

# Radio Digest

EVERY WEEK

# Illustrated

TEN CENTS

REG. U. S. PAT. OFF.

Vol. IV

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R. D. P. Co. Inc.

CHICAGO, ILL., SATURDAY, MARCH 10, 1923

No. 9

## R. C. A. IN NEW GRAB?



### WASHINGTON'S BIRTH CELEBRATION ON AIR

WASHINGTON, D. C.—For the first time in the history of the celebration of Washington's Birthday, the ceremony which takes place at the base of the Washington Monument was broadcast over the entire country by Radio. The broadcasting set was erected in the doorway of the Monument and connected by cable with the Arlington Radio station, NAA.

to the hundreds of thousands who could hear me over the Radio. It really made me feel smaller than I am, being just one of so many folks who heard me talk that day. But when I began to talk I felt like a great big giant speaking to so many people at one time.

At the left is "Jackie" Coogan, famous child movie star, who recently gave a talk to his many admirers from Station WOR

### FAN NEARLY LEAVES HOME AS OPERA ENDS

Broadcast So Perfect He "Thought He Was in Theater"

SAN ANTONIO, TEXAS.—Many splendid reports on the broadcasting of the opera "Rigoletto" recently by WOAI, the broadcasting station of the Southern Equipment Company and the San Antonio Evening News-Express, as it was presented at the Grand Theater by the San Carlo Grand Opera Company, have been received from Radiofans in all parts of the country.

Dr. W. L. Kitchens of Stamps, Ark., who heard the concert at his home, reported the reception was perfect, so perfect, in fact, that he imagined he was in the Grand Theater in San Antonio listening to the opera, instead of in his own home. Dr. Kitchens expressed his appreciation in the following telegram:

"Your program Monday night was so perfect that at the conclusion I started to leave my home, thinking I was in the opera house at San Antonio. My compliments to the San Carlo Grand Opera Company."

## ARMSTRONG LICENCEES AIM OF SUIT

May Hurt 17 Companies

Scathing Rebukes Greet R. C. A. and Westinghouse — Monopoly Efforts Rapped by Independents

(By Special Correspondence)  
NEW YORK.—Not hesitating once in its reported efforts to monopolize the "air" and all Radio apparatus, the Radio Corporation of America has shot its latest agitating bolt at independent Radio manufacturers. The move which is rumored to be another spite action directed toward complete and imperialistic monopoly of the Radio industry, took the form of a suit instituted February 26 in the District Court of New Jersey by the Westinghouse Electric and Manufacturing Company against the  
(Continued on page 2)

## 'IT'S THE BERRIES,' —'JACKIE' COOGAN

CHILD STAR WRITES EXCLUSIVELY FOR DIGEST

WOR Broadcasts First Talk of Movie Youngster — Voice Is Pallophotophoned

By "JACKIE" COOGAN

I have had a Radio receiving set for some time, both in my home, in Los Angeles, and at the studio where I make my pictures, and I get lots of fun out of listening in at different times, just like all the other readers of the Radio Digest. But it was not until I came to New York on my last trip that I had the chance to speak on the Radio myself.

It was while I was visiting Newark, N. J., where I met the boys and girls of the city at Bamberger's store there. WOR is the Bamberger station; and after lunch I spoke in their microphone.

I told the boys and girls, who were listening, how interesting and thrilling it was to speak to them all. Up to now it has been just a case of their seeing my pictures on the screen and me seeing them in small groups in different places, for after all, even twenty-five thousand people (this is the number that met me at Newark) is a small group compared



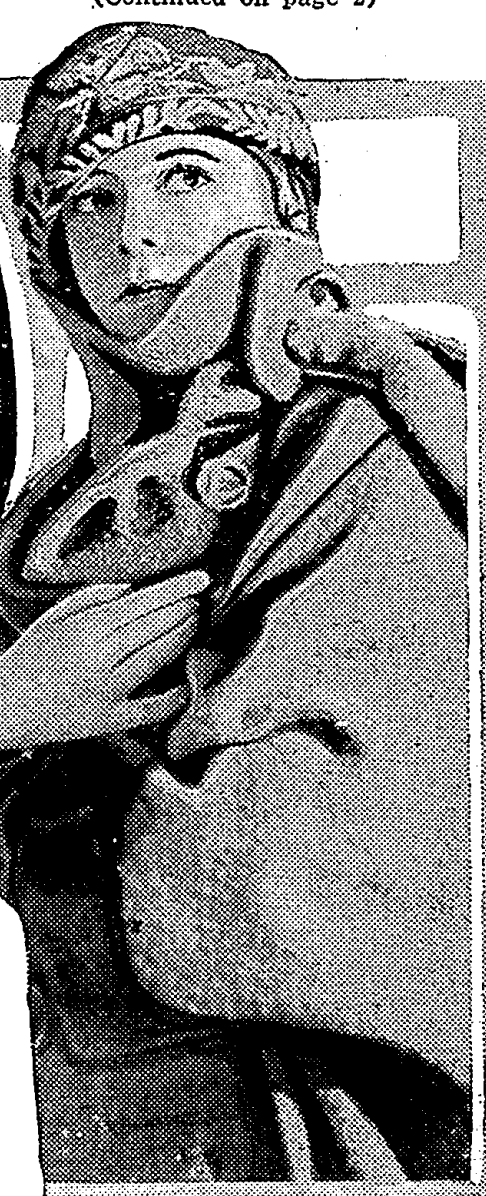
Above is Mme. Maeterlinck, who, as critics say, "is not a singer striving for voice effect, but a dramatic artist using music." She was on one of the recent Bamberger Store's programs and many fans have praised her part highly. At the left is Mariona Rakauska, dramatic soprano, who delighted listeners of KYW with her Polish folk songs

I spoke over the Radio again for Gimbel Brothers' store, at New York. But just before this I had my voice photographed on the pallophotophone, invented by Mr. Hoxie. I think this was one of my most interesting experiences. In a couple of weeks this talk will be broadcast and I will hear myself talk over my set in Los Angeles, three thousand miles away, and you can just bet I am going to tune in. That will be some stunt. What do you think?

It is really wonderful to think of all  
(Continued on page 2)

### Symphony Heard from WNAC

BOSTON, MASS.—Members of the Boston Symphony Orchestra, in a smaller organization known as the Boston Symphony Ensemble, recently gave a concert by Radio, the music being broadcast by WNAC of the Shepard stores. The Symphony members played at Jordan Hall, and the music was relayed to WNAC by telephone. These Boston Symphony Ensemble concerts are made possible by special arrangement with Aaron Richmond, manager of the Ensemble.



### R. C. A. IN NEW GRAB?

(Continued from page 1)

Radiocraft Company, Inc., and the DeForest Radio Telephone and Telegraph Company, for infringement of the Armstrong patent.

The Westinghouse company, one of the five organizations in the Radio Corporation, claims that the Armstrong license, one of which is held by the Radiocraft Company, a subsidiary of DeForest, does not permit the sale of Armstrong circuit sets through the regular trade channels of jobbers and dealers, but only direct to the amateur. The suit evidently seeks to prevent the seventeen independent manufacturers licensed under the Armstrong patent from doing business except as mail order houses, that is, direct to the fan.

