Chamber of Commerce.

WTAM, Cleveland, Ohio (Eastern, 390), 8:00 p. m., Selections, WFLAM Symphony Orchestra; Chorals, Al Koran Chanters; Soles, Marguerite Quimby, soprano; Banjo solo, songs, Fred C. Stutenburg; Soles, Clarence J. Sloan, baritone; Fred W. Hinz, tenor; Violin solo, Ben Silverberg; Piano solos, Alma Schirmer; Trumpet solos, Alois Hruby.



Tony Corcoran (left), a popular Irish tenor who will sing from Station WJAZ, Chicago, Saturday night, March 29. Jewel Johnson (above), dramatic soprano, who will be featured in a ballad concert from WGR, Buffalo, Monday evening, March 31. Miss Johnson was recently a member of the Metropolitan Opera company.



Right, Louis Gamble (Soko Koma), a full blooded Sioux Indian, is a saxophonist in Finzel's Arcadia dance orchestra, which broadcasts weekly, from WCX, Detroit, as a feature of the Red Apple Club. Those who have heard Mr. Gamble will remember him by his famous imitations of a steel guitar. Marion Dunn (extreme right), soprano, will be heard from Station KFI, March 29, in a program presented by California School of Artistic Whistling.

## Thursday, March 27

CKAC, Montreal, Can. (Eastern, 425), 8:00 p. m., Special concert and talk, Canadian National Railway artist and officials.

KDKA, Pittsburgh, Pa. (Eastern, 326), 12:30 p. m., Lenten services, Trinity Church, Rev. Floyd W. Tompkins; 6:15, Dinner concert, KDKA Little Symphony Orchestra; 8:30, Concert, Spanish Music, KDKA Little Symphony Orchestra; Greetings, Vice Consul of Spain, J. L. Corriola; 11:30, Concert.

KFI, Los Angeles, Calif. (Pacific, 469), 6:45-7:30 p. m., concert, sales lecture and bedtime story, Y. M. C. A.; 8:00-9:00, Concert, Ambassador Hotel; 9:00-10:00, Examiner concert; 10:00-11:00, Vocal and instrumental concert.

KFKX, Hastings, Neb. (Central, 341), 9:30 p. m., Musicales.

KFNF, Shenandoah, Ia. (Central, 266), 12:30 p. m., Noon day concert for women.

KFSG, Los Angeles, Calif. (Pacific, 278), 3:00-4:30 p. m., Organ recital for "Shut-ins"; 7:00-7:30, Children's hour; Bible story; 8:00-9:30, Musical program of vocal and instrumental selections.

KGO, Oakland, Calif. (Pacific, 312), 8:00 p. m., Claremont Hotel Orchestra; Philip Ashcroft, tenor; Violet W. Rucker, pianist; Mildred Erickson, soprano; "The Fascination of Golf," Hay Chapman; Bob Derbridge, saxophonist.

KGW, Portland, Ore. (Pacific, 492), 3:30 p. m., Woman's story program, "The Midlander"; 8:00, Accordion solos, Johnny Sylvester; 8:15, Studio program, Dance music, George Olsen's Metropolitan Orchestra; 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 Musicales, arranged by N. W. Devereaux; 6:45-7:30, Children's program, presenting Dickie Brandon, screen juvenile; Bedtime story, "Uncle John"; 8:00-10:00, Program, Mrs. A. F. Borden, director.

KPO, San Francisco, Calif. (Pacific, 423), 1:00-2:00 p. m., Rudy Selger's Fairmont Hotel Orchestra; 2:30-3:30, Pack Pait's Entella Cafe Orchestra; 4:30-5:30, Rudy Selger's Fairmont Hotel Orchestra; 5:30-6:30, Children's hour, stories for children, "Big Brother" of KPO, Book of Knowledge; Alyce Schallcock, pianist; 7:00-7:30, Rudy Selger's Fairmont Hotel Orchestra; 8:00-8:30, Program, Theodore J. Irwin, director; 9:00-10:00, Pacific Musical Society; 10:00-11:00, E. Max Bradfield's Palace Hotel Orchestra.

KSD, St. Louis, Mo. (Central, 546), 3:00 p. m., "Martha," San Carlo Opera Co.; 8:00, Music.

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; 7:00-7:30, Dinner concert, Joska DeBarby's Orchestra; Clyde Doerr's Orchestra; 8:00-8:20, "Twenty Minutes of Good Reading," Rev. C. J. Pomin; 8:20-9:05, Musical program, Hinshaw Conservatory of Music, Everett Opie, director.

WAAM, Newark, N. J. (Eastern, 255), 7:00-7:45 p. m., "Star Spangled Banner," James F. Gregory's University Club Orchestra; 7:45-8:00, "Etiquette of the Dining Table," talk by Captain Geo. E. Balys, Jr., of Alvin Silver Co.; 8:00-8:15, Mme. Gitza Rapoch, soprano; 8:15-8:30, Margulies Trio; 8:30-8:45, "Daring Our Way to Health," by Dr. G. A. Lowenstein, scientific dietitian; 8:45-9:00, Ruby O. Heritage, soprano; 9:00-9:15, Rev. Dr. Arthur W. Brooks, scientific astrologist; 9:15-9:30, Con Conrad in a breezy song review; 9:30-9:45, Fritz Leyton, vaudeville headliner; 9:45-10:00, Plantation Male Quartette; 10:00-10:15, Frank W. Efinger, radio engineer; 10:15-10:30, Harry Golub with Jack Plamer songsters; 10:30-11:30, Program by Carolina Ramblers Orchestra, under direction of Arthur E. Richter.

WAAW, Omaha, Neb. (Central, 360), 8:10 p. m., Expedition International Sunday School Lesson, the Rev. Edgar Merrill Brown, Omaha; 8:30, Agricultural address, W. J. Martin, Union Pacific System.

WBAH, Minneapolis, Minn. (Central, 417), 12:30-1:30 p. m., Dick Long's Trio, and soloist; 9:30-11:00 p. m., Special orchestra program.

WBAP, Fort Worth, Texas (Central, 476), 7:30-8:30 p. m., Concert, Piano and Hawaiian guitar music, Mrs. Albert Davis; 9:30-10:45, Concert, Choir of the First Baptist Church.

WBAV, Columbus, Ohio (Central, 390), 12:00 m., Piano music, Ila Lorbach Owens; Sermon, Rev. J. J. Tisball.

WEZ, Springfield, Mass. (Eastern, 337), 7:00 p. m., Music talk, "The Music of the Theater," Robert Elisha S. Olmstead; 7:30, Bedtime story for the Kiddies; 7:40, Springfield Conservatory Male Quartette, Frank Chipman, 1st tenor; John G. Merkle, 2nd tenor; Arthur Thoun, 1st bass; William S. Tilton, 2nd bass; Mrs. Charles Mackay, accompanist; Story for Grown-ups, Orison S. Marden.

WCAE, Pittsburgh, Pa. (Eastern, 462), 4:30 p. m., The Sunshine Girl; 6:30, Dinner concert, William Penn Hotel; 7:30, Uncle "Kaybee"; 7:50, Travel talk, Rev. Clyde L. Nevins; 8:30, Hazel Venatta, soprano; Kamiki Hawaiian Trio; 11:00, Late concert.

WCAL, Northfield, Minn. (Central, 360), 9:45 a. m., St. Olaf College chapel services; 9:00 p. m., Pearl Weeks, pianist; Leona Davis, contralto; Klara Overby, mezzo-soprano; Gladys Dahle, soprano; D. Valeria Michael; Mildred Hoff, accompanist.

WCBD, Zion, Ill. (Central, 345), 8:00 p. m., Zion Choir; Trombone quartet, A. H. Biddle, L. Hampton, R. Valkenaar, A. Sefton; Piano trio, Mary Ross, Olive Wright, Esther Naffziger; Saxophone duo, John and Robert McElroy; Kylophone solo, George Beem; Hermann Mosher, cellist; P. B. Newcomer, cornetist.

WCX, Detroit, Mich. (Central, 517), 2:20 p. m., Sunday School lesson, Rev. Gaius Glenn Atkins; 4:15, Orchestra; 6:00, Dinner concert; 8:15, Lenten lecture, Rev. John A. McClory, S. J.

WDAF, Kansas City, Mo. (Central, 411), 3:30 p. m., Albert Halsey, Dance Orchestra; 6:00, Speaker, William Jewel College; Cecil Burton, reader; Children's story; Fritz Hanlein's Trianon Ensemble; 11:45, Nighthawks.

WDR, Philadelphia, Pa. (Eastern, 395), 11:45 a. m., Daily Almanac; 12:02 p. m., Organ recital, Stanley Theater; 12:30, Arcadia Cafe Concert Orchestra; 2:00, Arcadia Cafe Concert Orchestra; Talk, "The Market Basket," Mrs. Anna B. Scott; 7:30, Dream Daddy's bedtime stories.

WEAF, New York, N. Y. (Eastern, 492), 11:00 a. m., Musical program; 11:25, Alvin Silver Company; 4:00 p. m., Edith Thayer, soprano; 4:15, Gertrude Krantz, soprano; 4:30, Tanglewood Serenaders; 7:00, N. Y. Federation of Churches; 7:30, Thornton Fisher; 7:40, Hambone Quartette; 8:30, Hunter College musical program; 9:00, Bank of America; 9:10, Hunter College; 9:30, Ella Good, contralto, and Robert McConnell, baritone; 10:00, Talk on "The Miracle of Modern Palestine"; 10:10, Ella Good and Robert McConnell; 10:30, Gladys Durham, soprano, and Frank Munn, tenor.

WEO, Columbus, Ohio (Central, 360), 8:00 p. m., Concert, Alphi Phi Sorority of Ohio State University; 9:30 p. m., Talk, "Apple Spraying Program for Ohio," Prof. Wendel Padcock.

WFA, Dallas, Texas (Central, 476), 12:30-1:00 p. m., "The Crab and the Farmer," William M. Reilly; 8:30-9:30, Wednesday Morning Choral Club, Mrs. Ralph C. Smith, chairman.

WFI, Philadelphia, Pa. (Eastern, 395), 1:00 p. m., Meyer Davis Bellevue Stratford Hotel Orchestra; 6:00, Sunny Jim, the Kiddies' Pal; 6:30, Meyer Davis Bellevue Stratford Orchestra; 8:00, Meeting of Boy Scouts Radio Corps; 8:30, Harold Simonds, baritone; 10:10, Charlie Kerr and his Symphonic Orchestra from Majestic Hotel.

WGL, Medford Hillside, Mass. (Eastern, 360), 6:30 p. m., Meeting of the Amrad Big Brother Club; 7:00, Late song hits, Bernard Eyles; 7:30, Concert, Elizabeth Bernard, soprano.

WGR, Buffalo, N. Y. (Eastern, 319), 12:30-1:00 p. m., George Albert Bouchard, organist; 2:30-4:00, The Radio Dealers' Musical Program; 6:30-7:30, Vincent Lopez Hotel Statler Orchestra; 7:30, Digest of the day's news; Boy Scout Radiogram; Story from "The American Boy"; 8:45, Addresses, "The Million Dollar Wash Lady," J. Claire Stone, president of the American Institute of Laundering; "Hitting the High Spots," John D. Wells; at the annual banquet, Hotel Statler, New York State Laundry Owners' Association.

WGY, Schenectady, N. Y. (Eastern, 380), 2:00 p. m., "How to Buy China," courtesy Modern Priscilla; 6:30, Dinner music, Romanto's Orchestra; 7:45, Musical program, Jean Lyman Cooper School; Jean Lyman Cooper, contralto; Marie C. Fahrenkopf, soprano; Rose Burger, mezzo-soprano; Hallie Bryce, contralto; Mrs. G. Desnoyers, soprano; Elton Warren, baritone; Mabelle Cooney, soprano; Edward Hinkleman, violinist; Mary Walsh, soprano; Ann Mealy, mezzo-soprano; "A Few Moments with New Books," L. L. Hopkins.

WHAS, Louisville, Ky. (Central, 400), 4:00-5:00 p. m., Strand Theater Orchestra; Selections, Walnut Theater Orchestra; 7:30-9:00, Concert, Kieth Kannard and his Kentucky Ramblers; Four-Minute Forum Talk.

WHB, Kansas City, Mo. (Central, 411), 2:00 p. m., Ladies' hour of popular music by Sweeney Radio Orchestra; 7:00, Sixth of series of addresses on "Conservation of Vision," by Dr. George J. Eiskine, vice-president of the American Optometric Association; Instrumental solos; 8:00, Old fashioned songs and music pupils of Otleye Cranston, vocalist.

WIP, Philadelphia, Pa. (Eastern, 509), 1:00 p. m., Gimbel Brothers' Tea Room Orchestra; 6:05, WIP

WJAZ, Chicago, Ill. (Central, 448), 10:00 p. m.-1:00 a. m., Helen Hawk, pianist; Helen Greim, pianist; J. Henry Welton, tenor; Oriole Orchestra; 12:00 midnight, Weekly Bowdoin program.

WJZ, Newark, N. J. (Eastern, 455), 12:00 m., Lenten service, Trinity Church, Rev. P. N. Wazgett; 1:00 p. m., Schraff's luncheon music; 2:00, New York Board of Education program; 3:00, Jeanette Schneider, pianist; 3:15, "Book Reviews," Grace Isabel Colbron; 3:30, Thomas Dunn, baritone; 3:45, Marie Kimball, soprano; 4:00, Women's Wear; 4:05, Thomas Dunn; 4:20, Faith Van Volkenberg, vocal, original interpretations; 4:30, Tea concert, Hotel Commodore Orchestra; 5:30, Prof. Herman H. Home; 7:00, "Adventures of Peter," Florence Smith Vincent; 7:30, Dance program, Irving Selzer and his celebrated Cafe Boulevard Orchestra; 7:45, "The Progress of the World," Review of Reviews talk; 8:00, Dance program, Irving Selzer and his celebrated Cafe Boulevard Orchestra; 8:30, "Public Welfare," Honorable Bird S. Coler; 8:45, Samuel S. Aronson, pianist; 9:00, "Weimar—Musical and Literary," Wert Barnitz; 9:15, Samuel S. Aronson, pianist; 9:30, New York Delta Upsilon Glee Clubs; Anna Welch, harpist; 10:30, Dance program, Emil Coleman and his Trocadero Orchestra.

WKAR, East Lansing, Mich. (Central, 280), 7:00 p. m., "Botany," Dr. E. A. Bessey; 7:15, "Farm Crops," H. L. Rafter.

WLAG, Minneapolis-St. Paul, Minn. (Central, 417), 1:35 a. m.-12 m., Surprise hour, 2:00-2:30 p. m., Woman's Club; "Dressmaking," Myrtle Saperston; "Work for Women," Mildred Rosenstiel; 2:40-4:00, Daylight concert, Red Cap Orchestra; 4:00-4:30, Magazine story reading; 5:30-6:00, Children's stories; 6:00-6:30, "Indian Legends," J. Bryan Bushnell; 7:30-8:15, "Drama Buttermilk, Its Value and Use," N. P. Collins; "Why It Pays to Build Permanently," H. R. Straight; 9:15, Business message; 9:30, musical.

WLW, Cincinnati, Ohio (Central, 309), 4:00 p. m., Program, "Shut Ins," Wurlitzer Concert Company; 8:00, Program, E. Kahn's Sons, Lyric Minstrels, Eschberger Orchestra.

WMAQ, Chicago, Ill. (Central, 447.5), 1:00 p. m., Speeches, Chicago Association of Commerce; 4:20, Items of interest to women; 4:30, Pupils, Cosmopolitan School of Music; 7:00, George Faulkner, story lady; 7:30, Weekly lecture from Northwestern University; 8:40, La Salle Hotel Orchestra; 9:00, Talks, Chicago Charities; 9:15, Program, Gunn School of Music.

WOC, Davenport, Iowa (Central, 484), 12:00 m., Chimes; 3:30 p. m., "Is Art Superior to Nature?" C. A. Russell; 6:30, Sandman's visit; 7:00, "Organization of Farm Bureau Women," Lulu Tregoning; 7:15, "Getting the Most Out of Life," Dr. Newton C. Carpenter; 8:00, Margaret Patnee, pianist; Suzanne Thompson, pianist; Helen Bluer, pianist; Charlotte Thompson, pianist; Elizabeth Dunne, pianist; Doris Larson, Mrs. W. F. Peterson, harpist; Choral class, Eileen Moore, soprano; Evelyn Griffin, soprano.

WOO, Philadelphia, Pa. (Eastern, 509), 11:00 a. m., Organ recital, Mary E. Vogt; 12:02 p. m., Wanamaker's Crystal Tea Room Orchestra, Robert E. Golden, director; 4:45, Organ recital, Mary E. Vogt; 7:30, Haven Casino Orchestra from Hotel Sylvania, Vincent Rizzo, director; 8:45, WOO Orchestra, Robert E. Golden, director; 10:03, Walter Miller and his Ritz Carlton Orchestra.

WOR, Newark, N. J. (Eastern, 405), 2:30-2:45 p. m., Recital by Katherine Granberry, soprano; 3:30-3:45, Katherine Granberry; 6:45-7:00, Ernie Crickett's Paramount Record Orchestra; 8:00-8:15, Talk, Paul McGinniss; 8:15-8:45, Joint Program by Beth Trezgaris, contralto, and Douglas, violinist; 8:15-9:00, Arthur Murray, Ballroom Etiquette; 10:00-11:00, Gotham Entertainers of New York.

WOS, Jefferson City, Mo. (Central, 440.9), 8:00 p. m., "Forest Protection Week, and Arbor Day," H. F. Major; 8:20, Old-time "addlin'" program, Famous String Trio.

WSB, Atlanta, Ga. (Central, 429), 4:00-4:30 p. m., Howard Theater overture and prologue; 5:00, Vick Myers' Melody Orchestra; 5:30, Bonnie Barnhardt's songs and Burgess bedtime story; 10:45-11:45, "Come to Atlanta," program, Junior Chamber of Commerce.

WTAM, Cleveland, Ohio (Eastern, 390), 8:00 p. m., Selections, WFLAM Symphony Orchestra; Chorals, Al Koran Chanters; Soles, Marguerite Quimby, soprano; Banjo solo, songs, Fred C. Stutenburg; Soles, Clarence J. Sloan, baritone; Fred W. Hinz, tenor; Violin solo, Ben Silverberg; Piano solos, Alma Schirmer; Trumpet solos, Alois Hruby.

WTAS, Elgin, Ill. (Central, 286), 8:30-midnight, Guyons Paradise Orchestra playing 40 dance selections; Jerry Sullivan, Jose Manne, Jack Perry, songsters.

WVJ, Detroit, Mich. (Central, 517), 8:00, Setting-up exercises R. J. Horton; 12 m., Joan Goldbetti's Orchestra; 3:00 p. m., News Orchestra; 8:30, "Tolanthe" selections, Eastern High School; Wendell Hall; Lenten speaker.

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Saturday, March 29

(Continued from page 17)

WCX, Detroit, Mich. (Central 517), 6:00 p. m., Dinner concert.
WDAF, Kansas City, Mo. (Central, 411), 3:30 p. m., Riley-Ehrhart Orchestra; 6:00, Address, Edgar A. Linton, writer, children's story, Fritz Hanlein's Trianon Ensemble; 11:45, Nighthawks.
WDAF, Philadelphia, Pa. (Eastern, 395), 11:45 a. m., Daily Almanac; 12:02 p. m., Organ recital, Stanley Theater; 12:30, Arcadia Cafe Concert Orchestra; 2:00, Arcadia Cafe Concert Orchestra; 7:30, Dream Daddy's Bedtime Stories.
WEAF, New York, N. Y. (Eastern, 492), 4:00 p. m., Meta Christenson, contralto; 4:30, Carolinians Orchestra; 7:15, New York Tuberculosis Society; 7:30, Claremont Male Quartet; 8:00, Adele Marcus, pianist; 8:20, John Alden Spooner, tenor; 9:00, Talk by Wm. C. Bedford; 9:10, Elizabeth Spencer, soprano; 9:40, Associated Motion Pictures Advertisement.
WEAY, Houston, Texas (Central, 360), 8:00-10:00 p. m., Patty Martin's Dance Orchestra.
WFAA, Dallas, Texas (Central, 476), 12:30-1:00, Address, Dr. E. L. Shurter; 3:30-4:00, Musical program; 8:30-9:30, Piano recital, David Guion; 11:00-12:00, Adolphus Hotel Orchestra.
WFI, Philadelphia, Pa. (Eastern, 395), 1:00 p. m., Meyer Davis Bellevue Stratford Orchestra; 6:00, "Sunny Jim, the Kiddies' Pal," 8:00, Educational Talk, auspices Philadelphia County Medical Society; 9:00, International Sunday School Lesson, Dr. William T. Ellis; 10:10, Charlie Kerr and His Symphonic Dance Orchestra from Hotel Maerck.
WGL, Medford Hillside, Mass. (Eastern, 360), 6:30 p. m., Meeting, Amrad Big Brother Club; 8:00, Ninth of a series of talks on New England Business Industry, Arthur H. Currier; Musical.
WGR, Buffalo, N. Y. (Eastern, 319), 12:30-1:00 p. m., George Albert Bouchard, organist; 2:30-4:00, The Radio Dealers' Musical Program; 6:30-7:30, 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, Romano's Orchestra.
WHAS, Louisville, Ky. (Central, 400), 4:00-5:00 p. m., Strand Theater Orchestra; 7:30-9:00, Concert, Zur Schmieded Harmonie Diggers; Reading, "Interesting Historical Episode."
WHB, Kansas City, Mo. (Central, 411), 2:00 p. m., Ladies' hour of popular music by Sweeney Radio Orchestra; 12:40, Dance music by Sweeney Orchestra.
WIP, Philadelphia, Pa. (Eastern, 509), 1:00 p. m., Organ recital, Karl Bonawitz; 6:05, Club Madrid Orchestra; 7:00, Uncle Wip's bedtime stories; 8:00, Science talk, Philadelphia College of Pharmacy and Science; 8:15, Performance of "Stradella" by Philadelphia Operatic Society; Russian Choir recital; 10:15, Harold Leonard and His Redcoats from Club Madrid.
WJAZ, Chicago, Ill. (Central, 448), 10:00-1:00 a. m., Cambridge Sisters, vocal trio; Langdon Brothers, steel guitarist; Fred W. Agard, tenor; Oriole Orchestra.
WJZ, New York, N. Y. (Eastern, 455), 2:30 p. m., Special Saturday Discussion, National Democratic Club; 3:00, Lotta Green, mezzo-soprano; 3:30, Famous Fain Dance Orchestra; 4:00, Tea Concert, Hotel Belmont Stringed Ensemble; 5:00, Warner Hawkins, pianist; 7:00, Howard Garis' Uncle Wiggley Stories; 7:30, Hannah Van Vollenhoven, pianist; 7:45, "Mistakes of Employees," R. M. Wellington; 8:00, Hannah Van Vollenhoven; 8:15, Lily Christoffers, 10 male voices; 8:45, "Echoes of the Present," Dr. Alfred N. Goldsmith; 9:00, Lily Christoffers; 9:15, "Mark Twain," David Edwards; 10:30, Frederick Velaz's Spanish Orchestra.
WLAG, Minneapolis-St. Paul, Minn. (Central, 417), 11:35 a. m., 12:00 p. m., Weekly meeting of Postcard Club; 1:30, R. B. Burt, 10:00, "Songs and Sacred Review," Lester Rees; 2:30-4:00, Studio concert, Traffic Club Orchestra; 4:00-4:30, Telling of Magazine story; 4:30-5:00, Talk on Radio, Ray R. Sweet; 5:30-6:00, Meeting of Children's Radio Health and Toothbrush Club of America, Dr. F. W. Pepper; 6:00-6:30, "Swimming with the League," 7:30-8:15, Farm Lectures; 9:15-10:15, Scandinavian program, Mr. and Mrs. Bert Film; 10:15-12:30, Dance program, Nankin Cafe.
WMAQ, Chicago, Ill. (Central, 447.5), 2:30 p. m., Holstein Park Girls' Orchestra and Chorus; 8:00, Band concert, Chicago Daily News Band; 9:00, Balaban & Katz Chicago Daily News.
WMC, Memphis, Tenn. (Central, 500), 8:30 p. m., Program, Avery Chapel A. M. E. Church, H. D. Whalum, choirmaster.
WOAW, Omaha, Neb. (Central, 526), 6:00 p. m., Pollyanna's Synchopators, Lincoln, Neb., popular music; 9:00, Pearl Wood's Orchestra; Address, 12:00 p. m.
WOC, Davenport, Iowa (Central, 484), 12:00 p. m., Chimes; 3:30 p. m., "Soil Conservation," C. C. Hall; 5:45, Chimes; 6:30, Sandman's visit; 7:00, "The Production of Silk and Its Uses," T. W. McFarlane; 9:00, P. S. C. Orchestra; V. B. Rochte, baritone.
WOO, Philadelphia, Pa. (Eastern, 509), 11:00 a. m., Organ recital, Mary E. Vogt; 12:02 p. m., Wana-maker's Crystal Tea Room Orchestra, Robert E. Golden, director; 4:45, Organ recital, Mary E. Vogt.
WOR, Newark, N. J. (Eastern, 405), 2:30-2:45 p. m., Recital by Joseph Lord, tenor; 3:00-3:15, Recital by Vanston Lee, baritone; 3:30-3:45, Joseph Lord; 3:45-4:00, Vanston Lee; 6:15-7:15, Paul Van Loan's Cinderella Orchestra; 7:15-7:30, Fred J. Bendel, "Sporting News Up to the Minute."
WSB, Atlanta, Ga. (Central, 429), 4:00-4:30 p. m., Howard Theater overture and prologue; 5:00, Vick Myers' Melody Orchestra; 5:30, Bonnie Barnhardt's songs and bedtime story; 8:00-9:00, Helen Knight, director; 9:00-11:00, Mike McGuire-Young Striding bout.
WTAS, Elgin, Ill. (Central, 286), 8:30-midnight, Program from Kimball Hall, Guyons Orchestra, Jerry Sullivan, Will Rossiter, Irene McGinn, Charley Dale, Jimmie Eggert, Jack Perry, Milton Charles, Jack Fritch.

Where to Hear Dramas

DRAMAS, humorous, serious, musical comedies and even operettas are broadcast during the week and below are listed the stations and dates.

Tuesday: KGO, "Come Out of the Kitchen," KGO Players; KPO, "The White Headed Boy," Players Club of San Francisco; WJY, "Trial by Jury," Brooklyn Light Opera Society; WLAG, "Oh, You Brute," WLAG Players.
Friday: WDAF, Walter Greenough's

WDAR Players; WGY, "The Merchant of Venice," WGY Players.
Saturday: WIP, "Stradella," Philadelphia Operatic Society.
Monday: WHAZ, "It Pays to Advertise," Dramatic Club.
Tuesday: WGY, "Snowball," WGY Players.

Tuesday, April 1

WDAF, Philadelphia, Pa. (Eastern, 395), 2:00-4:00 p. m., Arcadia Cafe Concert Orchestra; 8:30, Organ recital, Stanley Theater.
WEAF, New York, N. Y. (Eastern, 492), 2:45 p. m., N. Y. Federation of Churches; 3:45, Dr. S. Parkes Cadman; 7:20, Capitol Theater Orchestra and Staff; 9:00, Skinner Organ Recital.
WFAA, Dallas, Texas (Central, 476), 5:00-6:00 p. m., Vesper service, Westminster Presbyterian Church, Dr. T. O. Perrin, pastor; 6:00-7:00, Radio Bible Class, Dr. William M. Anderson, Jr.; 9:00-10:00, Singers' Club; 10:00-11:00, Jack A. Davis and his Seven Shirt-Sleeve Shakers Orchestra.
WFI, Philadelphia, Pa. (Eastern, 395), 7:30 p. m., Church services, Arch Street Presbyterian Church, Rev. Clarence Macarty, minister.
WGL, Medford Hillside, Mass. (Eastern, 360), 4:00 p. m., "Adventure Hour," Youth's Companion; Concert, St. John's Baptist Colored Male Quartette; 8:30, Talk, auspices of the Greater Boston Federation of Churches; Musical.
WGR, Buffalo, N. Y. (Eastern, 319), 12:30-1:00 p. m., George Albert Bouchard, organist; 2:30-4:00, The Radio Dealers' Musical Program; 6:30-7:30 and 11:30, Vincent Lopez Hotel Statler Orchestra; 7:30, Digest of the day's news; (Individual Night) 8:50-9:00, Address, Dr. F. S. Fosdick, "The High School," 9:00-9:15, Jewel Johnson, dramatic soprano; 9:15-9:45, Bill Whelan, Scotch humorist and singer of Scotch sentimental songs; 9:45-10:00, Jewel Johnson; 10:00-10:15, Winnie Hibsher, mezzo-soprano; 10:15-10:25, L. J. Havenstein, tenor; 10:25-10:50, Flute, harp and violin; 10:50-11:00, Estherma Clark, reader.
WGY, Schenectady, N. Y. (Eastern, 380), 11:00 a. m., Service, Presbyterian Church, Rev. Peter A. Macdonald, pastor; 5:30 p. m., Concert, WGY Symphony Orchestra; 7:30, State Street Presbyterian Church.
WHAS, Louisville, Ky. (Central, 400), 9:57 a. m., Organ music; 10:00, Church service, First Christian Church, Rev. E. L. Powell, pastor; Chester Solomon, choirmaster; 4:00-5:00, Sacred concert, St. Cecilia Choir.
WHB, Kansas City, Mo. (Central, 411), 7:35 p. m., Church services broadcast from First Baptist Church.
WHK, Cleveland, Ohio (Eastern, 283), 8:00 p. m., Concert program, WHK Symphony Orchestra; solo and duet numbers, Miss Ruth Sponsler, Hugo Oliver.
WIP, Philadelphia, Pa. (Eastern, 509), 1:00 a. m., Church services, Rev. Floyd Tompkins, minister; 9:30 p. m., Special Sunday night concert from Germantown Theater directed by Bed Stad and Karl Bonawitz.
WJAZ, Chicago, Ill. (Central, 448), 6:00-9:00 p. m., Mia Likora Giermann, contralto from Prague Opera; Marion O'Neill-Holland, violinist; Irene Vopat, pianist; Genevieve Green, pianist; Oriole Orchestra.
WLAG, Minneapolis-St. Paul, Minn. (Central, 417), 10:30 a. m., Plymouth Congregational Church; 3:50 p. m., House of Hope Church; 6:30, Second Church of Christ, Scientist; 7:45, Hennepine Avenue Methodist Episcopal Church; 9:30, Special Musical Program.
WLW, Cincinnati, Ohio (Central, 309), 9:30 a. m., School, Editorial Staff, Sunday School Publications of the Methodist Book Concern; 11:00, Services, Church of the Covenant, Dr. Frank Stevenson, minister; 7:30, Church services; 8:15, Concert, Western and Southern Orchestra.
WOAW, Omaha, Neb. (Central, 526), 9:00 a. m., Church services conducted by Bishop E. V. Shaylor, assisted by Trinity Cathedral choir; Ben Stanley, organist; 6:00, Bible study hour, Mrs. Carl R. Gray; 9:00, Sacred music, Trinity Baptist church choir; Catherine Long, organist.
WOC, Davenport, Iowa (Central, 484), 9:00 a. m., Sacred Chimes; 1:30 p. m., P. S. C. Orchestra; 7:00, Pipe organ, Erwin Swindell; 8:00, Church service; 9:30, Musical program, Erwin Swindell, director; P. S. C. Orchestra.
WSB, Atlanta, Ga. (Central, 429), 11:00 a. m., First Presbyterian Church service, Rev. J. Spry Lyons, pastor; 8:45, Charles Sheldon, organist; 5:00-6:00 p. m., Sabbath, twilight studio, Vineville Methodist church; 7:30-9:00, Wesley Memorial church service, Rev. Marvin Williams, pastor; Mr. and Mrs. A. C. Boatman, musical director.
WTAS, Elgin, Ill. (Central, 286), 2:30-5:00 p. m., Guyons Paradise Orchestra; Joe Manne, Harry O'Brien, Bob Allen, Tuck Wilber; 8:15-12:00 midnight, Guyons Paradise Orchestra.