#### Suit Flimsy Cloak for Real Purpose?

Although the suit just filed was directed against the Radiocraft and DeForest companies, it is said that the action is merely a flimsy cloak for the real purpose of the monopolists. The real significance of the suit is that it may be construed as a test case against the sixteen other independent manufacturers who paid good money to E. H. Armstrong for their licenses. These manufacturers, it is said, are now being attacked by a group of five organizations called the Radio Corporation of America which is reported to have entirely too much capital behind it for no other purpose than wrecking the Radio industry for the purposes of everyone except themselves, by court suits, injunctions, and other methods.

#### "Buncombe by Woolworth Building Gang"

Another angle to the demoralization of the Radio industry and hundreds of independent manufacturers by the Radio Corporation of America is found in the belief that the Westinghouse-R. C. A. clique is seeking publicity for the Armstrong regenerative sets to counteract the growing popularity with Radiophans of Reflex circuit sets, a patent for one of the best of which is owned by the DeForest Radio Telephone and Telegraph Company.

Radio manufacturers throughout the country are indignant at the latest "grab," as one of these has termed it. Another stated that the Westinghouse suit was the "choicest piece of buncombe yet shot out by the Woolworth Building gang." A third person suggested that the R. C. A. wouldn't stop at taking pennies from a blind man's cup.

The counsel for DeForest in the suit is Darby and Darby, New York City. The date of the hearing has been set for March 19.

#### No Strings on Armstrong Licenses

Investigation of one of the Armstrong licenses held by an independent manufacturer shows that the license granted him the right to sell to everybody except for commercial purposes. It is hardly believable that this right could fairly and rationally be construed to mean specifically the channels of distribution through which the goods were to be sold. Armstrong, reported to have been paid \$500,000 by Westinghouse, it is said, will be called on to testify as to what he meant then, and if the meaning has changed any.

Another point of interest turned up in the discovery that Dr. Edward Preston, president of the Weston Instrument Company, manufacturers of high grade electrical measuring instruments, is a shareholder in the Radiocraft Company, now being attacked. The interesting part of the discovery, not obvious to outsiders, is that Dr. Preston, a multimillionaire, in protecting his rights regarding electrical measuring instruments, has defeated several of the largest electrical manufacturers in the country in court battles when the latter attempted to steal certain of his patented ideas. It is reported that the Westinghouse Company was involved in these so-called steals.

Whether the Westinghouse company would like to "get back" at Dr. Preston is not known, but as was said, the connection presents some interesting sidelights.

#### Supreme Court Gives R. C. A. a Shock

A very telling shock was given to the Radio Corporation in its group of numerous court actions and entanglements when a decision in a patent suit was handed down recently by the Supreme Court of the United States.

In a nutshell, this case was number 240 between the Crown Die and Tool Company, petitioner, and the Nye Tool and Machine Works, respondent. The latter had bought the "right to sue" the former for infringements from the owner of an important patent. The District Court of Illinois maintained that the right to litigate could not be bought from an inventor. The case was appealed to the Circuit Court of Appeals for the Seventh Circuit, which court for the first time in the history of the United States, reversed the decision and said that the right to litigate could be purchased as a license from an inventor.

#### Supreme Upholds District Court

The case was then appealed to the Supreme Court of the United States, by the Crown Die and Tool Company. The final judiciary gave its decision February 19. This was a reversal of the Circuit Court's reversal.

In other words, the Supreme Court sustained the first, the District Court, and

maintained that the legal right of an invention could not be licensed by a patentee, and that all infringement actions must be maintained by the patentee alone. Miss Florence King, famous Chicago patent attorney, won this case.

#### Sixteen Suits of R. C. A. Weakened

Now for the interesting part. The counsel for the Radio Corporation of America attempted to be heard in this case before the Supreme Court. Their motion to be heard was denied, however. In the R. C. A. brief, the counsel for the R. C. A. put down in black and white that the Radio Corporation of America was relying on the decision of the Circuit Court of Appeals for the Seventh District in sixteen suits for injunctions and accountings which they had pending because of infringements of patents, "each of which is based upon one or more assignments." The suit, R. C. A. vs. Jacob Hohenstein et al., was mentioned as one of these cases.

The conclusion, therefore, is that the R. C. A. lost an important toe hold when it based many of its legal efforts on a decision which has since been reversed by the Supreme Court of the United States.

### Representative White Asks for Federal Investigation

AUGUSTA, ME.—Congress Representative White of this state is out after a Federal investigation of the entire Radio Situation of the country, particularly with reference to possible violations of the anti-trust laws. In a resolution he introduced, as member of the House Merchant Marine Committee, he asks that the Federal Trade Commission investigate the entire Radio industry. The resolution required that a report to the next House be given on the manufacture of Radio apparatus, ownership of patents, agreements tending to restrict trade or fix prices and contracts or leases for exclusive rights or special privileges in the reception or transmission of messages. Rep. White is joint author of the White-Kellogg Federal Radio Control bill.

### DEALERS ORGANIZE FOR AID TO WHAM

#### Rochester Plant to Get High-Grade Artists as Result of Meetings

ROCHESTER, N. Y.—As a result of several meetings held recently by the electrical dealers of this city who handle Radio supplies, a new organization has been formed, known as the Radio Broadcasting Musical Association. The new association will give a series of musical programs which will be broadcast from Station WHAM.

This move, it is said, is due to the intense interest in Radio in this section and the excellent quality of the transmitting apparatus in use at the Broadcasting station in the Eastman School of Music, which is equal to that of any station in the country.

The high-grade artists appearing on these programs are only available on one or two nights a week, and as the majority of Radiophans in this city have sets with a rather limited range, it was thought advisable to broadcast additional material, and with this view the new association was formed.

The association has announced that popular programs will be broadcast each evening except Sunday and Monday, from 7:30 to 8:30 o'clock, in addition to the regular schedule.

### "JACKIE" COOGAN

(Continued from page 1)

the fun we can get out of Radio and all the interesting things we can learn. I will never forget my first talk into the microphone and I hope every one of the Radio Digest readers will have the same chance I did. It was wonderful.

### ETHER ONLY PILOT IN SIX HOUR FLIGHT

#### NEW FRENCH APPARATUS PROVES SUCCESSFUL

#### Aveline Control Weighs But 90 Pounds —Developed By State Research Laboratories

PARIS.—A pilotless French military airplane today made a flight of six and one-half hours in an aerodrome. This is an epoch making performance. The plane could have reached Berlin, Vienna, Rome or equivalent distances without the touch of a human hand.

#### Radio Control

A pilot was sent up with the plane, but he did not touch the controls during the flight. Two miles below he could barely see the group of aeronautical engineers on Only field make the plane ascend, descend, loop and bank itself at just the right angle in making turns. It responded instantly to Radio control. The only action of the pilot was to land the airplane after the flight. The control apparatus does everything but land the plane.