Theater; 12:30, Arcadia Cafe Concert Orchestra; 2:00, Arcadia Cafe Concert Orchestra; 4:30, Betty Logan in talk on fashions; 7:30, Dream Daddy's bedtime stories; 8:00, Talk, Samuel Lacker; 9:25, Features from Stanley Theater; 10:10, Howard Lamin's Arcadia Cafe Dance Orchestra.
WEAF, New York, N. Y. (Eastern, 492), 4:00 p. m., Corine Muer, soprano; 4:15, Adrian Vanderbilt pianist; 4:45, Mary Bowlby, soprano; 5:00, Mothers' program; 7:30, Thornton Fisher; 7:40, Metropolitan Mixed Quartette; 8:00, Lawyers Mortgage Co.; 8:10, Metropolitan Mixed Quartette; 8:30, A talk on "Sales Literature"; 8:40, Minnie Weil, pianist; 8:50, Talk on Clocks; 9:00, Walter Leary, baritone; 9:30, Gypsy String Ensemble.
WFAA, Dallas, Texas (Central 476), 12:30-1:00 p. m., Address, Prof. J. D. Boon; 8:30-9:30, MacDonell Sisters; 9:00, Hatfield music; George Ashley Brewster.
WFI, Philadelphia, Pa. (Eastern, 395), 1:00 p. m., Meyer Davis Bellevue Stratford Orchestra; 3:00, Piano recital, Loretta Kerk; 6:00, "Sunny Jim, the Kiddies' Pal," 6:30, Meyer Davis Bellevue Stratford Orchestra.
WGR, Buffalo, N. Y. (Eastern, 319), 3:00 p. m., Vesper service, the Rev. Guy D. Wallace, First United Presbyterian Church.
WGY, Schenectady, N. Y. (Eastern, 380), 2:00 p. m., "Suggestions on Planting and Beautifying Home Ground Part II"; 7:15, "The Essentials in the Cooperative Marketing Movement," H. E. Babcock; 7:25, "The Extension Service of the College of Agriculture," Dean R. Mann; 7:45, WGY Orchestra; Mrs. Wm. B. Williams, soprano; Ernest Burling, cellist; Peter Schmidt, clarinetist.
WHAS, Louisville, Ky. (Central, 400), 4:00-5:00 p. m., Walnut Theater Orchestra; Standard Theater Orchestra.
WJAZ, Troy, N. Y. (Eastern, 380), 9:00 p. m., Mildred Lamb, contralto; Fluma G. Macintosh dramatic reader; Garden talk, John Jeannin, Jr., extension lecturer of State Department of Agriculture; 9:45, "It Pays to Advertise," Dramatic Club; 11:00, Dance music, Campus Serenaders.
WHB, Kansas City, Mo. (Central, 411), 2:00 p. m., Ladies' hour program of classical music, Sweeney Radio Orchestra; 7:00, Educational program for younger folks directed by Lenore Anthony of Book of Knowledge.
WIP, Philadelphia, Pa. (Eastern, 509), 1:00 p. m., Gimbel Brothers' Tea Room Orchestra; 4:00, Mah Jong lesson by Mr. and Mrs. Wei Lum Wong of Shanghai, China; All-Italian program, director, Carlo Nicocia; 6:05, Dinner music, St. James Hotel Dinner Dance Orchestra; 7:00 p. m., Uncle Wip's bedtime stories.
WLAG, Minneapolis-St. Paul, Minn. (Central, 417), 10:45-11:15 a. m., Household Hints; 11:15-12:00 m., Surprise Hour; 2:00-2:30 p. m., "20th Century House-keeping," Bernice Bell; 2:40-3:00, Daylight concert; 4:00-4:30, Magazine reading; 5:30-6:00, Children's stories, Tess Cooperman; 6:00-6:15, Sport review; 6:15-7:00, Dinner concert from Nankin Cafe; 7:30-8:15, Farm Lectures.
WLW, Cincinnati, Ohio (Central, 309), 8:00 p. m., Special concert, College of Music; Ladies' Quartette, Florence T. Watts, Carry Schaefer, Nora B. Thuman, Beatrice W. Chipman; Dorothy Stolzenbach, Clifford Lang, pianists; 9:00, Croley Theatrical Review; Wendy Meyers Cincinnati Orchestra.
WMAQ, Chicago, Ill. (Central, 447.5), 4:30 p. m., Pupils Jeannette Durmo.
WMC, Memphis, Tenn. (Central, 500), 8:30 p. m., Program, Garoso Hotel Orchestra.
WOAW, Omaha, Neb. (Central, 526), 6:30 p. m., Randall's Royal Orchestra, playing at Brandeis Restaurants; 9:00, Harno Orchestra, Knights of Columbus Glee Club; Address, W. C. Fraser.
WOC, Davenport, Iowa (Central, 484), 12:00 p. m., Chimes; 3:30 p. m., Educational lecture; 5:45, Chimes; 6:30, Sandman's visit; 7:00, Lecture; 8:00, Dr. Erwin Swindell, 9:00, Croley Theatrical Review; Musical program.
WOO, Philadelphia, Pa. (Eastern, 509), 11:00 a. m., Organ recital, Mary E. Vogt; 12:02 p. m., Wana-maker's Crystal Tea Room Orchestra, Robert E. Golden, director; 4:45, Organ recital, Mary E. Vogt; 7:30, Hotel Adelphia Concert Orchestra; 9:15, Fox Theater Orchestra, Erno Rapee, director; 10:30, Havana Casino Orchestra from Hotel Sylvania.
WOR, Newark, N. J. (Eastern, 405), 2:30-3:00 p. m., Oreste and His Puck Inn Orchestra; 3:30-4:00, Gosh Entertainment; 6:15-7:30, Harry Cox and His Hotel Robert Treat Orchestra; 8:00-8:15, Alfred J. McCosker, "Current Motion Pictures"; 8:45-9:00, Jolly Bill Steinke, "Radio Cartooning"; 10:00-11:00, Murray Wachsmann and Henry Jedel's Commonwealth Orchestra.

WSB, Atlanta, Ga. (Central, 429), 4:00-4:30; p. m., Howard Theater overture and prologue; 5:00, Vick Myers' Melody Orchestra; 5:30, Bonnie Barnhardt's songs and bedtime story; 8:00-9:00, "Cycle of Life," Helen Knight, director; 9:00-11:00, Mike McGuire-Young Striding bout.
WTAS, Elgin, Ill. (Central, 286), 8:30-midnight, Program from Kimball Hall, Guyons Orchestra, Jerry Sullivan, Will Rossiter, Irene McGinn, Charley Dale, Jimmie Eggert, Jack Perry, Milton Charles, Jack Fritch.

KFNF, Shenandoah, Ia. (Central, 266), 12:30 p. m., Musical program for women.
KPO, San Francisco, Calif. (Pacific, 423), 1:00-2:00 p. m., Rudy Seiger's Fairmont Hotel Orchestra; 2:30-3:30, Mammie Marks' New Shanghai Cafe Orchestra; 4:30-5:30, Rudy Seiger's Fairmont Hotel Orchestra; 5:30-6:30, Children's hour, "Big Brother," stories from Book of Knowledge; 7:00-7:30, Rudy Seiger's Fairmont Hotel Orchestra; 8:00-10:00, Spanish Night; 10:00-11:00, E. Max Bradford's Palace Hotel Orchestra.
WAAW, Omaha, Neb. (Central, 360), 8:10 p. m., Musical program, auspices Omaha Grain Exchange.
WBAP, Fort Worth, Texas (Central, 476), 7:30-8:30 p. m., Concert, Municipal Band; 9:30-10:45, Concert, Hawaiian Steel Guitar music, Fred Paul and Nanette Wagner.
WBAV, Columbus, Ohio (Eastern, 390), 12:00 m., Piano music, Ila Lorbach Owens.
WGAL, Northfield, Minn. (Central, 360), 9:45 a. m., St. Olaf College chapel services.
WDAF, Kansas City, Mo. (Central, 411), 3:30 p. m., Johnnie Campbell's Kansas City Club Orchestra; 8:00, Travelogue by E. O. Moffatt, children's story; Fritz Hanlein's Trianon Ensemble; 11:45, Nighthawks.
WDAF, Philadelphia, Pa. (Eastern, 395), 11:45 a. m., Daily Almanac; 12:02 p. m., Organ recital, Stanley Theater; 12:30, Arcadia Cafe Concert Orchestra; 2:00, Arcadia Cafe Concert Orchestra; 7:30, Dream Daddy's bedtime stories.
WFAA, Dallas, Texas (Central, 476), 12:30-1:00 p. m., Address, DeWitt McMurray; 3:30-4:00, Concert, Choral Club; 11:00-12:00, Musical and dramatic entertainment, Players from The Jefferson Theater, Pete Pate and Company.
WFI, Philadelphia, Pa. (Eastern, 395), 1:00 p. m., Meyer Davis Bellevue Stratford Hotel Orchestra; 6:00, "Sunny Jim, the Kiddies' Pal," 6:30, Meyer Davis Bellevue Stratford Hotel Concert Orchestra; 10:10, Charlie Kerr and His Symphonic Dance Orchestra from Hotel Maerck.
WGR, Buffalo, N. Y. (Eastern, 319), 12:30-1:00 p. m., George Albert Bouchard, organist; 2:30-4:00, The Radio Dealers' Musical Program; 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., "Color and Harmony in House Decoration," Mrs. C. W. Ashworth; 6:30, Dinner music, Instrumental Trio of Hotel Ten Eyck; 7:45, WGY Orchestra; Radio drama, "Snowball," WGY Players.
WHAA, Iowa City, Ia. (Central, 484), University of Iowa, Address, "New Developments in Summer Study," by Prof. Charles H. Weller, director of the summer session; Music.
WHAS, Louisville, Ky. (Central, 400), 4:00-5:00 p. m., Selections, Strand Theater Orchestra; Selections, Walnut Theater Orchestra; 7:30-9:00, Concert, Visiting students, Louisville Conservatory of Music, Violette M. Code, director; Reading, "An Interesting Historical Episode."
WHB, Kansas City, Mo. (Central, 411), 12:35 p. m., Popular music, Sweeney Radio Orchestra; 2:00, Ladies' hour of classical music, Sweeney Radio Orchestra; 7:00, Garden talk, Mrs. Roy Briggs, instrumental music; 8:00, "April Fools' program."
WIP, Philadelphia, Pa. (Eastern, 509), 1:00 p. m., Organ recital, Karl Bonawitz; 6:05, Dick Regan and His WIP Symphony Orchestra; 7:00, Uncle Wip's bedtime stories; 8:00, Dramatic Review, Elliott Lester; 10:15, Ted Weems and his Cafe L'Aiglon Orchestra.
WJAZ, Cleveland, Ohio (Eastern, 309), 7:30 p. m., Bedtime story, E. G. Johnson; 7:45, Orchestral and solo numbers arranged by the Cleveland Leader-News.
WLW, Cincinnati, Ohio (Central, 309), 4:00 p. m., Topics of Interest to Women; 10:00, The Romance of Mahogany, P. C. Schmidt; St. Aloysius Male Chorus; Duets, Irma, Myrtle Suhre; 10:30, Half Hour of April Fool (ishness); 11:00, Wadsworth Watchcase Dance Orchestra, Elbert L. Kellum.
WMAQ, Chicago, Ill. (Central, 447.5), 2:35 p. m., Concert, Lyon & Healy concert hall; 4:20, Pupils Glenn Dillard Gunn School of Music; 7:00, Debate, Crane and John Marshall High Schools; Clinton A. Jerome, reader; 8:40, La Salle Orchestra; 9:15, Lyon and Healy program.
WMC, Memphis, Tenn. (Central, 500), 8:30 p. m., Program, Prof. Chin-Chin and his Brillings' Cafeteria Novelty Orchestra; 11:00, Midnight Frolic.
WOAW, Omaha, Neb. (Central, 526), 6:30 p. m., Dinner dance program; 9:00, Musical program auspices Corn Exchange National Bank, Omaha.
WOO, Philadelphia, Pa. (Eastern, 509), 11:00 a. m., Organ recital, Mary E. Vogt; 12:02 p. m., Wana-maker's Crystal Tea Room Orchestra, Robert E. Golden, director; 4:45, Organ recital, Mary E. Vogt.
WSB, Atlanta, Ga. (Central, 429), 8:00-9:00 p. m., Dahlstrand Orchestra; 10:45, Independent Quartet Darky Songsters.
WTAS, Elgin, Ill. (Central, 286), 8:30-midnight, Guyons Paradise Orchestra, Special Dance Program.

Monday, March 31

Sunday, March 30

CKAC, Montreal, Can. (Eastern, 425), 4:30 p. m., Sacred concert.
KFI, Los Angeles, Calif. (Pacific 469), 10:00-10:45 a. m., Church service presented by L. A. Church Federation; 4:00-5:00 p. m., Vesper service presented by Federated Church Musicians; 6:45-7:30, Concert program; 8:00-9:00, Concert by Ambassador Hotel; 9:00-10:00, Examiner concert; 10:00-11:00, Concert.
KFNF, Shenandoah, Ia. (Central, 266), 6:45 p. m., Sacred song service.
KFSS, Los Angeles, Calif. (Pacific 278), Entire Church service broadcasted at 10:30 to 12:30 m., 2:30 to 5:00 p. m. and 7:30 to 10:00 p. m.
KHJ, Los Angeles, Calif. (Pacific, 395), 10:00 a. m., Sermon from Studio of KHJ; 10:30-12:30 m., Entire service and organ recital from First M. E. Church, Rev. E. E. Helms, pastor; Arthur Blakeley, organist; 7:00-7:30 p. m., Arthur Blakeley, organist; 8:00-10:00, De Luxe concert.
KPO, San Francisco, Calif. (Pacific, 423), 11:00-12:00 m., Radio Church Service American Bible Society, Ensign C. E. Stairs, speaker, Neida Houx, soprano; 8:30-10:00, Rudy Seiger's Fairmont Hotel Orchestra.
KYW, Chicago, Ill. (Central, 536), 11:00 a. m., Central Church Service, Dr. F. F. Shannon, pastor; 2:30 p. m., Studio Chapel service, Chicago Church Federation; 7:00, Chicago Sunday Evening Club service; Bishop W. H. Overs, speaker.
WBAP, Fort Worth, Texas (Central, 476), 11:00-12:15 p. m., Service, First Methodist Church, Rev. J. W. Bergin, pastor; 4:00-5:00, Organ concert, Margaret Agnew White; 11:00-12:00 midnight, Fred Cahoon's WEAP Southern Serenaders Orchestra.
WGAL, Northfield, Minn. (Central, 360), 11:00 a. m., Services, St. John's Lutheran Church of Northfield, Rev. Nils Klevan, pastor; Dr. F. Melius Christian-son, organist; 8:30 p. m., Sacred program, Rev. H. M. Thompson, speaker; Arthur Solberg, pianist; Edna Johansgaard, soprano; Eugene Swenunson, trumpeter; Florence Groetrum, Margaret Hoigaard, accompanists.
WCX, Detroit, Mich. (Central, 517), 2:30 p. m., Chapel services, Central Presbyterian Church; 7:30, Services, Central M. E. Church, Rev. Lynn Harold Hough, Skinner organ, Hudson quartets.
WDAF, Kansas City, Mo. (Central, 411), 4:00 p. m., Program, North Kansas City Schools.