#### Of Military Value

The apparatus, which weighs ninety pounds, is called Aveline control. It has been developed by state research laboratories. It has two pistons working as arms, which are driven by compressed air. Mercury tubes, making or breaking contacts with the tilting of the ship, constitute the heart of the control apparatus. The apparatus will have not only military value, but for commercial aviation it will serve as a safety device.

### Leper and Wife United to Outside World by Ether

#### Receiving Set Installed in Leper Colony By Army Officer

MISSOULA, MONT.—Through the magic of Radio the world has been restored to two persons who for six years have lived apart from their fellow men in forced confinement—one a leper, the other his wife.

Six years ago O. G. Willett, former state senator, was found to have leprosy, contracted, it is believed, during his service as a soldier in the Philippines. When he was banished from society, his wife followed him into exile, and since that time they have lived in a small bungalow near the little town of Alberton, Mont. Alberton is in Mineral county, whose people Senator Willett once represented in the state assembly.

The Radio set was recently installed by Lieutenant Alexander, a Radio expert of Fort Missoula, Mont. With another soldier and Mayor W. H. Beacon of Missoula, he visited the leper camp after obtaining permission from the state board of health to enter the enclosure.

The antennae was strung from the bungalow at the top of a lofty pine, about 150 feet distant. Before he left Missoula, Lieutenant Alexander had tested the set and found that he was able to "pick up" Los Angeles, San Francisco, and Nome, Alaska.

### Springfield Exchange Club Listens in to Louisville

SPRINGFIELD, OHIO.—Members of the Springfield Exchange club spent an enjoyable night this week when they assembled at the Foss Gas Engine company plant and listened to a Radio program broadcast by the Exchange club of Louisville, Kentucky. The Radio program was composed of musical numbers and several four-minute talks, all having a part in the program being members of the Louisville club. After the program had been started, a telegram was sent to the Louisville club stating that the program was being heard distinctly and was being thoroughly enjoyed. Twenty minutes later, the Louisville announcer stated that the telegram had been received and a special number was played for the Springfield organization.

### Station WEOA Broadcasts Ohio Senator's Messages

COLUMBUS, O.—Legislators of Ohio, members of the general assembly in session at the present time, were given the opportunity to broadcast messages to their constituents from Station WEOA of the Ohio State University on Thursday, February 22, as a part of the program of the university in showing the public officials the state university plant and a cross section of its activities on University Day, annually observed on Washington's birthday. Governor A. V. Donahey, cabinet members, supreme court judges, legislators and others in public life in Ohio were in the party that visited the state university and were guests of the Ohio State Alumni association and other campus organizations.

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Radio Digest, Illustrated, Volume 4, Number 9, published Chicago, Illinois, March 10, 1923. Published weekly by Radio Digest Publishing Company, 123 West Madison Street, Chicago, Illinois. Subscription rates, yearly, Five Dollars; Foreign, Six Dollars; single copies, Ten Cents. Entered as second-class matter April 27, 1922, at the postoffice at Chicago, Illinois, under the Act of March 3, 1879.

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## Looking Ahead

Flewelling Contest Prize Winners will be announced in the next issue of the Digest. Who do you suppose won the \$100 in prizes? See the next issue for the details. It is planned to describe the prize winning sets in issues of the near future.

Reinartz Sets will be discussed again next week by H. J. Marx. He has something neat in store for Reinartz fans.

G. C. Arnoux of WBAP, "Uncle Billy" of WGI and Harry Sadenwalter of WGY will be a few of the mystery men unfolded to listeners in who read page 5 of the Digest next week. The station announcers and staff members whose voices are often heard, are but rarely seen, and less known. But their pictures in the Digest will eliminate all this uncertainty and will help the invisible audience to visualize the invisible personnel of the great broadcasters.

Part II of the Radiophonist's Telephone Book will be given on page 8 of the March 17 issue. You can't get along without it, can you?

A-B-C Lessons for Beginners, Chapter Eleven next week will discuss the action of the vacuum tube as an amplifier. A. G. Mohaupt will make this article just as interesting as all of its predecessors. See his Chapter Ten on page 11.

E. T. Flewelling Will Tell More About His Circuit in the March 17 issue. The Digest certainly scored a hit when it "found" Flewelling. Read what he says this week on page 7.

Newsstands Don't Always Have One Left

WHEN YOU WANT

## Radio Digest

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# WOR TEST PROVES HIGHLY SUCCESSFUL

## MISS BENNETT IS HEARD BY EUROPEAN FANS

American Soprano Sings for Largest Audience Ever Reached By Human Voice

**By F. N. Hollingsworth**  
NEWARK, N. J.—The trans-oceanic recital test recently made by the Bamberger station, WOR, more than fulfilled the fondest dreams of the Radio engineers in charge. This test, the first of its kind to be made, proved to be perfect. WOR was distinctly heard by amateurs in England, France, Italy and possibly nearly all of the European countries. At the date of writing cablegrams and letters continue to flood the Bamberger store offering congratulations in appreciation of the program offered, from DX listeners living in all parts of Europe.

**Largest Audience Ever Reached**  
Experts here state that Miss Edith Bennett, of Concord, N. H., the young American soprano selected to test out the experiment of singing by Radio to an overseas audience, sang to the largest audience ever reached by human voice. Miss Bennett, who was chosen from a long list of American and European concert stars, by a special jury of Radio-musical experts, is proclaimed to be the world's finest singer for Radio broadcasting. Only this one vocalist was used for the program so that one voice could be considered in adjusting the powerful transmitting apparatus.

**Heard by Assembled Audiences**  
Several of the big Continental newspapers, including the Paris-New York Herald, the Antwerp Neptune, the Geneva Currier and the Stockholm Svenska Dagblad, made arrangements to receive Station WOR's program for assembled audiences. And, of course, almost every individual Radiophan abroad made a serious attempt to tune in the Bamberger station. According to the many communications received a large majority of them were successful.

**European Fans Doubtful**  
In spite of the fact that WOR has been heard clearly in France, Italy, Belgium, England, Scotland and Sweden on a dozen or more former occasions, there were some of the European Radiolists who were a bit dubious regarding the complete success of the recent experiment. The American Radio engineers, who made a complete check of all data leading to the test, were more than positive that Miss Bennett's voice would be heard in the European countries, however, it can be safely said that they did not expect the test to be such a complete success as it proved.

Besides the many acknowledgements from across the Atlantic, Station WOR received a heavy mail from American Radiophans who heard the recital. These letters came from almost every section of the states.

## New England May Soon Have New 'Silent Hours'

Inspector Kolster Plans Change of Evening Broadcasting Hours

BOSTON, MASS.—Radio Inspector C. C. Kolster of the New England division is about to recommend to the Radio Bureau of the U. S. Department of Commerce a slight variation in the "silent hours," for code sending, which he believes will straighten out many of the difficulties now being experienced throughout New England. First he will ask the Federal Bureau to sanction the Monday "silent night" broadcasting scheme for this district. With most of the local broadcasting stations now silent on Monday night, it gives the fans a chance to tune in on long distance broadcasts, and also gives the "spark" a chance to pound the brass to his heart's content.

It is also planned by Inspector Kolster to change the evening broadcasting hours from 7:30 to a half hour later, with the pro-

## HILL GIVES CANADA HEALTH OVER ETHER

BUFFALO, N. Y.—Canada will get its health by Radio. Dr. H. W. Hill, director of the London Institute of Public Health, London, Ont., Canada, will do the broadcasting through the London Free Press station. Dr. Hill was formerly director of the public health work of the state of Minnesota. The Free Press station carries through all the western part of Ontario.

## NORWEGIAN COMPANY TO MAKE AIRPHONES

WASHINGTON.—A company recently has been formed in Christiania, Norway, to manufacture Radiophones and other equipment, according to a report from Assistant Trade Commissioner Sorensen, at Copenhagen. The company will make a specialty of making the phones for the Norwegian fishing fleet which comprises over 14,000 ships.

## NEW BROADCASTING PLANT FOR CHICAGO

### THE "CRYSTAL STUDIO" TO BE "SHOW PLACE"

Station WJAZ Promises to Be on Air in Three Weeks with Program

CHICAGO, ILL.—Chicago is soon to have a new broadcasting station. Contracts were recently signed and license arranged for. This new station will have some novel features that will give the public an insight in the mysteries of broadcasting.

WJAZ will be the call of the new station to be located on the Edgewater Beach Hotel here. It will be known as the "Zeneth Edgewater Beach Hotel Station" and it is already being spoken of in Radio circles as "the crystal studio." This comes from the unique design of the operating room and artist's studio.

**The "Show Place of Chicago"**  
The station proper will be located in the main floor of the hotel and its walls will be built of three thicknesses of plate glass. This will offer a full view of the entire station to spectators who care to watch the work. The studio will be entirely draped in red velour with indirect lighting, furnished in period style. In an interview, Mr. E. F. McDonald, Jr., of the Chicago Radio Laboratories, who will operate the station, said, "We intend to make this station the show place of Radio broadcasting stations in Chicago."

**Paul Beese to Furnish Music**  
The regular concert programs will be broadcast from the crystal room and at other intervals Paul Beese's Orchestra will furnish dance music from the Marine dining room of the hotel. Every Sunday a concert will be given from the lounge room and in the Summer time the orchestra will broadcast from an open air platform. Station WJAZ will be under the direct supervision of the engineers of the Chicago Radio Laboratories, with Mr. L. M. E. Clausing, operator, Mr. R. H. T. Mathew, assistant engineer, and Mr. M. B. West, formerly of the Navy Radio department directly in charge. The antenna of the station will be of the fan type. The set will have an output of 10 K. W. Generators that are now being built are in relation and capable of 4,000 volts. The new station will probably be heard for the first time in the next three weeks.

## FLORIDA COCOANUTS FOR 1,000 LISTENERS

WQAM Makes Unique Offer to Those Hearing Program

MIAMI, FLA.—On Sunday, March 11, Station WQAM will broadcast a trans-continental program beginning at 11:00 P. M., (Eastern time), and lasting about two hours. Music for this program will be furnished by Harold Stern's Orchestra and the Castle House Orchestra, both are of New York City but now playing at the Miami Beach Casino here. There will also be selections by some of America's leading artists who are wintering in Florida.

To each of the first thousand listeners who acknowledge reception of this program - real Florida grown coconut will be forwarded, post paid, free of charge. This offer is made by the Curtis Bright Company of Miami.

WQAM, (formerly WFAW), broadcasts the programs prepared by the Miami Daily Metropolis. This station is operated and maintained by the Electrical Equipment Company, and has the distinction of having been heard in thirty states as well as Canada, Porto Rico and Cuba.

**Convention at Columbus**  
COLUMBUS, OHIO.—Hotel Columbus will be the scene of the first annual statewide Radio convention to be held March 16 to 18, according to officials of the Columbus Radio Club. There will also be exhibits by Radio appliances companies and a small broadcasting station in operation at the hotel.

## THE "HIRED HAND" OF WBAP



"The Hired Hand" at the Fort Worth Star Telegram microphone, known the country over for his humorous announcements. He is president of the "Radio Truth Society" of WBAP, with a membership of 10,000, whose purpose is to see that the truth is not abused and overworked. His activities are centered around the boiler room when not announcing. WBAP has still another famous feature in the cow bells which open and close all programs, symbolical of the cattle empire of the Southwest, of which Fort Worth is the capital

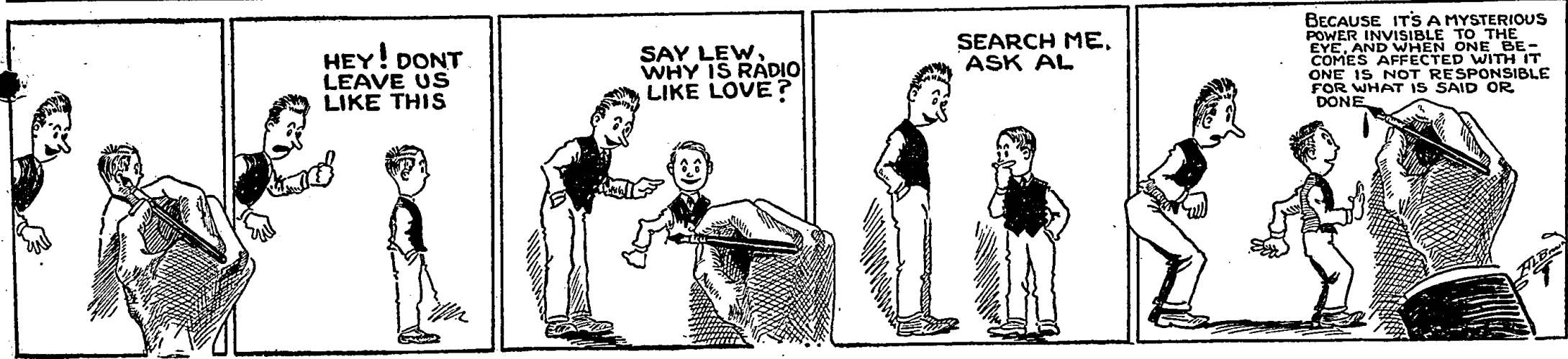
grams running from eight to 11, and thus giving the DX amateur two hours every night for sending, after which he is to remain silent for the rest of the evening, during the broadcasts.

### Shepard Stores Program Has Many New Features

BOSTON, MASS.—Some notable features were added to recent broadcasts of the Shepard Stores WNAC station. These included an evening's program by mem-

bers of Mme. Emilia Ippolito's Vocal School offering selections from the Opera Cavallera Rusticana, and the sextette from Lucia. Also a concert on the same evening by the Peerless Quintet of Boston, relayed by telephone and microphone from the New England Hardware Dealers' banquet at the Copley-Plaza. On another evening the "Liberty Chorus" of the R. H. White Company Store Members divided the program with the King's Chapel Choir, which gave a fine Lenten concert of sacred choral music.