CKAC, Montreal, Can. (Eastern, 425), 1:45 p. m., Mt. Royal Hotel Concert Orchestra; 4:30, Mt. Royal Hotel Dance Orchestra.
KFEE, Pullman, Wash. (Pacific, 330), 7:30 p. m., "Spraying for Orchard Leaf Roller," Dr. A. L. Mander; "Teaching as a Profession," Dean A. Cleveland; "Economic Effects of Artificial Leather," Prof. C. M. Brewster; "Small Fruits and Their Care," Prof. M. D. Armstrong; Conner Stringed Trio; Ray Kromer, guitarist.
KFXX, Hastings, Neb. (Central, 341), 9:30 p. m., Musical program.
KFNF, Shenandoah, Ia. (Central, 266), 12:30 p. m., Concert.
KHJ, Los Angeles, Calif. (Pacific, 395), 12:30-1:15 p. m., Concert. SILENT rest of day.
KPO, San Francisco, Calif. (Pacific, 423), 1:00-2:00 p. m., Rudy Seiger's Fairmont Hotel Orchestra; 2:30-3:30, Madies program, Mme. Rose Florence; 4:30-5:30, Rudy Seiger's Fairmont Hotel Orchestra; 5:30-6:30, Children's hour, stories for children, "Big Brother," Book of Knowledge; 7:00-7:30, Rudy Seiger's Fairmont Hotel Orchestra; 8:00-9:00, United States Army Band, 300 Infantry.
WAAW, Omaha, Neb. (Central, 526), 7:15-7:30 p. m., "Star Shangled Banner," James V. Moore and His Clover Club Entertainers; 7:30-7:45, Victor Wilbur, baritone, Joseph Macy, pianist; 7:45-8:30, Nelson Rogers WAAM Dance Orchestra; 8:30-8:45, "The Best of Current Motion Pictures," Alice B. Evans, Secretary of National Committee for Better Films; 8:45-9:30, Continuation Program by Nelson Rogers' WAAM Dance Orchestra; 9:30-9:45, Jack Sherman and Ruby Cowan; 9:45-10:00, Frank Bessinger, tenor; William Axtman, pianist; 10:00-10:15, Bernard MacFadden, author and publicist; 10:15-10:45, Times Square Entertainers; 10:45-11:00, Fred Austin and Jack Bergere, song writers; 11:00-11:15, Vincent Roswell Stortz, concert pianist.
WAAW, Omaha, Neb. (Central, 360), 7:30 p. m., Old time dance music, Happy Home Orchestra; auspices J. J. Markey & Sons.
WBAH, Minneapolis, Minn. (Central, 417), 12:30-1:30 p. m., Dick Long's Trio, and soloist; 9:20-11:00 p. m., Studio Concert.
WBAP, Fort Worth, Texas (Central, 476), 7:30-8:30 p. m., Old-time fiddle music, Capt. Dunning of Tahoka; 9:30-10:45, Concert, 50-piece band of Mosiah Temple Shrine, L. Cecil Meadows, director.
WBAV, Columbus, Ohio (Eastern, 390), 12:00 p. m., Piano music, Ila Lorbach Owens; 8:00 p. m., Concert, WB&V Orchestra, Frances Handbeau, director.
WCBZ, Zion, Ill. (Central, 345), 8:00 p. m., Zion Orchestra; Mixed quartet, Mrs. Thomas, Mrs. Sparrow, Barton, Thomas; Soprano and tenor duet, Mr. and Mrs. Steel; Tenor and baritone duet, Barton, Thomas; Fred Fassen, organist.
WDAF, Kansas City, Mo. (Central, 411), 3:30 p. m., Milo Finley's Dance Orchestra; 6:00, Speaker from Kansas University, children's story, Fritz Hanlein's Trianon Ensemble; 8:00, Ray Stinson's Serenaders and Soloists in minstrel numbers; 11:45, Nighthawks.
WDAF, Philadelphia, Pa. (Eastern, 395), 11:45 a. m., Daily Almanac; 12:02 p. m., Organ recital, Stanley

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# Meditations by the Inventor of King Miloplex

## Part XXV—More About the Miloplex Wave Traps

By the Mystery Man

**R**IDEM, Cowboy! Didja ever hear about the fellow who tried to build a compound wave trap, then came into town riding a mountain lion, with a wild cat under each arm, using a rattlesnake for a whip? Got off at the corner drug store and, with one shot at the vaseline sheik back of the soda fountain, asked for a glass of carboric acid with a dash of iodine, and a moth ball as a chaser? Neither did I—yet he still lives and is so tough he uses fresh cotton for lather and shaves with a blow torch—and even dares me to answer one word of his Q. and A. He wins—you see Digest and “My Gang” need me—so I’m letting Maggie answer him. Believe me, when she starts answering—well, she simply sends it out so hot she has to turn down the damper. Let her start one number on her answering broadcasting program, and all of the wave traps this side of our main sulphur supply couldn’t tune her out. So beware, Cowboy! If the mailman says he has a letter for you, kneel, sinner, bow down—’cause when they come to pick up the pieces the committee will sure feel you must have met with a minor accident. Ridem, Cowboy! Let your conscience be your guide. I’ll be in Kansas

and telling me you can’t get stations 200 to 1,000 miles away very loud on your loud speaker. Neither can I, nor the fellow who wrote me he was getting Havana every night, unless Havana has a station that automatically broadcasts when it’s shut down. Anyway, Mr. Havana, you are to be complimented. Never mind your sending radius—totally close down. I’ll still get reports on hearing you, and that’s some Cuban prize. No, sirEEEE, O. M., if you want real D. X. on the King Reflex use a vario-coupler in place of the loop and ground your minus A. Possibly a few of my circuits work—at least, the audience say they do—but listen: If I ever know enough about Radio circuits and the lung power of a tube to build a circuit using one tube that will bring in 1,000-mile D. X. in loud speaker volume on a loop—well, if I do (who was the dude that invented that word if?) again—I can’t resist saying it again if I do—somebody will have to pay me seven million iron men C.I.F. (cash in fist), and refuse to eat anything but gold fish and sleep in King Tut’s spare bedroom, the while giving Maggie carte blanche and money also. I’ll put up a broadcasting station so powerful—well, I’ll make the guy that invented “if” cross out the word.

Have you missed “Howler,” my dog? I have. You know I think he has been out broadcasting without a license. But he’s gone—electioneering, I ’spose. Maggie called him Spot and tried to prove it, but one spot more or less meant little in his howling life, yet I never could understand why they put a guaranteed slip polish on a floor and then covered it with a Turkish rug made in Kalamazoo. How’s a dog going to feel homelike when he has to dig his toenails in when making a quick “chase-me party” with the cat? (Will this guy ever cut this out and talk wave traps?)

Don’t throw the paper—it’s too hard work picking it up again, because here’s another trap and it works another trick: If you can wind wire on a coil—even tho it slips and slides and decides to spoil a perfect day—you can still lick it and possess a trap that will cut out B.C. and spark. Come home 30 minutes early for supper and you can have it finished in time to say “Gimme” when the first dish of corned beef lands on the pure white.

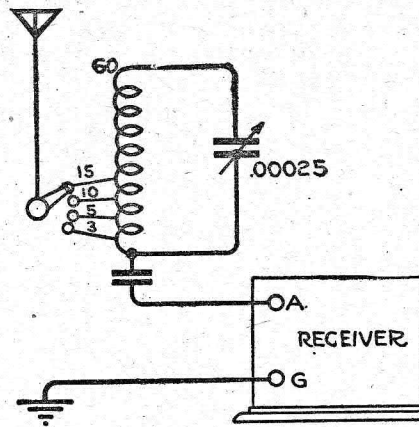
### Winding the Wave Trap Coil

For this trap or filter I’m going to use one of Harry Schwarzberg’s spasmodic primary’s, a 4-inch tube 3 1/2 inches long, a .0025 variable condenser and a chunk of number 22 dec. (or cotton, if you wish) copper wire—sixty turns, or approximately 80 feet in length.

Start the winding one-half inch from one end of the tube, anchoring it in the usual manner. Now watch carefully.

Wind on three turns and bring out a tap at the third; then two more turns and bring

out another tap, this being the fifth turn from the start. Continue the winding up to the tenth turn, where another tap should be taken off, and then continue by



winding on five more turns, which should be the fifteenth when the final tap is taken off, and continue the winding until 45 more turns have been added, which is the finish of our wedding. Is supper ready? No!

Alrighty—let’s look at it. If you have did or done (no, it’s did, ’cause I didn’t), if you have—you should have a coil comprising 60 turns, tapped at the 3rd, 5th, 10th and 15th. Atta, boy! Golly—he gave us the tuff ones first; this is as easy as smelling the stock yards in Chicago, or Dave Grimes hiring keepers for his Radio lighthouse so they can reflex the waves.

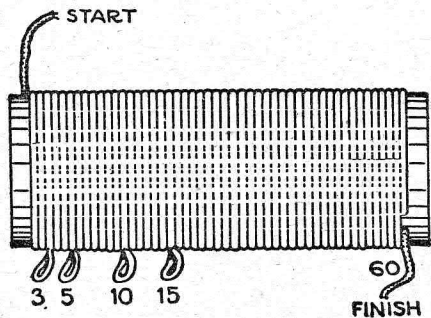
### Connecting Taps

And now for the connections—the start and finish hook onto the rotor and stator terminals—while the taps numbers 3, 5, 10 and 15 go to switch points. The way to hook it up is just as easy—look at the diagram; the rest is as clear as mud.

There now, Mr. Radio Smith, is your trap—ready for anything up to 600 meters that thinks it can slip by. But what is it? Well, it’s a big word—sort a like KOKOLOKA, and means in Radio language a QUENCHER, but if I named it Digest might decide it was free publicity, but if you saw it theoretically described it would be called a conductively coupled auto transformer having an untuned or spasmodic primary and variable ratio of primary to secondary of from 1 to 59 up or down to 15 to 45.

### More Circuits to Come

With one exception (because there is (Continued on page 29))



City eating and talking to “My Gang” at the A.R.R.L. meet. Just get swept up by the time I return, as the health department is trying to keep our neighborhood clean.

### Miloplex Reflex

And now that another teapot dome scandal has been rehearsed, just a word to you who have received my picture and reflex hook-up. Yes, you can have one—you’re not too late. Send in your self-addressed stamped envelope and get yours. Alright, yur wulkum. Get this answer to 314 letters on the King Reflex; it was designed to be used on a loop. How big? Oh, about 2 feet square with 18 turns of number 18 or 20 spaced 3/8-inch apart. Yes, it was also designed so that on the aforesaid loop you could bring in local stations on a loud speaker using but one tube. So mercy, man, don’t make me think you are mysterious by writing in

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<p>Capacity, 6-10 volts, 3-20 amperes; automatic; needs no watching while charging. Can not be injured by accidentally short-circuiting generator leads. Ball bearing Ohio Motor and Generator will run quietly and smoothly thousands of hours without further oiling. Equipped with ammeter and rheostat to</p>	<p>control charging rate. Long leads permit plugging in practically anywhere. Made of best materials; well finished; mounted on substantial base; weighs 60 pounds. Regularly equipped with 110 v. 60 cycle A. C. Motor; 6-10 volt Generator. Equipped for other service if desired; prices on application.</p>
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“If not satisfactory, you may return the set within 30 days and we will return the full purchase price.”

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# Radio Digest

EVERY WEEK **Illustrated** PROGRAMS TEN CENTS

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## More About Legislation

### Get Busy and Write Your Congressman

THE Radio law of 1912 is rather obsolete for present-day operation. Representative White, who has the Radio bill in charge, says a new Radio bill is much needed. It is quite necessary for the broadcasters to review those laws of 1912 and mail their concrete suggestions to Representative White. This should be done without delay.

Also, those who own sets and have the science foremost in their minds at the present time, should write a letter to their own congressmen in their respective districts regarding this matter so vital to the future of Radio.

## More Help Needed

### More Inspectors Required to Help Out Radio

WE HAVE only twenty-nine actual inspectors of Radio in the service of the Department of Commerce. This is a very small number for the work to be done. These inspectors have it in their power to do a great deal for all of us interested in Radio. There are not enough in the field to cover it fast enough to keep all the transmitters properly inspected.

What is most needed is an increased appropriation to enable the department to do much better work in policing the air. Subscribers are urged not only to write to their congressmen, but to have retailers, fans and other associates in the trade do the same thing, asking for increase in the appropriation for this work.

## That Applause Again

### Your Favorite May Not Broadcast Again

TOO much stress cannot be laid upon the importance of thanking various artists for the Radio entertainment they have furnished you. Many of the performers who are delighting hundreds and thousands of listeners have never before played to an invisible audience, and the lack of thunderous applause at the conclusion of their program, leaves them in doubt as to the manner in which it was received.

High-salaried stars, whose appearance in any community would bring a rush to the box office, are giving programs that millions are enjoying free of all charges. Surely word of appreciation if you have enjoyed the entertainment, is little enough to offer and it is the performer's only method of knowing that his or her program has been appreciated.

## Interference by Re-radiation

### Noises from Sets Cannot Be Tuned Out

IN the early days of broadcasting the amateur spark transmitting set was the chief offender of the air while programs were given. The spirit of fair play caused a great many owners of these stations to shut down voluntarily while music was being broadcast so that their stations would not mar the pleasure of a neighbor.

The efficiency of C.W. over spark transmission still further thinned out the ranks of the spark sets until they are no longer a vital factor in disturbing the peace. Now the interference comes from re-radiation, and it has the old spark transmitter beat many ways. Cities are crowded with sets, the owners of which do not know how to tune in, or are careless and do not mind how much annoyance they cause their neighbors with the oscillations given out by a "spill over" of their own tubes.

The spark can be filtered out by wave traps and by sharp tuning, but the interference from radiating receiving sets is becoming an ever-present nuisance that cannot be tuned or filtered out because it is tuned in on the wave you wish to receive.

The same situation prevails in Radio as in automobilizing, the selfishness of some people will force others out of the road or air so that they may retain the right of way. Turn your detector down a little and let others enjoy the program with you.

## RADIO INDI-GEST

### Mrs. Partington Speaks Out



Dear Indi: Mrs. Partington says a smart feller named W. R. C. at Washington is learning her a lot of politics, and she is willing to learn all her Radio friends the same free. Quite recently they had a bad land storm at Washington, and she listened to a speaker pouring "Water on the troubled oil." She knew it wasn't General Lafayette, of Wisconsin, nor Magnavox Johnson, as that crowd makes more profit by wrenching the Govt. machinery than they would to oil it.

She says it's turrrible the way they was stealing the Navy's oil while Mr. Dunby was so busy, even carrying it away in teapots until somebodys dome cracked and Mr. Fell's teapot leaked oil all over Mr. Dough Heney's new suitcase full of money, but she's glad to know that Mr. McAdough came out all right as she heard that he had collected all but a million dollars of his wages that he made by honest, hard, and few hours labor at the regular union scale.

She says Radio politics is much more interestin and educating than Ma Jung's game and hopes the fans will listen to it more.

SIGNING OFF.

### Dedicated to Indi-Gest

*I have a little Radio  
And when it works just right,  
You come over to my house  
And we'll be up all night.*

*Last night it wasn't working good  
I bought an Indi-Gest,  
It told just how to fix it  
And now it's at its best.*

*Now when my little set goes wrong  
The Indi-Gest I'll see  
For just now I have found out  
It's the Indi-Gest for me.*

CURTIS C. SPRINGER.

### Oh, She Could Use a Dress Shield and Chest Protector

Dear Indi: A Kansas City femme says it isn't safe to breathe any more since so much Radio has been turned loose in the air. What to do? Should she hold her breath?

R. S. T.

### It's Antiseptically Okeh for Halitosis

Dear Indi: Sh-h-h! I am the inventor of the famous Super Iodine circuit. What do you think of it, and why?

F. J. G.

### They Ain't No Station COD, Lota

Dere Indi: Ples n answer for rit des anoners al tim sa sen me tel-ram n vin a priz. How cum dey no say sen im C. O. D.? Tank u.

LOTA TROBAL.

### Ode to King Miloplex

*I've never invented a circuit,  
I've never thought up a kink,  
But, by Gee, I get some good results,  
With a wire tached onto my sink.*

*I'll ne'er have a name like Flewelling,  
Or some other genius, with "specs"  
But, by Gee, I can tune in most anywhere,  
With my good ole MILOPLEX.*

—MIKE ROFARADS.