## THE ANTENNA BROTHERS Spir L. and Lew P. First Signs of Spring



# WGM "OLD RELIABLE" SCOOPS ALL RIVALS

SECURES FIRST AIR TALK OF "BIG BOSS"

"Ether Talk is Enough to Make Anyone Feel a Little Queer," Says D. B. Carson

By G. C. Congdon, Jr.

ATLANTA, GA.—Picture if you can Henry Ford riding for the first time in an automobile in 1923. Picture Thomas A. Edison listening for the first time to his phonograph. Picture the late Alexander Graham Bell in 1922 using a telephone for the first time.

If you can do all this, then you can conjure up in your mind the picture that was presented a short time ago in the studio of Station WGM, the "Old Reliable" of the south. Not later than two weeks ago, D. B. Carson, commissioner of navigation of the department of commerce, the "big boss" of Radio, spoke for the first time from a Radiophone broadcasting station.

### Introduced from "Old Reliable"

Mr. Carson is a native of Atlanta and during a recent tour of port inspections in the South visited in Atlanta. He visited the Atlanta constitution's station as one of the first points of interest to him. It was after five o'clock in the afternoon. Station WGM presents its first evening program at six o'clock. At six o'clock Mr. Carson was introduced and gave his first address by Radio.

Odd, isn't it?

When Mr. Carson stepped back from the microphone, he wore a rather foolish look on his face.

"Well," he said, "I don't blame people for feeling a little queer when they are delivering a talk by Radio."

# YANK PLANES GET PERMITS AS STATIONS

Ether Phones Become Safety Measure for Air Travelers

By Carl H. Buttman.

WASHINGTON.—Radio as a safety measure for the protection of pilots and passengers has come into its own in air travel as well as on the sea, where its value was first realized. Seven airplanes and flying boats now are equipped with Radio and answer to regular calls.

The first American commercial aircraft to be licensed as a limited commercial station was one belonging to the Airline Transportation Co., of California. The Aeromarine company followed with the "Buckeye" in December and licensed five more planes recently. Radio equipment, officials believe, will make for greater safety in oversea travel and insure aid when air boats are forced down on the water.

The following aircraft have been licensed to date as limited commercial stations on 525 meters wave length:

- KFBI, Airline Arrow, No. 1, Airline Transportation Co., Los Angeles, Calif.;
- KFBY, Balboa, Aeromarine Airways Inc., New York City; KFBA, Buckeye, Aeromarine Airways Inc., New York City; KFBF, Gov. Cordeaux, Aeromarine Airways Inc., New York City; KFBJ, Nina, Aeromarine Airways Inc., New York City; KFBM, Ponce de Leon, Aeromarine Airways Inc., New York City; KFBZ, Santa Maria, Aeromarine Airways Inc., New York City.

# OPERA BROADCAST DRAWS BIG CROWD

German Opera Draws Heavily on Fans—Reminiscent of Hammerstein Days

NEW YORK.—Without warning save for such explanation as followed the Manhattan's first "broadcasting" of an opera here two nights previously, the former Hammerstein Theater in Thirty-fourth Street was besieged by operagoers all day yesterday and its lobbies were the scene of a wild but friendly "riot" last night when the Wagnerian Opera Festival began its second week with a packed house for "Die Meistersinger." At first the management was at a loss to account for the crowd, some hundreds of whom had to be turned away for lack of either seats or standing room.

### May Change Policy

Then it was suggested that the wide public interest had resulted from Saturday's experiment, when a performance of "The Flying Dutchman" had been sent by Radio over a city and suburban population of millions from the Westinghouse plant at Newark, N. J., the music having been conveyed to that place on a single wire installed in the Manhattan stage by the Postal Telegraph Company. Influential members of the Metropolitan directorate had likewise heard it and there were those who said the result might change the policy of the older Broadway house, which hitherto has barred the broadcasting of opera by Radio.

# Again the Ether Is Called Into Use to Find Missing

SCHENECTADY, N. Y.—The Radio has given another evidence of its value recently, when the whereabouts of Louis Gordon, former sergeant of Company B, 301st Artillery, military police corps, was found. He was wanted to substantiate the claim of an ex-service man who was dying in a Buffalo hospital, and letters to Gordon's last known address had been returned. Finally Station WGY was appealed to. This plant complied by sending out a Radio inquiry, by H. M. Laughlin, county claim agent of the Chatauqua county committee, American Legion. Within twelve hours after the broadcast inquiry Gordon saw a lawyer, drew up the necessary papers and mailed them to the claim agent. Later others by the name of Gordon wrote in, giving their full names, addresses and outfits with which they served an doffered any assistance they could.

### May Change Wave Lengths

WASHINGTON, D. C.—It is possible, it is understood, that the Secretary of Commerce might make an effort to change Radio wave lengths in spite of the fact that the Radio law is not being changed by Congress. He might make an effort to do something without the law.

### Freshman Has New Home

NEW YORK.—The Chas. Freshman Company, Inc., has recently moved their quarters from 97 Beekman street to a much larger and more pretentious store at 106 Seventh avenue, on the corner of 17 street. This company is one well familiar to all Radiophans.

# CKCK HELPS CAPTURE "DOC" PURVIS—BANDIT

New Use Found for Broadcasters By Regina Police Force

WINNIPEG, CAN.—Prompt use of the Regina, Sask., Leader's Radio broadcasting plant CKCK was responsible for the arrest of "Doc" Purvis, train bandit.

As a transcontinental train was nearing Regina the masked bandit entered the express coach, held up and bound the messenger and took all the mail from stations between Edmonton and Regina. He jumped off the moving car as the train slowed down for the station and made away in the darkness. It was thought he had been completely lost.

The trainmen who discovered the bound messenger dashed to the nearest telephone and informed the Regina police. Immediate and up-to-date action was taken by the "coppers" and the Regina Leader's Station flashed a complete description of the bandit as furnished by the expressman.

Within ten minutes a net was spread around the city and surrounding country that proved impossible to escape. The bandit was detected four days later as he attempted to board an out going train. He said he had intended to leave the city sooner but heard of the action taken with the Radio and consequently feared arrest.

### New Wrinkle for Fans

PAWTUCKET, R. I.—James Hanley, Radiophan of this city has found that he increased his signal strength by cupping out the center of the diaphragm of one of its phones so that the center almost touched the magnets. Before he did this he could generally hear Station KDKA, Pittsburgh, 25 feet from the phones, but after trying the new wrinkle he could hear at least 25 feet further away. By loosening or tightening the receiver cap, he can vary the sound to any degree of sound amplification.

## FLEWELLING

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## HUDSON-ROSS

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## Spirala — PEOPLE "FROM MISSOURI" ARE OUR SPECIALTY!

MOST FOLKS don't believe that a perfect loud speaker can be sold at so low a price—We "Show" 'em! We can convince you, too, that SPIROLAS are, and always have been, the most perfect reproducers of voice and music that have ever been produced. A trial on your own amplifier set will make you a "Spirala booster" for life!