### Too Bad. Is It Written by Request?

Dear Indi: Yesterday afternoon we were listening to WOC at Davenport. The announcer, as is his custom, made reference to "Where the West Begins." Then the maid observed:

"Well, my land, they're always announcing 'Where the West Begins' and then they never play it—they always play something else instead."

Just imagine the disappointment of the poor girl as she has waited time after time—and always heard some substitute tune!

H. C.

### Old Advice Radio-Actuated

1. One station tuned in is worth two on the air.
2. The early Radiophan catches the program.
3. Too many waves spoil the entertainment.
4. Children should be receiving sets and not broadcasting stations.
5. Tune in while the static is nil.

BESSIE L. ME.

### From a Nine-Year-Old Radioknut Contrib

*Pa be nimble,  
Pa be quick,  
To your Radio set and stick;  
Turn the dials and  
Hold your breath,  
Loss of sleep will be your death.*

—ALICE REICHERT.

### Who Gets the Point? Write Indi, He Doesn't

Dear Indi: I see by last week's Indi-Gest that your typesetter is named Ohm. Being head of a growing family myself I certainly hope the advent of the UV-199 tubes had no disastrous results if aforesaid Ohm is a married man.

FRESH MAN.

## What He Didn't Expect



## Condensed

By DIELECTRIC

Possibly by this time some effort has been made to supply the patients in Cook County hospital with a loud speaker, if not, then such action should be started right now. They have a receiving set and phones, but no loud speaker, and you know what that would mean to a group of two hundred and fifty patients. No one hears much of anything. Col. Green, or some other like-spirited individual, could win the affection of many thousands of sufferers in this land by establishing a Radio Fund for supplying apparatus to institutions of this kind. It brings so much for so little. Who will take the suggestion?

After listening to the voice of an announcer night after night, you know your station without waiting for the call letters. No doubt some of you listeners could sit with your back to the speaker and tell the different stations as they were tuned in, merely by recognizing the announcer's voice, and do so with quite a list of stations. But suppose you were accustomed to hearing "Dream Daddy" through station WDAR, and he was tuned in, where would you say the voice came from? Harry Ehrhart is "doing" the broadcasting stations in the east just now.

The novelty of having your wedding ceremony performed under circumstances which permit thousands of absentees to listen in has not had the appeal lately it once had. Or, is it that marriages are farther and fewer between? However, Mr. and Mrs. Proulson of Chicago were willing to let Radio play a part in the ceremony which united them in wedlock. A brother of the bride arranged with station WDAP to broadcast the wedding march from "Lohengrin" so that the strains of this marital air might be heard by the peaceful couple and their guests. As evidence of the ability of a distant announcer to appreciate local color, WDAP later sent out the music to "I Love You Truly."

Did you listen to the speeches and music at the alumni meeting, in New York, of the Massachusetts Institute of Technology? If not, you missed a rare treat, for another milestone in the advance of Radiophony was reached that evening. WJZ, WGY, KDKA, KFKX, KGO and 2AC in England were each giving the program to their respective audiences and no land wires used. This marks the first time such a thing has been done. Listeners in England heard clearly through the relaying by KDKA, and several cablegrams were read to that effect at the meeting. This should prove an important experiment, since it was so successful.

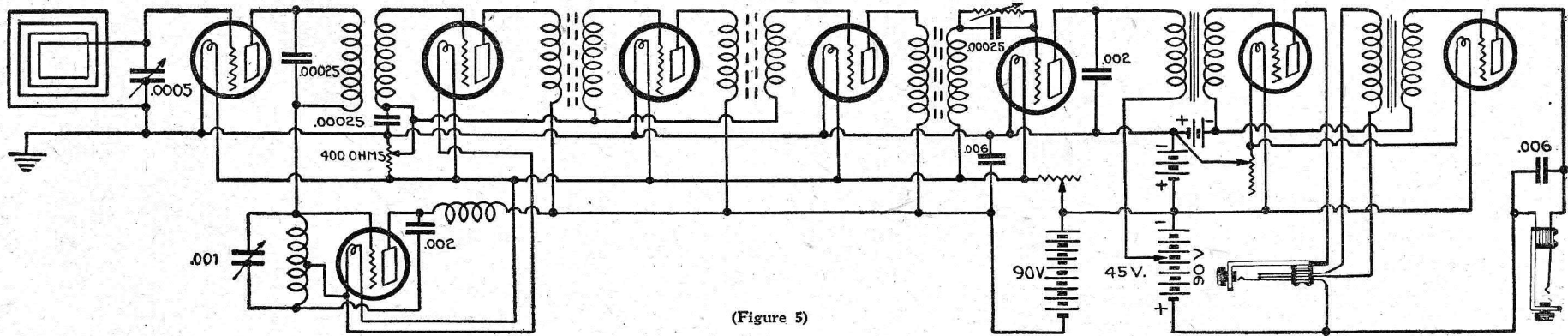
You can tune in some stations and hear fervent Republicans berating Democrats, or zealous Democrats lambasting Republicans, as broadcast from political meetings. You may listen to boundless praise, or bitter denunciation of certain measures, according to the speaker before the microphone. Now, if all that is available to the owner of a receiving set, why, ask labor representatives, may you not hear facts concerning the activities of labor unions? The possibility of establishing broadcasting stations all over the country for the sake of presenting the views of organized labor is now under consideration. Will the Government permit it? Will its use be detrimental in any way? If Radio broadcasting is not to be open to subjects of interest to the majority of listeners, then it will be greatly handicapped. Who are the majority?



# The Latest in Super-Heterodyne Hook-Ups

## Part III—Two Forms of Super-Heterodynes

By H. J. Marx



**I**N the last article two foreign forms of super-heterodyne circuits were presented. In this article two more circuits are offered for examination and analysis. One was designed by Paul Fonteneau, president of the Radio Club of Nantes, France, while the other is a typical American circuit that is being developed in Chicago.

Both of these circuits are much simpler to understand and are more within the possibility of construction of our average fan. More definite information and values are given for experimentation.

### Fonteneau Circuit

The circuit shown in Figure 6 is a six-tube hook-up with the usual oscillator, two detectors and three stages of amplification.

It will be noticed that there are three sets of resistance couplings and a stage of tuned air core transformer which has a very loose coupling between the primary and the secondary. Another unusual feature is the variable coupling tickler running from the plate circuit of the second detector back to this loose coupled transformer. This makes the circuit distinctly regenerative in addition to the heterodyne action.

### Tuning Unit

The tuning unit consists of 100 turns of number 22 sec. wire wound on a 3-inch tube and tapped every ten turns. These taps are connected to two inductance switches, one for the primary circuit and the other for the secondary circuit. Two .0005 mfd. variable condensers are used to tune the primary and secondary circuits.

The details of the oscillator coupler coils are as follows: The pick-up coil consists of 35 turns of number 22 sec. wire wound on a 1½-inch rotor, and the grid and plate coils are made up of two honeycomb coils in fixed relation to each other, with the pick-up rotor between them. These two coils are from 25 to 50 turns each, depending on the range and strength of the oscillation desired.

The loose coupled transformer can be made up of a three-honeycomb coil unit with the following coil values: Primary, 300 turns; secondary, 300 turns; and tickler, 150 turns. As these values will vary at times, some experimental work is necessary before maximum results can be obtained.

The condenser in the grid circuit of the last tube (2nd detector) is indicated as .001 mfd.—this should be .0001 mfd. The

other two grid condensers in the amplifying tubes are correct, as shown.

The grid leak of the first detector should have a resistance of four megohms, and the grid condenser should have a capacity of .0005 microfarads.

The oscillator tube has a separate filament battery in order to avoid the tendency of the oscillation frequency leaking to the amplifier circuit.

The antenna used with this set was a two-wire aerial 100 feet long and 35 feet above the ground, running north and south.

### Eight-Tube Circuit

The circuit shown in Figure 5 can be used with a loop, or if an outdoor antenna is used a variocoupler or other form of tuning unit can be added. The loop is tuned with a .0005 mfd. variable condenser, which should be of high electrical efficiency in order to get the desired selectivity.

The usual fixed tuned coupling transformer is used. The grid returns of the three amplifier tubes (super-audible stages) are connected to a 400-ohm poten-

(Continued on page 24)

## 91½% of All Radio Tubes Are Needlessly Destroyed



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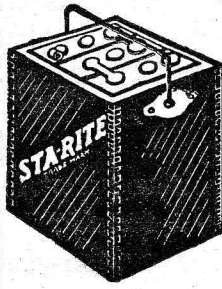
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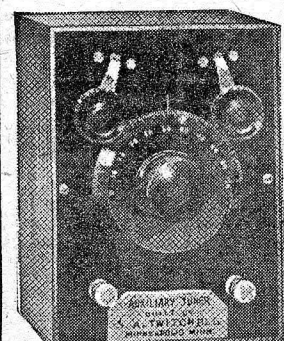
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This instrument will also enable you to bring in programs sent out on longer waves than you can tune in without it, thus bringing in all the broadcasting stations within the wave length range of the many sets of limited range now in use.

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

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**THIRTY MINUTE A-B-C**

(Continued from page 13)  
as sound because they are in the range which can sympathetically vibrate the ear drums.

Now, vibrations are regular series of

**DULL RED LIGHT WAVES COOLING DOWN THROUGH SLOWER FREQUENCIES RECONIZED AS HEAT**

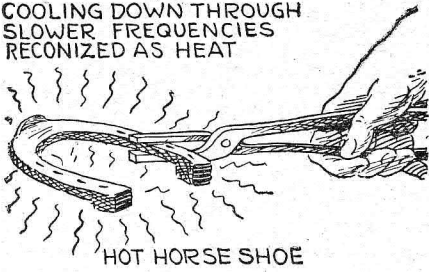


Figure 8.

waves, and are sometimes called oscillations. Instead of speaking of the distance between successive waves as the wave length, this is also expressed in terms of how many occur in a specified time. Thus, if there are sixty waves or

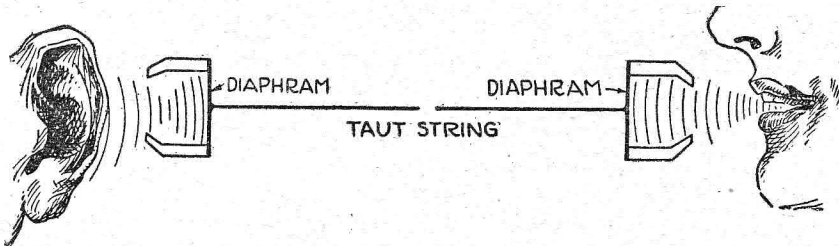


Figure 9.

pulsations in a second, the frequency is said to be sixty cycles.

**What Are Cycles?**

Cycles means how many waves occur in a given time; one second. In light, the waves are very short and since they travel at the rate of 186,000 miles per second, it is understood that there are very many billion of them vibrating each second, so the cycles are a high number. Light comprises an extremely high frequency.

In Figure 7, there are illustrated three widely separated frequencies one can fix in mind. The cycle of day to night, as

to be heard as a hum in apparatus such as power transformers. All such low frequencies are called audio frequencies if they can be heard.

A broadcast station uses very high frequency energy, and for a 360-meter wave length this amounts closely to 833,000 cycles per second. In Radio, high frequency energy or vibrations as used in broadcasting are above audibility and are called Radio frequencies.

**Sound Important in Broadcasting**

Air is not required for the transmission of light or Radio but sound must have air or a material medium. Since sound controls the intensity of broadcast Radio waves by means of suitable apparatus, the way this is done is important. The common range of audio frequencies is about 16 to 8,000 cycles, and varies according to the ears of individuals.

Heat waves are another form of energy which can be compared with Radio. A hot horseshoe taken from a blacksmith's forge, Figure 8, in cooling down from dull red goes through a range in which the particles of iron or molecules of which it is comprised go through a great commotion, which becomes slower and slower during the cooling. Heat waves

are extremely short compared to Radio waves.

**Frequency of Oscillation**

Having seen that Radio is concerned with vibrations, it is well to fix in mind what is meant by oscillations. Figure 12 illustrates a clock pendulum 1, having an adjustable weight 2 which the clock-works keep in motion, swinging from 4 to 5 and back again. This pendulum like other material things has a natural rate of travel back and forth, and to change this the weight 2 is moved up if one wants the pendulum to travel faster or down for slower. One trip from posi-

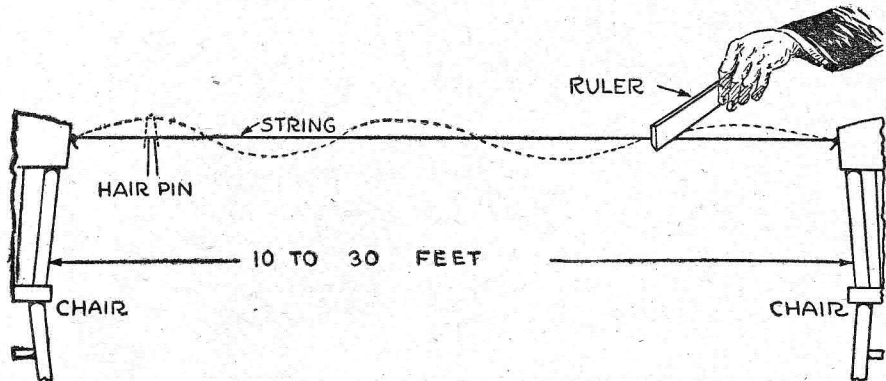


Figure 10.

the earth rotates, is very slow. A similar and much faster example would be the trip back and forth of the pendulum of a clock. The ordinary alternating current supply of a power line has sixty cycles per second. This is slow enough

tion 4 to 5 and back again is one cycle, and the pendulum is said to oscillate or swing between positions 4 and 5. When the weight 2 is raised the length of the pendulum is shorter and the distance between 4 and 5 will be shorter.

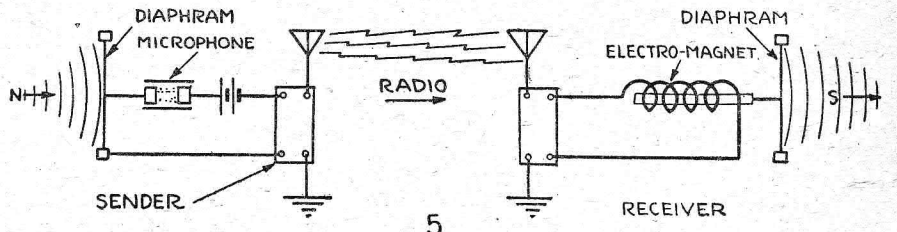
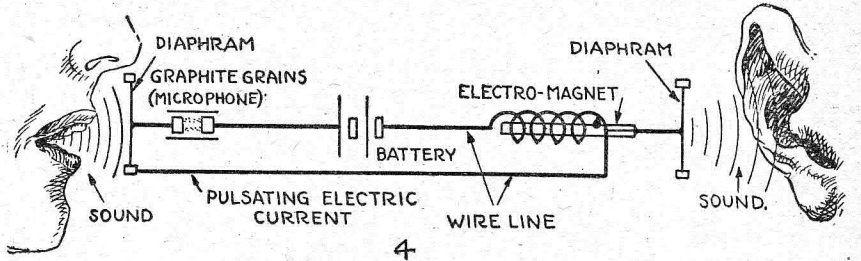
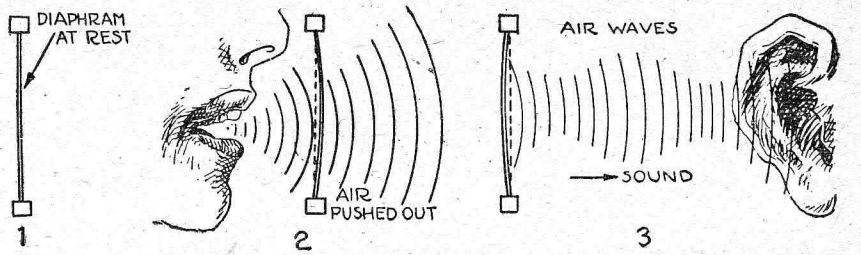


Figure 12.