<p>SPIROLAS combine perfect tone and loudness with beautiful style and finish, and exceptionally reasonable price—an unequalled combination.</p> <p>SPIROLA DUPLEX—uses any headset. Beautiful finish of dark red mahogany, bronzed throat.</p> <p>(DM) Same in black finish, nickel-plated fittings. . . . . \$4.85</p> <p>(DB) . . . . . \$3.85</p> <p>L. H. DONNELL MFG. COMPANY, Dept. D.</p>	<p>SPIROLA SIMPLEX—uses Baldwin or other unit. Mahogany (DM) \$4.85; Black (DB) . . . . . \$3.85</p> <p>SPIROLA CONCERT—Has built in Baldwin unit, mahogany finish, bronzed throat. Complete with unit and cord. (CM) . . . . . \$12.50</p> <p>For sale by all good dealers. If yours hasn't them well ship by mail, postpaid (Guaranteed). C. O. D., if you wish.</p> <p>Box 70. ANN ARBOR, MICH.</p>
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# Ether Cops Keep Watch for High Wave Length

Canadian Government Give Canadian Amateurs More Leeway

OTTAWA, ONT.—"Ether Cops" are maintaining a constant vigil over the upper strata in Canada. Such is the term applied to those inspectors who have been appointed by the Canadian government department of marine and fisheries. They are mostly ex-service men and pass the night checking up on the wave lengths being used by amateurs in cities with a population greater than 15,000.

Canadian government officials contend the Canadian amateur is given more leeway than the operators of any other country, which Radio has become popular.

## BEST RADIO BARGAINS

Westinghouse R. C. Set, Complete, \$132.50;	now . . . . . \$99.00
Tresco Reinartz Tuner Set, Complete, \$104.00; now . . . . . 79.00	
Baby Lawson Crystal Set, Complete, \$20.00; now . . . . . 9.99	
Dictograph Loudspeaker, \$20.00; now . . . . . 12.49	
K.-C. Crystal Set, Complete, \$16.50; now . . . . . 7.99	
Dictograph Headset, \$12.00; now . . . . . 4.49	
K.-C. 23 Plate Variable Condenser, \$3.30; now . . . . . 1.64	
Magic Crystal Detector, \$1.50; now . . . . . .39	
Radio for Everybody, by Lescaurhoura. \$1.50; now . . . . . .79	
(Published by Scientific American.)	
Vacuum Tube Hookups, includes Armstrong Super-regenerative, by Brigham, 50c; now . . . . .29	
Send Money Order. All Goods Guaranteed.	

**WILSON RADIO AND ELECTRICAL SHOP**  
1503 3rd Ave. SEATTLE, WASH.

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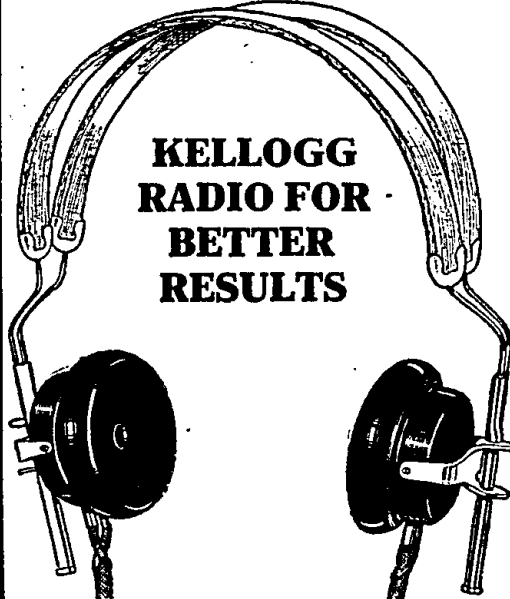
King Quality Switch Levers  
King Quality Tube Sockets  
King Quality Plain and Vernier Rheostats  
King Quality Dials

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Costs No More Than Inferior Made Products

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WRITE for ATTRACTIVE PRICES

## WERNES & PATCH

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**KELLOGG RADIO FOR BETTER RESULTS**

**KELLOGG SWITCHBOARD & SUPPLY COMPANY**  
Chicago

## NOW READY! ACT QUICKLY!!

The first and only complete line of high-grade receiving instruments made by one manufacturer. For many years we have specialized in Radio instruments for voice and musical reproduction. We now offer a perfectly developed and GUARANTEED line of apparatus with a price range to meet every demand. Send for circular.

### The Wonderful New ACOUSTICOLA with Loud Speaker Unit

Made in four models; especially designed as a Loud Speaker. Has a large, highly sensitive diaphragm with ADJUSTABLE device. Will not "blast" on the strongest amplified signals and gives remarkable volume and clarity on weak signals. Gives truest reproduction of voice and music.

**TRIMM "CONCERT GRAND" MODEL ACOUSTICOLA**

A finely finished large walnut cabinet, enclosing a Cast Aluminum horn with Loud Speaker Unit of exceptional tone quality and volume. A handsome ornament for the finest home.

**TRIMM "STUDIO" MODEL ACOUSTICOLA**

Has same Loud Speaker Unit as "Concert Grand" model, but a composition horn of somewhat smaller size. Walnut cabinet. Reasonably priced.

**TRIMM "SIMPLEX" MODEL ACOUSTICOLA**

Designed to give all the advantages of the more expensive "Concert Grand" and "Studio" models, but less expensive because not enclosed in a cabinet. Has the same Loud Speaker Unit mounted on wood base with composition horn uncovered. A wonderful value.

# T R I M M

**TRIMM "PROFESSIONAL" 3000 OHM HEAD SET**

The finest instrument of its kind. Moulded Bakelite cases and ear caps, single bar Tungsten steel magnets; light weight. Exceptional tone and volume. A \$12.00 quality to retail at \$7.65.

**TRIMM "DEPENDABLE" 2400 OHM HEAD SET**

Standard bi-polar construction. Aluminum case. Splendid appearance, volume and tone, to retail for only \$5.00. Greatest value ever offered.

**TRIMM ACOUSTICOLA Phonograph Attachment**

The wonderful Trimm Loud Speaker Unit mounted in a small cabinet to be placed in any phonograph, with bushings for attachment to the tone arm. A convenient and handsomely finished instrument.

ORDER ANY TRIMM PRODUCT ON APPROVAL. YOUR MONEY BACK IF NOT SATISFIED. Write us today for full description and prices. Mention your dealer's name.

## TRIMM RADIO MFG. CO., Dept. 41, 24-30 S. Clinton St., Chicago

# DID ARMSTRONG INVENT SUPER?

**Courts Will Soon Decide If Title Belongs to Logwood**

**Meisner First to Register**

**Logwood Eager to Give Improved Circuit to Radio World With Few Restrictions**

By Albert H. Munday

What promises to be one of the most interesting and important steps in the development of Radio, the Armstrong vs. Logwood case at present pending in the United States patent office, is gradually being consummated, and judging from present indications Charles V. Logwood will win the case. If this is the outcome it will mean that Major Edward H. Armstrong will be required to withdraw his patent rights, which have been sold to the Radio Corporation of America for \$500,000, and the new circuit, known as the Logwood super-regenerative circuit, will predominate in the Radio world.