Now in the case of other oscillations such as Radio oscillations which occur at extremely high rate, an analogous procedure can be carried out to adjust the rate of vibration or oscillation. A further example to fix this point is furnished by a dinner gong or bell. When

struck, the gong is set into audible oscillation. Essentially the transmitting aerial of a broadcasting station is similarly struck electrically and set into high oscillation. Whereas the gong sets up corresponding motion in the sur-

(Continued on page 24)

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# Simple Explanation of Radio for Everybody

## Chapter XIV—The Reflex Circuit

By M. W. Thompson

LIKE neutrodyne, reflex is a principle, not just a circuit. Although we would like to give credit for reflex to an American, this most efficient of sys-

vacuum tube without interference; to the purchaser of a receiving set it means less tubes to purchase and less maintenance expense in the form of batteries. In a

took up Radio frequency amplifiers; the two types of amplification were taken up on the basis that different tubes were used for each. One, two or three tubes were

form the duties of an A.F. amplifier; if we could just fold over or double back our circuit at the detector and have the output in front of the detector instead of after

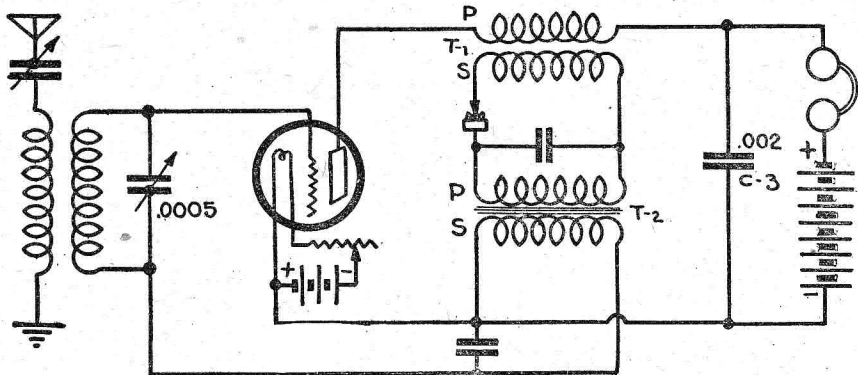


Figure 108.

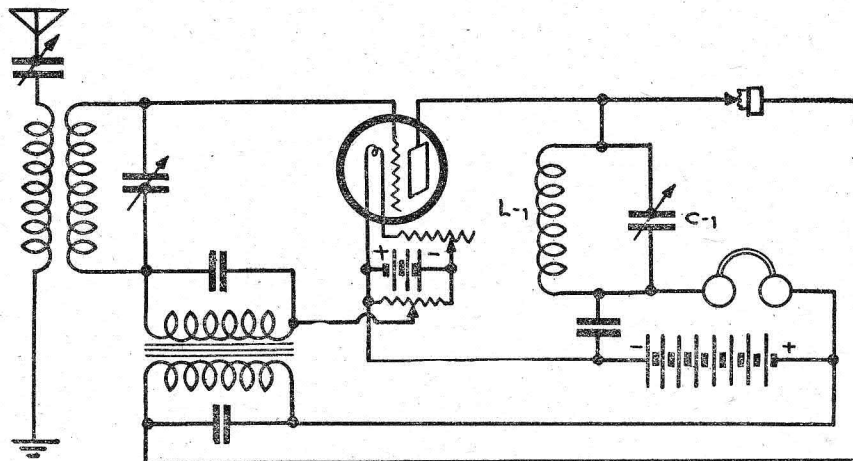


Figure 110.

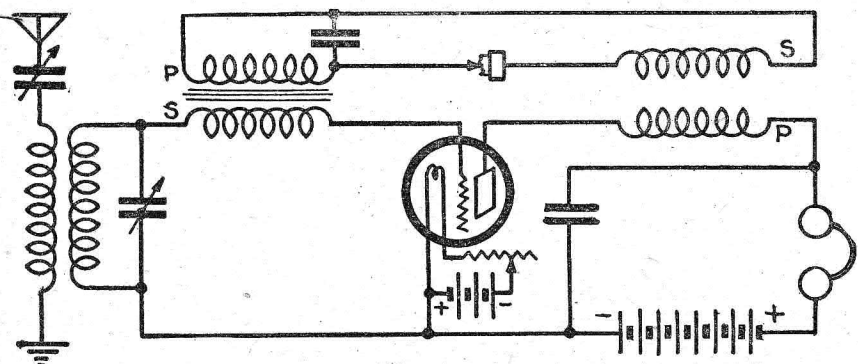


Figure 109.

used to amplify incoming programs while the frequency of variation was from 500,000 to 4,000,000 per second; then came a detector tube, followed by one, two or three tubes to amplify the speech and music when its frequency was between 10 and 10,000 vibrations per second. To obtain one stage of R.F. amplification, a detector and one stage of A.F. amplification, three tubes were needed; to have three R.F. amplifiers, detector and three A.F. amplifiers, seven tubes were necessary.

### Reflex Circuits

It would be economy, indeed—economy in initial expense, in maintenance and in space needed, if each tube used as an R.F. amplifier could also be made to per-

it. This is exactly what reflex does, and here we reiterate reflex is a principle, and no one circuit can be held up as the reflex hook-up. Reflexing can be applied to one tube, two tubes, three, four or five tubes and a detector; the R.F. coupling may be transformer, tuned impedance, tuned transformer or neutrodyne. The varia-

(Continued on page 29)

tems is the work of a French engineer, Marius Latour. It was patented by him in November, 1917, yet for some reason received but little attention in this country between the end of the war and the beginning of the Radio broadcasting era—October, 1921. Even after the demand for sets outdistanced production, due to broadcasting, this now popular method of receiving went a year without attention.

To Radio engineers reflex means the passing of two frequencies through a

previous chapter we discussed audio frequency amplifiers—in a later chapter we

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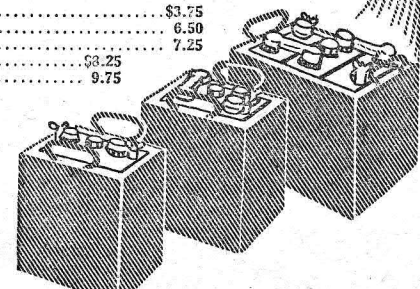
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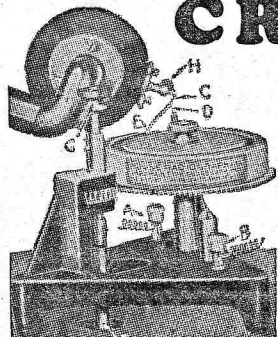
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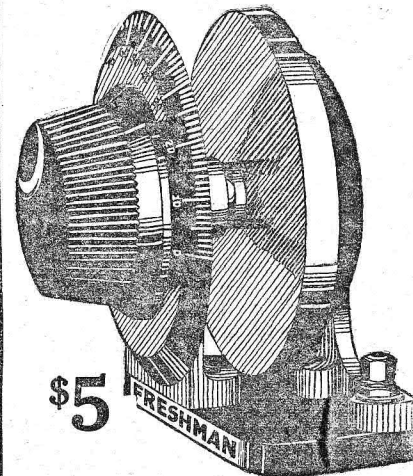
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**SUPER-HETERODYNE**

(Continued from page 21)

tiometer for control of grid potential in these tubes.

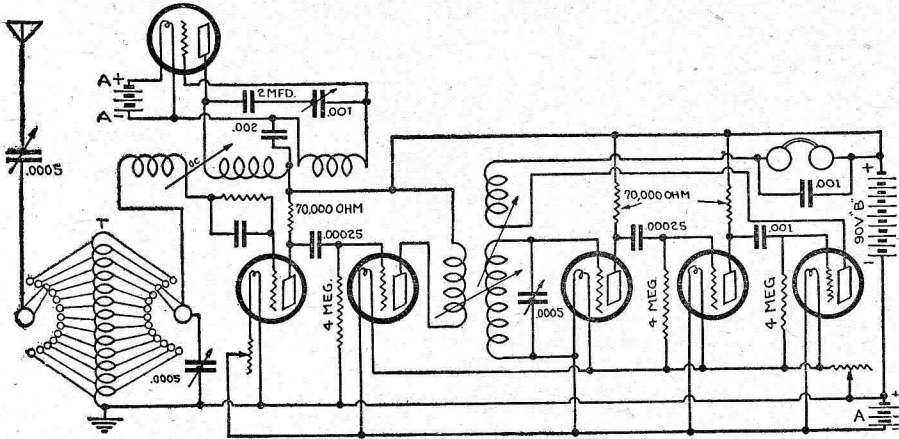


Figure 6.

Separate B batteries are used for the Radio amplifier side of the circuit.

The main point of interest in this circuit is the use of a Hartley oscillator, whereas most of the previously shown circuits make use of the Colpitts circuit.

The coil in the plate circuit of the oscillator is a Radio frequency choke, used to avoid instability of the circuit by leakage from the oscillator to the B battery circuit and the Radio frequency amplifiers.

It is important that the oscillator variable condenser also has a high electrical efficiency rating with the best possible maximum to minimum capacity ratio. On

the main super-heterodyne circuit, including the detector, and one for the audio frequency amplifiers.

**Two Oscillators**

Figures 7 and 8 show two oscillators

that have been made up following the specifications given in the February 2nd issue of Radio Digest, but using different coil construction. Figure 7 shows one in which the coils are self-supporting, but

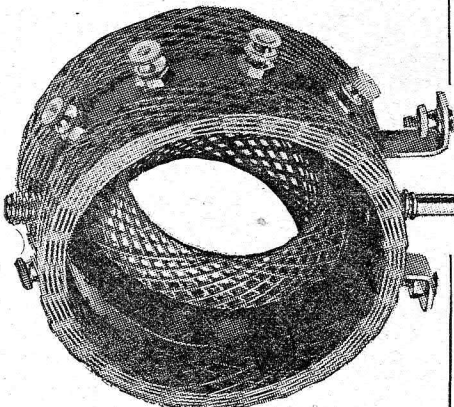


Figure 7.

this fact depends the actual working range of the heterodyning action.

The addition of two stages of audio frequency with jacks makes the circuit ideal for loud-speaker use.

Only two rheostats are used, one for

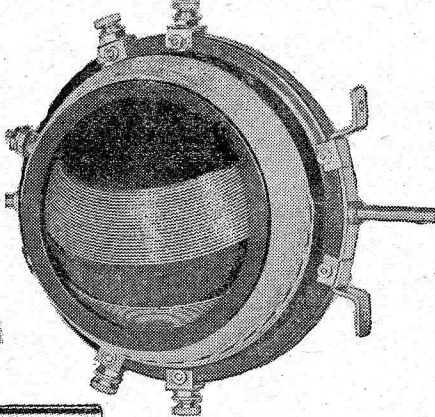


Figure 8.

are held in position by means of a narrow piece of tubing, which also takes care of the rotor bearing.

Figure 8 shows the oscillator coupler made up with the two stator windings bank wound on a bakelite moulded form. The rotor winding is spaced. This unit is unusually neat in appearance and workmanship.

In the next part details of a filter circuit recommended for use after the detector stage will be given. This filter eliminates any radio frequency leakage that is the cause of noisy reception and howling.

(TO BE CONTINUED.)

**THIRTY MINUTE A-B-C**

(Continued from page 22)

rounding air, the aerial so energized, sets up a similar motion in surrounding space.

**Audio Frequency**

In Figure 9, a toy telephone line is shown. Two diaphragms are connected by a taut string. When air waves strike the diaphragm at the right, this diaphragm moves back and forth and pushes and pulls at the string so that the wave motion moves the diaphragm at the left, setting up similar air waves which may be heard. Or if a string is tied between two chairs, a hairpin hung at one end can demonstrate energy transmitted when a ruler strikes the string near the other end. The string can be arranged so that this is seen, or if very short and taut, the wave motion set up will be at a high enough rate to be heard. Audio frequencies are such as can be heard.

In Figure 11 a diaphragm is shown in circumstances 1 to 5. At 1 the diaphragm is at rest. A voice pushes air against one side of the diaphragm as shown by 2 and air on the other side is pushed out. As shown at 3, the diaphragm will flex back, and in moving in and out set up a series of waves recognizable as sound. Now if this diaphragm were a bell, provided that it could still send out the sound waves from the applied voice, it would also send out its own audio frequency. Diaphragms are accordingly constructed as far as possible to minimize their own natural frequency, so as to transmit the applied audio frequency.

**How Sound Is Changed into Electrical Pulsations**

Electrically this is done in much the same way. The diaphragm is arranged to jostle some graphite grains held between two contacts. This device is called a microphone because the path it offers

to a current of electricity varies according to the positions taken up by the graphite grains according to the vibrations of the controlling diaphragm. More or less electric current can thus pass the microphone according to the motion of the diaphragm. A battery connects the microphone with a receiver in which an electromagnet gets a variable current supply governed by this microphone. This electromagnet is then used to op-

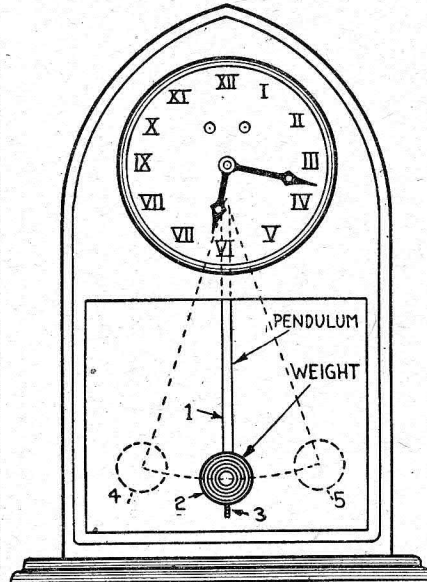


Figure 12.

erate a reproducing diaphragm, so that the electrical means does what the string did in the example of Figure 9. For Radio, there is a substitute for the wire line, the Radio link between the broadcast sender and receiver.

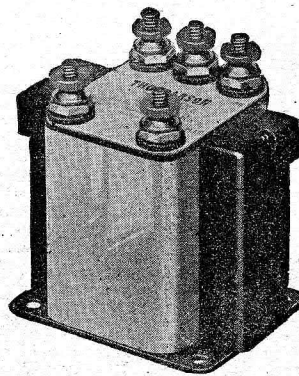
Broadcasting wave lengths are expressed in terms of meters. This means that the wave is the length stated, a meter being about 3.28 feet. Thus a 360 meter wave can be thought of as a wave about 1150 feet long.

How Radio is broadcast will next be further discussed.

(TO BE CONTINUED.)

A steady hum in the headphones is not always caused by alternating current electric wires, although this is the most frequent cause. An open circuit somewhere in the set will produce the same noise.

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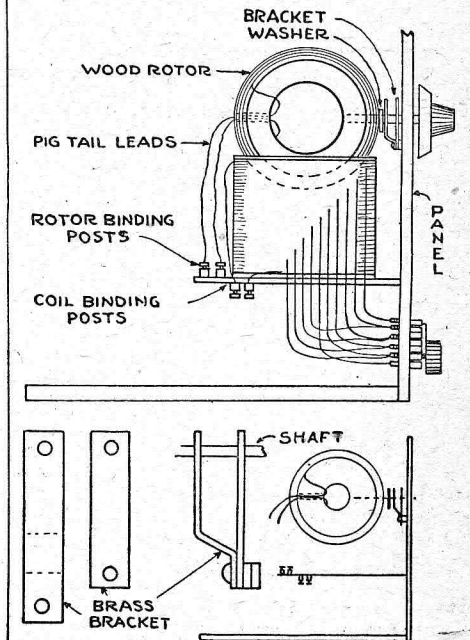
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side. The two leads from the rotor are taken through the center and through the other hole out to the two binding posts as shown in the illustration.

The bracket can be made of two small pieces of brass drilled and fastened to the panel as shown. A washer should be placed between the bracket and rotor to avoid wearing the windings. By following this method the rotor can be fastened to the panel by itself and the coil placed under it.

In making my set I assembled the rotor first and attached it to the panel, then I was able to place the coil where I wanted it. The rotor may be removed by drawing out the shaft. This enabled me to make a neat job of soldering the tops with the rotor out of the way.—R. F. Keller, Brush-ton, Pa.

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# Clever Modification of the Flewelling Circuit

## Sharp Tuning Brings Maximum Volume

By Warren S. Higgins

THE coil marked P is the primary; that marked S, the secondary, and the coil marked T is the tickler. The other apparatus and connections are those of the regular Flewelling circuit.

The action of the circuit is as follows: It operates as a Flewelling which is inductively coupled to the antenna instead of conductively coupled. As is well known, a loose coupling decreases interference, but also decreases the signal strength. If, then, we connect the Flewelling circuit with a loose coupling, making coil S the secondary of the coupler, instead of connecting coil S to the antenna, as in the Flewelling, we would naturally expect less interference and weaker signals. However, on trying out the circuit, we find that although we get much sharper tuning, as expected, we get somewhat stronger instead of weaker signals.

### Maximum Loudness

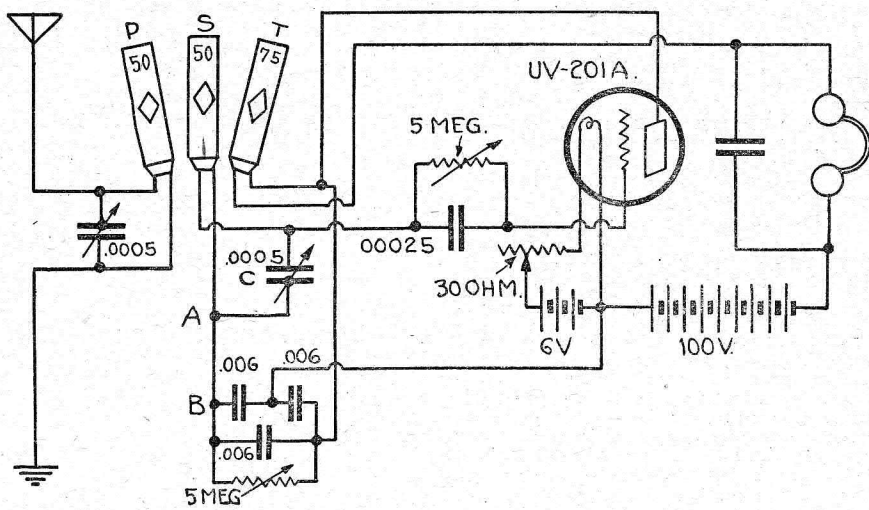
One explanation of this seems to be this: With the Flewelling circuit, it is usually found that when it is adjusted to give the maximum loudness, it will suddenly start squealing without any apparent reason. If a little searching is done, it will generally be discovered that some other station, on very nearly the same wave length, is causing interference which, while it may not show up in the phones, seems to upset the balance of the set. This is particularly true of ship spark sets—for obvious reasons. The increase in the signal strength may therefore be due to the fact that the set can be adjusted to a more critical point.

It will be found that the secondary coil must be reversed with respect to the primary and tickler coils. This is what we should expect. Since the tickler coil and the secondary coil together form a lightly loaded air core transformer with a variable leakage, in which transformer the S coil is the primary and the T coil the secondary, the induced E. M. F. of the tickler coil lags the E. M. F. of the S coil by a phase angle of almost 180 degrees. Now, since this is a feedback circuit, the two E. M. F.'s should neutralize each other if they are of the same amplitude and the two coils are in the same direction. This is because the trough of one wave is exactly in time with the crest of the preceding wave and therefore the resultant is zero.

### Doubling Signal Strength

It is very often assumed that if regeneration is carried to the limit, it would exactly double the signal strength, and a super-set is supposed to use the full regeneration. Therefore, with the two coils in the same direction, no signal should be heard, and this is just what occurs. However, if coil S is reversed, the two E. M. F.'s should add, giving a wave of double amplitude.

There is also another matter to be considered; coils P and S taken together form



another transformer, and therefore the E. M. F. in S lags the E. M. F. in P 180 degrees; and the E. M. F. in the tickler lags the E. M. F. in coil P almost exactly 360 degrees, or is in phase with it. It should be noted here that it is a given wave and the preceding wave which are in time with each other. Now the currents in both T and P lag their respective E. M. F.'s almost 90 degrees, and since the E. M. F.'s are in phase, the currents will be in phase also. The magnetic flux is in phase with the current generating it and therefore the fluxes of coils P and T will add together. Due to this, coil S will have this combined flux to induce an E. M. F. in it. This also sheds more light on the loudness of the reception.

### Distortion Dodged

Still another point that should be considered is that some of the flux induced by P links directly with T. The E. M. F. induced by this flux lags the E. M. F. of P 180 degrees. Since the E. M. F. in T induced by the flux from S lags the E. M. F. of P 360 degrees, these two E. M. F.'s induced in the T coil have a phase difference of 180 degrees and oppose each other.

However, a closed circuit coil forms a pretty good mirror for electro-magnetic waves of Radio frequency, so that not very much of the direct flux from P reaches T, especially when the coupling is rather loose, since P has a weak field at all times. Due to the above-mentioned fact that it is a given wave and the preceding wave which combine, it would seem that there would be distortion if the carrier wave was very long. This theory seems to check up in so far as the set seems to work much better on waves around 300 to 360 meters than it does on those around 500 meters. There is also another factor affecting this, as will now be explained.

A clever modification of the Flewelling circuit by R. D. appeared in the November 3 issue of Radio Digest, as Question and Answer Number 5104. In the regular Flewelling circuit any current passing from the grid around through the grid return and back to the filament has two possible paths, one through the condenser C in this diagram, and the other through the coil S. The current therefore will

divide, and the currents passing through the two portions of the circuit will be inversely proportional to their respective impedances. It will therefore be seen that the less condenser C we have, the greater will be the amount of current passing through S, and therefore the greater flux set up by coil S. Now in R. D.'s circuit the coil S is split into two separate coils, and the second part, which he refers to as the middle coil, is connected into the circuit between A and B. The result of this is that he uses the current passing through the condenser C to generate flux. It will be noticed in his circuit that condenser C can only tune the 35 DL coil, and it would seem, therefore, that his set would have a rather limited range of wave lengths. This modification will strengthen signals considerably, especially on the longer wave lengths, when most of condenser C must be used.

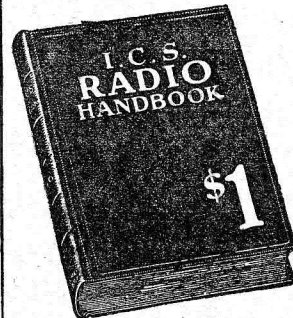
### Changing Inductance of Coils

As regards the slight movement of the middle coil affecting the strength of signals which he mentions, this is due to a double action. Changing the coupling between the 35 DL coil and the 25 DL coil changes the inductance of these two coils, which are in series, and therefore changes the tuning of the set, and in addition it also makes a vernier adjustment of the coupling with the tickler coil. However, it would seem that the experimenters who wind their own DL coils might try winding a coil composed of two 25 DL coils, wound one outside of the other, and connecting one winding in the usual way and the other between A and B, if they wished to try out this modification of the circuit without changing from a two coil mounting to a three coil mounting. If it is de-

(Continued on page 31)

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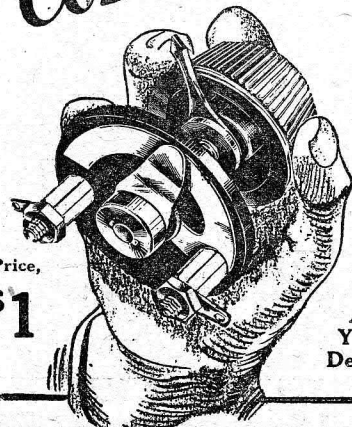
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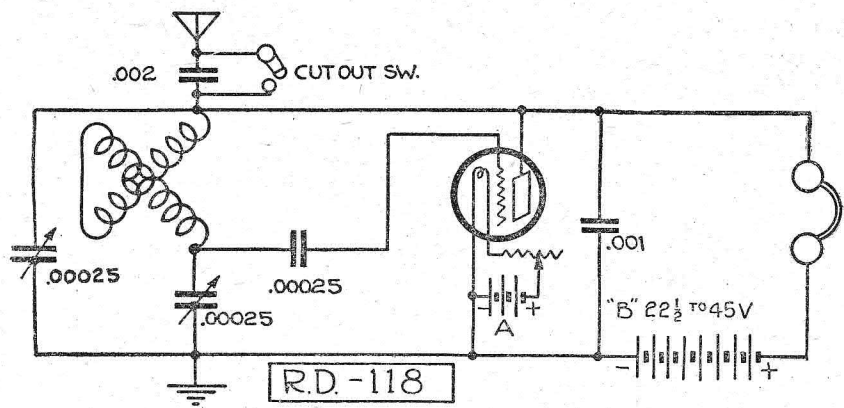
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### R.D.-118 ULTRA AUDION CIRCUIT



THE hook-up shown in the diagram has been tested by myself and some of my skeptical friends. To prove the merits of my set I invited two friends to listen in that evening. They claimed I would not get anything but static and local station. Much to my friends' wonder, I received the following stations from 7:00 until 11:00 o'clock: WJAZ, WOAW, PWX, WFAF, WDAP, WRC, WBBA, WBAP, WFAA, KSD, WGY, WDAP, and WGAT.

This hook-up is based on the Colpitts or Ultra-Audion circuits. I used a cut out switch to cut out or cut in the fixed condenser in the antenna circuit, and a

UV-199 tube with flash-light cells for A battery. The B batteries are of the small size type, adapted to portability. One .00025 mfd. condenser is used with a variometer and another one is connected across the antenna and ground. The fixed condenser is .001 mfd. and is used to help stabilize the circuit. A variometer can be used in the plate circuit if desired. At times it will work without a ground when the fixed condenser is cut out. If trouble is encountered with capacity effects, connect the rotary plates of the condenser to the ground. If this does not help, shielding is necessary.—Harold Miller, 15 National Drive, Newark, Ohio.

#### Efficiency in Sets

Cheap parts with poor electrical qualities and sloppy workmanship which add resistance and cause leaks in the circuit are responsible for virtually every failure in Radio. An amateur should exercise every care and effort in hooking up a set so as to make a good job of it. Use good parts, arrange them neatly and efficiently

in the cabinet, keep all wires well separated and exercise great care in soldering connections. If these rules are followed, success will be almost certain.

Don't handle vacuum tubes roughly, or elements may be injured.

### Turney's Famous SPIDER WEB

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Plex Tuner



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### The Reader's View

**Radio Sells Songs and Shows**  
Much has been said and written about Radio broadcasting being harmful to the sale of music, the attendance at places of amusement, etc., yet I feel sure I could convince the most doubtful to the contrary through my own experience.

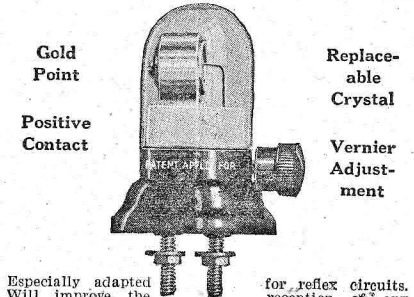
Being the possessor of a receiving set several years before music was broadcast, and aiming to have the most powerful set in the community ever since, I have come in contact with many persons, of whom some would come over just to listen in and others intended buyers of Radio sets.

The expression I have heard most is, "My, that was a pretty piece of music—I must get that," meaning, of course, a record for their phonograph or music for their piano. I know lots of them now who own Radio sets who keep a record of the name of any pleasing piece of music they hear via the airway, and give copies of that list to their friends, telling them to get that good and late music—and they do get it.

When soldering battery connections, always use pure lead, as tin composition will corrode.

### The New Marvel BEACON CRYSTAL DETECTOR

The Beacon Will—When Others Fail



Especially adapted for reflex circuits. Will improve the reception of any crystal set. Every Beacon is thoroughly tested in our laboratory and fully guaranteed. The gold point and vernier adjustment gives it positive contact at all times. Replaceable crystal and glass cover makes the Beacon the most efficient and economical crystal detector on the market.

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UV-201A	C-301A
UV-199	C-299
DV-1 or 2	DV-6 or 6A

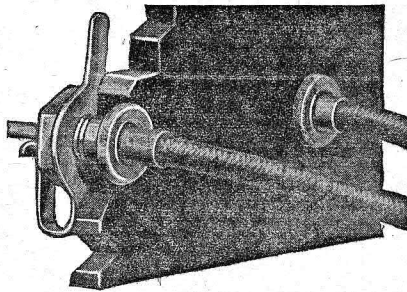
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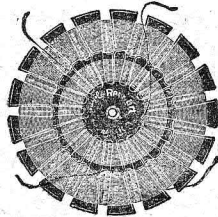
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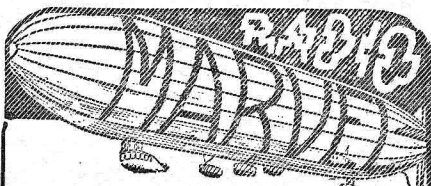
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# Single Circuit Using Dry Cell Tubes

## Portable Set Carried On an Automobile Trip

THE little UV-199 dry cell tube, since its introduction a few months ago, has come into quite general use, but has not always given the results that were expected of it. This is due in most

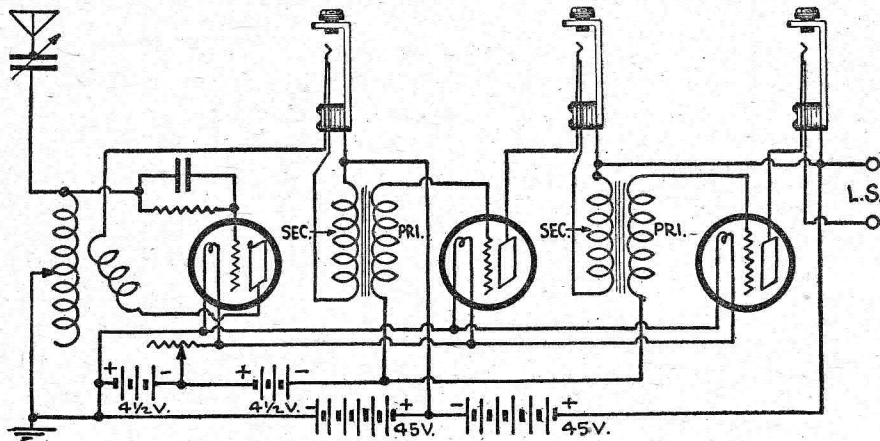
### WORKSHOP KINKS? EARN A DOLLAR—

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

cases to the way in which the tube is used, rather than to any defect in the tube itself. The writer has had considerable experience with these tubes and has found them satisfactory both as a detector and amplifier. They are not at all critical as to either plate or filament voltage, though, of course, they should be operated at the proper filament voltage to insure satisfactory life.

In spite of the fact that the filament is small, the tubes are very rugged and will stand as much rough treatment as any tube on the market. During the past summer the writer took a three tube portable set on a 350-mile automobile trip through the Adirondacks, on several occasions traveling roads that were almost impassable. Though the UV-199 tubes were in their sockets all the time and the set rested on the floor in the back of the car, they came through safely and furnished nightly entertainment during the trip.

## TWO STEPS OF A. F. IN HOOK-UP



The secret of the successful operation of these tubes is to follow closely the instructions on the printed slip packed with each tube. As stated in the instructions, when the tube is used as a detector, the grid return should be to the positive terminal. In all cases the rheostat should be in the negative lead. This, of course, is good practice with any tube. The plate voltage is not at all critical, and the tubes will detect well with from 20 to 45 volts. The writer has seen two of these tubes which operated very well as a detector with 90 volts on the plate, but this is exceptional. As a rule, 45 volts is very satisfactory.

When used as an amplifier the grid return should be to the negative side of the A battery, and not to the filament. To get the best results from your amplifiers, use 90 volts on the plate, and insert a grid bias of 4 1/2 or 6 volts in the grid return. This will give amplification that will compare favorably with that obtained from storage battery tubes.

Another point to remember is that these tubes are decidedly microphonic, and should be mounted on pads of felt or sponge rubber. It is also well to make connections to the socket with very flex-

ible wire, as stiff bus wire connections will make cushioning useless.