**Claim Herr Meisner Inventor**

It is safe to say that practically every Radiophan in the world today is familiar with the Armstrong circuit, but it might be mentioned, however, that Mr. Armstrong was believed to be the first man to conceive the principle of what is known as the super-regenerative circuit for Radio receiving sets. It will be remembered that this circuit was hailed by Radio experts all over the world as the greatest contribution to the improvement of the science; chiefly because it was an improvement in the sensitizility of the audion, and consequently the audibility of telephone and telegraph signals was increased by 1,000 times.

The new circuit was a development of the regenerative circuit patented by Herr Meisner, of Germany. This regenerative circuit was also known and developed by Charles V. Logwood and De Forest (simultaneously), E. Armstrong, Mr. Round, of England and Mr. Franklin, of England. In this case Herr Meisner was the first to register the circuit, and therefore he was given the credit for being the inventor.

**First Case Decided**

In the case of the super-regenerative circuit it has been understood for some time that Mr. Armstrong was the first to register the circuit, and accordingly he was granted the legal patents. But since, however, it has been discovered that Mr. Logwood really registered his application before that of Mr. Armstrong's. The first step in the case was decided in November last when the United States patent office declared an interference, as to whom was the first inventor.

In the first interview ever given to the world, and given exclusively to the Radio Digest, Mr. Logwood pointed out that his application was filed at Washington, D. C., in March, 1921, whereas that of Mr. Armstrong's was filed on June 27, 1921. The first written description of the circuit was made by Mr. Logwood on December 16, 1920, and that of Mr. Armstrong in March, 1921.

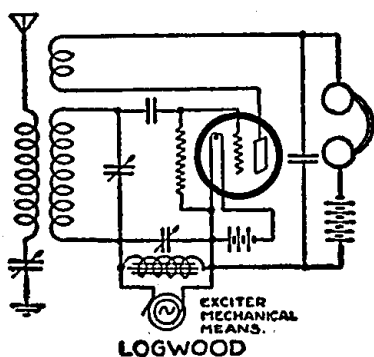
**Logwood Explains Difference**

Without going into technical details Mr. Logwood explained, in a few words, the difference between the Logwood and the Armstrong circuits. The Logwood circuit is equipped with a mechanical exciter and gives a broader field because both the mechanical and the electrical exciters can be used. The Armstrong circuit has a tube exciter by an electrical means. If the case is won by Mr. Logwood it will mean that the Logwood circuit will be available to the whole world (of course subject to Mr. Logwood's restrictions and patent exceptions), and will give a very broad field. This will also mean that Mr. Armstrong will be restricted. It is understood that the Logwood circuit is so sensitive for continuous wave reception that it is necessary to screen the tube circuit away from the influence of the antenna re-action.

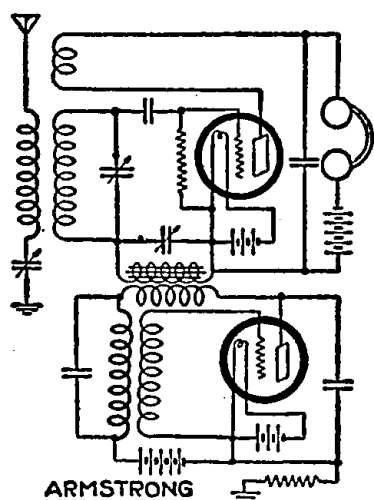
There are five steps in the great case now being held, which is expected to be settled within the next eight months. The first was recently declared by the United States patent office; the second is the motion to take the testimony of E. Armstrong; the third is the motion to take the testimony of Charles Logwood; the fourth will be the summing up, and the fifth and last step will be the decision.

**Views Expressed by Logwood**

Asked by the Radio Digest to express his view of the case, Mr. Logwood said: "I have the greatest admiration of Mr. Armstrong. He is a remarkable man and has accomplished excellent work for the development of the science, but in this case it is a question of rights and I feel that when the full testimony is in and summed up, the decision given by the United States patent office will be considered justice to everyone. It is a pe-

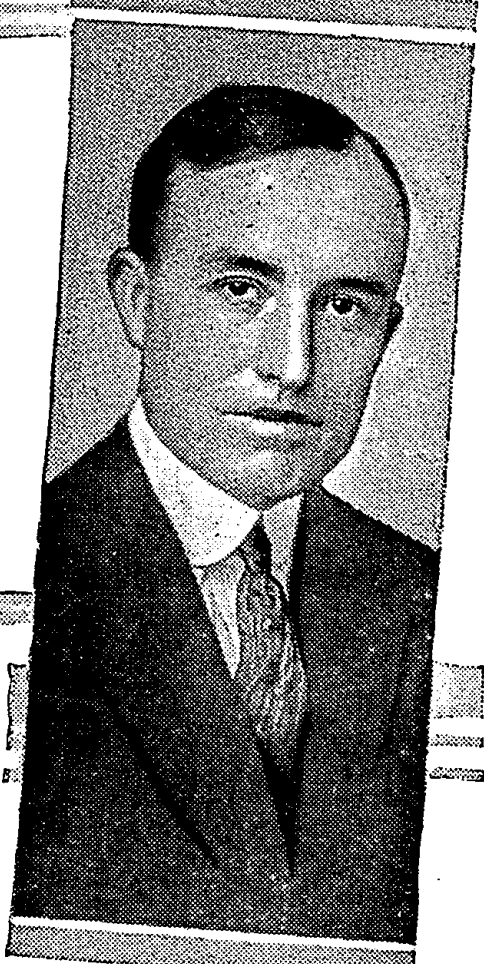


EXCITER MECHANICAL MEANS. LOGWOOD



ARMSTRONG

The striking similarity between the two circuits now in patent rights dispute is clearly illustrated by the diagrams shown above. Where Mr. Logwood used a mechanical exciter such as an alternator, Mr. Armstrong used a triode tube oscillator generator. The picture at the right is that of C. V. Logwood, claimed to be the original inventor of the circuit



cular psychological fact that when a new invention is declared there are many inventors who were thinking along the same lines, and in the case of the super-regenerative circuit there was no exception. It is because inventors think along the same lines of development and many hit upon the new improvement at the same time.

According to the patent laws in the United States, and other countries for that matter, it is the person who registers the invention first that is given the credit, and then, in the case of an invention that has been stolen or obtained by illegal means, it is necessary for the inventor to prove his claim. But in this case it is a question of priority that, I consider, has been overlooked by the United States patent office.

**Will Improve Circuit**

Questioned regarding his next move in the betterment of Radio, Mr. Logwood said: "As soon as this case is settled I am going to improve on the Logwood circuit so that every one from the expert in charge of the largest station in the world to the fan who has his small crystal set

will be able to benefit by my inventions, and especially by the Logwood circuit. At the present time the circuit is especially suited for the large powerful stations, and it is necessary for a well-informed man to be in charge in order to get the best results, but I am eager to give the Radio world the value of my experience; so that the new science may develop as quickly and as efficiently as possible."