The hook-up given is of the single-circuit feedback variety and shows the proper connection of grid returns and bias battery. The single rheostat for all three tubes is entirely satisfactory with these tubes, and for three tubes should have a resistance of 10 to 15 ohms. The two steps of amplification shown will give good volume on a loudspeaker for home use.—Lee M. Klinefelter, Norfolk, Va.

### Keep Direction Sheets

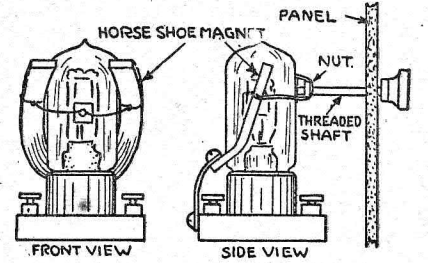
Do not throw away the direction sheets or booklet that came with your set and with the tubes.

Read all such material carefully now and then. If you have lost the direction sheets, write to the dealer or manufacturer for another. These sheets will answer most of the questions which have been puzzling you and preventing you from getting the best out of your set.

Don't insert vacuum tubes in sockets unless absolutely certain rheostats are turned off or at the proper setting for normal position.

## Vernier Tube Control With Horseshoe Magnet

A novel vernier which may be added to any set is shown in the illustration. The horseshoe magnet helps the electrons inside the detector tube, and with proper adjustment, it is not necessary to burn the



detector tube filament so high. Consequently, this is a form of vernier which not only gives fine control, but serves another purpose as well.—J. B. Owen, Blair, Okla.

It is more difficult to tune out local stations when a long antenna is used than when the aerial is fairly short. There is, however, a decrease in volume on the short aerial.



### RADIO "B" BATTERIES

At Factory Prices  
Greatest Radio "B" battery on market. Full number voltage taps; QUALITY GUARANTEED; LOWEST PRICES; brings in concerts LOUDER AND STRONGER; will work on any tube or loud speaker. Order by number TODAY with check, money order or pay postman C. O. D.  
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AYRES BATTERY CORPORATION, Cincinnati, Ohio

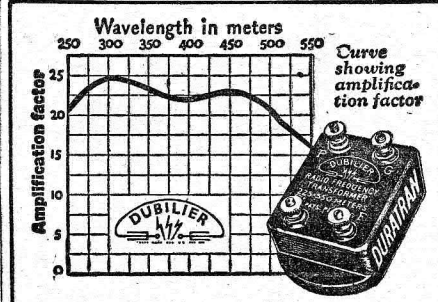


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# Fading Caused by Stations

## Oscillating Tubes in Sets Cause Trouble

I HAVE read with much interest many articles of late in various magazines on the subject of fading. Many views have been expressed; but by checking up on these, we find certain stations will fade notwithstanding the conditions mentioned.

One writer claims he has solved the problem; that fading is caused by fluctuations in the potential on the mains of the central power stations supplying the transmitter of the broadcasting station. We cannot say this will not cause fading, but how about WTAM, the Willard Storage Battery Co., of Cleveland? The entire power, I understand, is supplied by storage batteries. Does the potential fluctuate with this station? It fades just the same. We also find fading at night and not much in the daytime. Do the central power stations maintain a constant potential in the daytime and not at night? We must look for another cause.

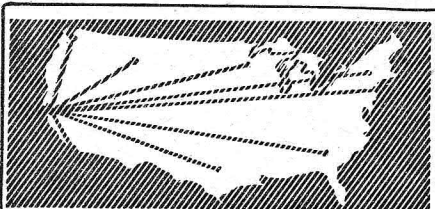
Another writer claims atmospheric conditions, such as clouds, relative humidity, temperature, etc., are alone responsible. Why, then, is a certain station fading, while on tuning in another station in the same direction, but even more distant (the waves being subjected to the same atmospheric conditions as the fading station) we receive the latter's entire program without fading? A certain station, W—, is being received by a fan in a certain state and is fading. In another state, in some other direction, the same station is being received finely. It looks like a clear case of atmospheric conditions, but is the fan who is receiving the program satisfactorily bothered with carrier waves interfering as is he who is

getting fading signals? The fan who is getting the fading signals may not hear the carriers, but nevertheless they are there, cutting down the efficiency of the signals tuned in.

Fading may be accounted for by the above causes, but the fading we get night after night—and which seems to be getting worse each week—is due to other broadcasting stations, spark stations, amateur stations and reckless operators of receiving sets (within the immediate vicinity oscillating their tubes) on nearly the same waves. The number of kilocycles of the interfering stations is so nearly synchronized with those of the station tuned in that a counteracting or fading effect is produced.

Single covered wire, such as single silk or cotton, should not be used for winding bank-wound or spider web coils. The insulation may be scraped off while winding and a short result.

Recent shipping mishaps near the English Channel islands, it is stated, have produced a strong agitation for the establishment of official wireless stations in that area.



### ON ONE TUBE

Broadcasting from Atlantic Coast, Canada, Mexico, Cuba and Hawaii heard in California by users of the CROSS COUNTRY CIRCUIT. Range due to Simplicity. One tuning control. ANY NOVICE can build easily and cheaply. Dry cell tubes used. No soldering. Complete instructions, Blue print panel layout, Assembly Photo, etc., post-paid 25 cents. Stamps accepted.

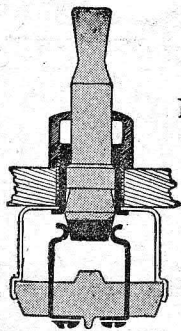
### WHAT USERS SAY

EAST—Am more than pleased with the parts ordered from you. The first night I hooked it up and received Omaha. Since then Minneapolis and Los Angeles. It works better without amplification than most sets with two stages.—Donalds, S. C. WEST—I am sending you a list of some of the stations heard on one tube: WSE, WCY, KDKA every night. PWX, WWT, WTAM, WLW every night. CFAC, CHCB. Not long ago I purchased another set of parts from you and first night got WGR, Buffalo, and KDKA. Ione, Calif. NORTH—Received coils O. K. If I have same results with these that I had with last will be wanting more. I am 1,500 miles from nearest station and have picked 56 to date. Chicago, Havana, Mobile, New Orleans and TWO IN ENGLAND.

Send stamp for further information  
**Vesco Radio Shop** BOX D-117  
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## Only One Hole No Bolts—No Screws

Retail Price  
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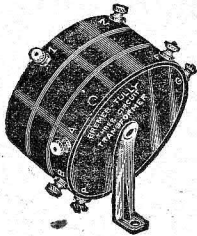
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## Review of Books

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**222 Radio Circuit Diagrams.** A complete and up-to-date collection of modern receiving and transmitting hook-ups. The book includes 224 diagrams and illustrations. Price, \$1.00.

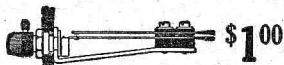
**Experimental Wireless Station.** By P. E. Edelman. Simple directions are given in this book for making Radio equipment for the transmission of messages over long distances. Price, \$3.

**Vacuum Tube Receivers.** By O. F. Heslar. A book that tells how to make a

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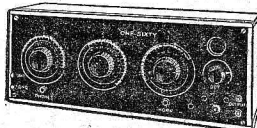
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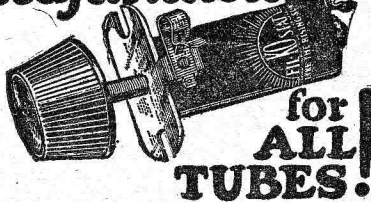
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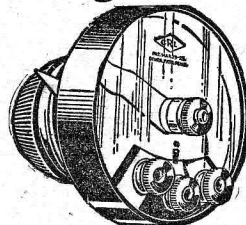
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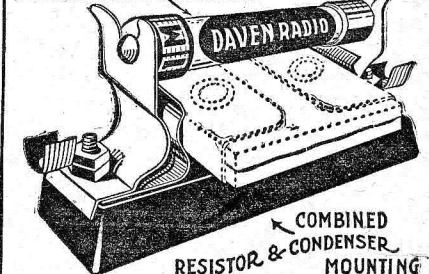
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# Simple Explanation of Radio for Everybody

(Continued from page 23)  
tions are without number—the writer has over forty, but there are probably over

For some reason, reflex circuits began with crystal detectors; why, no one seems to know. Possibly it was the difficulty

into the primary of the radio frequency transformer T-1, which is in series with the phones and B battery. Being at Radio frequency, the signals do not affect the phones and pass through the fixed condenser C-3. However, on passing through T-1, current was set up in the secondary of T-1, which is rectified and detected by the crystal detector and passed on as pulsating direct current to the primary of T-2. This creates similar impulses, now at audio frequencies, in the secondary of T-2 which is in the grid circuit of the tube. The tube handles these as an audio frequency amplifier, amplifies and passes them again to T-1 and the phones. Being now audio frequency impulses they do not affect T-1 but do affect the phones. Condenser C-3 cannot by-pass them.

the tube. The second time around, signals are in the form of audio frequency pulsations and inductance L-1 offers no opposition to their passage and they actuate the head phones. The tuned impedance circuit may consist of a 35 turn honeycomb coil and a .001 mfd condenser or a 50 turn honeycomb coil and a .0005 condenser.

Figure 111 offers an interesting combination of units. The input tuning system may be the same as that used in the three foregoing circuits or that shown. The unique feature lies in the tuned secondary of the Radio frequency transformer. It will be noted that the condenser is across the entire secondary while the lead to the primary of the audio transformer and the crystal detector goes to a switch arm. Such an arrangement gives a sort of volume control and permits of close tuning of this secondary. L-1 may consist of 50 turns of wire, about Number 26, on a 2 3/4-inch tube while L-2 is 50 turns of Number 26 on a 3-inch tube, tapped at the 10th, 20th, 30th and 40th turns. Condenser C-1 may have a maximum capacity of .0006 or .0008 mfd.

(TO BE CONTINUED)

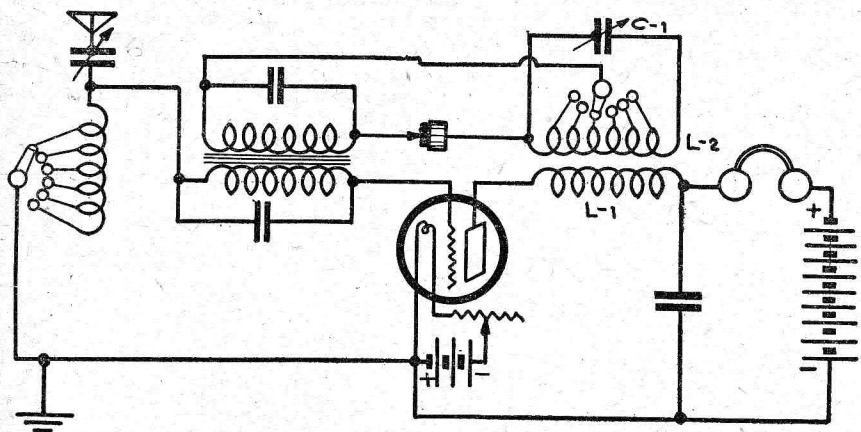


Figure 111.

300. We will consider a few, beginning with those using but a single tube, from which the reader can work out many others and will understand the various systems used as he comes in contact with them. Inverse duplex will be considered as a separate article, although really an improved system of reflexing.

experienced at first in preventing the whole from oscillating and a crystal detector made control easier. In Figure 108 we have a single tube used for both R.F. and A.F. amplification in conjunction with a crystal detector. Incoming signals pass through the usual variocoupler to the grid of the tube, are amplified, and pass

## MILOPLEX WAVE TRAP

(Continued from page 19)

one more trap I must build for you) this will end the series, or it will, rather, my conversation on wave traps and filters; therefore, as many of you are getting circuit hungry, week after next I'll give you an old circuit in a new dress. I say old—well, not so old, either; but one that every engineer and every ham, including the Wulf Hounigs (is that the way you spell it?) know by heart, yet few have built it because it appeared so simple; yet very often such apparently easily built babies are the star performers when one gives them a chance—and in the regenerative class this little teeney-weenie fellow is pretty hard to lick aziz. Remember the frog who said "Show me the pool" when he hopped up on the pool table? Which but prompts me to say that I will not disguise the circuit—but rather see if it cannot be refined so it may do some finer tuning and a .006, or near it, may be found hanging on a binding post if the artist doesn't slip.

**Mystery Man to Be Revealed**  
Following it—and just because some thousands of you are curious to know just who I am—will be an article which should go down in history as a positively unauthorized interview regarding who I am—how I came to be so mysterious—where I received my feeble Radio education, and a lot of side lights—and toll lights relative to what the reporter thought I said when he asked me to answer his several questions.

But, getting back to the trap, the first diagram shows the coil as it should appear when wound, while the second diagram shows the method of connecting it into your circuit.

(TO BE CONTINUED)

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# Questions and Answers

### Split Variometer

(05705) HD, Baltimore, Md.

Am an old Morse operator and think this bug that no one has seen, the Radio bug, has bitten me. I have been buying the Radio Digest at the corner newsstand, and must say it looks pretty complicated to me; so before I start thought I'd write. In his articles on the Miloplex hook-up, the "Mystery Man" speaks of a split variometer, with at least 62 turns on the stator and rotor. What does this mean? Does it mean that the rotor with the .00025 variable condenser in series is separate from the stator with a variable condenser between the grid and ground? What is the symbol bridged between the grid leak and minus-A battery fixed condenser .00025 and .002? Couldn't a variocoupler be used instead of a variometer, if the symbol as indicated above is a variable grid leak. Of what capacity must it be? Again, can the new dry cell tube be used? Of course, these may seem foolish questions, but I am asking them because I do not know and want to learn and build this Miloplex III.

I've already put up my aerial. Have it set like this: The roof is north-south and I erected aerial poles on northeast corner and southwest corners. It is 13 feet above the tin roof and 57 feet long, of Number 12 stranded copper wire, same as used on ship aeriels; three spans,

spaced 18 inches apart, the lead-in coming down through the skylight from the northeast end of aerial. It is about 40 feet long to where I want to place my receiver. Everything is doubly insulated with 3-inch round and long corrugated brown insulators, not porcelain. And I've made a dandy ground near end of the water pipe that runs to the foot of the yard. Drove four pieces of 1-inch pipe, 6 feet long, down to level of the pipe, scraped them all, clamped them well and soldered all to the water pipe. The ground is clay sand and I've wetted the ground well. Think I'm fixed pretty well here. Do you think the aerial large enough; height from ground is 35 feet.

A friend of mine, who built himself an Armstrong set detector and one step of amplification, uses the spider coils, primary, secondary and tickler, with a 6-volt storage battery for the detector. He had a loud speaker on it Sunday night and we heard concerts at Atlanta, Memphis, Omaha, Seville, Cincinnati, Fort Worth, Dallas and, of course, Washington and New York. He wants me to build

one, but I like the reading of the Miloplex. A.—Your interpretation of a "split variometer" is quite correct as is your method of connections.

The conventional symbol of an arrow always signifies a variable unit, in this case a variable grid leak. The CRL grid leak is recommended.

When figuring the cost of a switch, contacts and dial, remember they are extra.

### VT-1 on Dry Cells

(06515) AM, Erie, Penna.

Is it possible to use 2 VT-1 tubes with dry cell batteries? I want to use them for the audio amplifying stages. How long would dry cell batteries last? Can I use


2 UV-201A tubes with dry cell batteries? I want to know if they will work with dry cells? According to specifications, they take 5 volts but the filament current is the same as for WD-11. How long would the dry cell batteries last?

A.—The life of dry cells used to operate VT-1 tubes, as suggested, would be but a few minutes and the plan is not feasible.

UV-201A tubes can be operated on dry cells. The life of these batteries will be from thirty to fifty hours of service.

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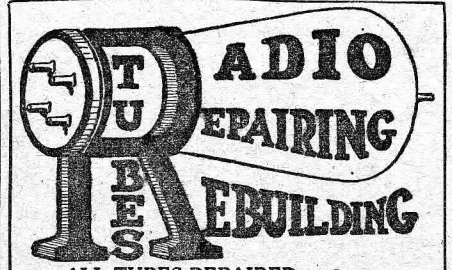
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