**Test Proves Audibility**

One of the outstanding features of this new invention of Mr. Logwood's is the fact that telegraph signal reception does not depend on the "beat" principle as in the Fessenden heterodyne circuit. In tests made in reception for telegraph signal from continuous wave stations is 10,000 to one in audibility ratio against the heterodyne circuit. Daylight reception with one tube in the circuit the first of December, 1920, in San Francisco, actually received daily signals from Marlon Röss, so loud one could not keep the phones on the ears at maximum intensity while with the best reception the audibility was but twenty.

## Etherized Sermons Bring in Collection

Liberal Donations Are the Result of Joke Made by Dr. Masee

BOSTON, MASS.—Rev. Dr. J. C. Masee and Rev. Dr. A. C. Conrad, pastors of Tremont Temple and the Park Street Church respectively, whose Sunday evening sermons are broadcast every week by Radiophone, find that spreading religion by Radio is an enterprise profitable to the church as well as to listeners. Liberal contributions have come in to both churches by mail from Radio listeners who were invited to assist in the regular offerings. Since they could not be reached when the plate was passed among the congregations they sent in their offerings by mail. Dr. Masee has received contributions varying from twenty-five cents to \$10 and during Christmas week a special contribution of \$50. One man sends in regularly, the church's weekly offering envelope, with his contribution within.

Dr. Masee said that his first suggestion for a mail offering from Radiophans was at first made half jokingly, and the congregation took it as a joke. Next day a Radiophan came in to Dr. Masee's office and gave him a dollar, saying he had heard the joking remark and had heard the congregation laugh. "Now let's see if the people at the service do as well," he said, as he walked out. At the next service, Dr. Masee got \$76 in bills, after telling his congregation of the Radiophan's challenge.

A Dorchester woman who has a set wrote that she would invite some women friends to lunch and have them listen in to the service. Another woman who heard the Radio service of Dr. Masee wrote that if she were not a Presbyterian she certainly would be a Baptist, and enclosed a dollar.

As a result of the stories told about the crippled boy who sent in a contribution to help some other cripple to a chance for listening in, this boy has been given a set, placed in his own home, and other sets have been promised by various donors to help other worthy sufferers, and a special fund is slowly growing also toward this end by contributions sent in.

**Meridian Opens New Station**

MERIDIAN, MISS.—A new broadcasting station has been opened at Meridian under the auspices of the newly organized Meridian Radio Club. The station will send reports of aid to farmers, such as weather forecasts picked up and relayed and news items of interest to the rural community.

## CFCN Operates on 2,000-Watt Output

Calgary Plant Offers "CFCN Night" and Plays to Listening Room Only

**By Jeffrey J. Dingman**

CALGARY, ALTA.—"CFCN Night" was observed all over the Middle West and Pacific Coast States and in western Canada on the night of February 19, when W. W. Grant, owner of CFCN, The W. W. Grant broadcasting station at Calgary, broadcast a special program from 6XB, Telegraph Hill, San Francisco.

W. W. Grant, former chief of the Radio station of the Canadian government at High River, Alberta, and now operating at Calgary one of the most powerful stations on the continent, was asked to broadcast from the Mercantile Trust Company's station at San Francisco as a special feature for 6XB, (test call for KFDB).

**Output of 2,000 Watts**

Mr. Grant, who has devised a special and most effective system for broadcasting, was heard clearly in Calgary and in many other cities of western Canada. CFCN at Calgary discontinued the regular broadcast that night to afford fans here the opportunity of hearing Mr. Grant in San Francisco. While in the States Mr. Grant "rode the goat" at The Night Owls Club of Portland, Oregon.

Last week Mr. Grant commenced operation on his new set at Calgary and CFCN now has a modulating output power of 2,000 watts, being equipped with four new 500-watt tubes which were especially manufactured at Montreal. It is believed that with the new set, which has four times the output of the old, CFCN will be able to establish new records and accomplish feats which will startle Radiophans. Communication with Australia and Continental Europe is within the bounds of possibility.

## Miss Florence Parsons Wins DX Prize Awarded by WNAC

BOSTON, MASS.—Miss Florence Parsons of Sydney, B. C., has been awarded a prize of a Sonochorde Loud Speaker by WNAC station of the Shepard Stores, as the person hearing this station the greatest distance from Boston. The distance is 3250 miles, an exceptionally long one for a 100-watt station to be heard, which proves that WNAC is ideally located for broadcasting. One requirement of the contest was that claimants should submit a portion of the program heard for verification before being considered eligible.

## INDIANS DANCE TO WHAZ—TROY TECH

POLYTECHNIC INSTITUTE WINS NEW NAME

New Midnight Program Proves Popular Among Brave Ex-Warriors of Famous Custer Battle

TROY, N. Y.—Sioux Indians to the number of 160—many of them ex-warriors of the Custer Battle of June 25, 1876, and a number of former Carlisle, Pa., students—gather at Lone Eagle's ranch at Winnett, Montana, to dance to music of the Rensselaer Polytechnic Institute Students Orchestra broadcast from radiophone station WHAZ at Troy, N. Y., approximately 2,500 miles distant. And at the request of Lone Eagle—who discovered when he first "listened in" a month ago that "Big Chief WHAZ with the Mighty Voice" could be heard clearly three-fourths of the way across the continent—the Students Orchestra will play "In the Land of the Sky Blue Waters" and other modern Indian airs for the entertainment of the descendants of the first Americans.

It came about thus that the oldest engineering college, which has developed the art of broadcasting to the furthest reaches of the continent from Alaska to Panama in a few months, provided Radio music for the first time for an Indian dance last month.

The Troy Polytechnic inaugurated this winter an international Radio program Monday night of each month. Immediate response came from remote points in all the Western states, Canada, Alaska, Mexico, from midnight to 1:30 A. M. on the second day, Cuba and Panama.

## RELAY OF BROADCAST BY WBAP—FT. WORTH

Liner Berengaria Picks Up WBAP in English Channel

FT. WORTH, TEXAS.—The Ft. Worth Star Telegram believes it is privileged to claim a new record for station WBAP due to the successful relay by this plant of a program broadcast by KHJ, Los Angeles, Calif. The program was heard almost all over the entire Southwest.

This plant has been doing very successful distance work and on one event was heard aboard the steamer Berengaria in the English Channel. Mr. L. S. Rothael, managing director of the Capitol Theatre, New York, listened to the complete program of WBAP over a receiving set installed in his cabin of the Cunard Line vessel. He said the reception was unusually clear and free from interference.

All ships sailing from American harbors and carrying fifty or more persons are required by law to maintain and operate a Radio transmitting and receiving set capable of covering at least 100 miles.

# WHITE ASKS TRUST TRUTHS IN REPORT

## MAINE SENATOR PUTS O. K. ON QUIZ RESOLUTION

Deems Investigation of Reputed Trust Activities Necessary for Intelligent Radio Legislation

By L. M. Lamm

WASHINGTON, D. C.—Representative White of Maine, who introduced the resolution providing for an investigation by the Federal Trade Commission of the alleged monopoly in the manufacture of Radio instruments and parts, reported this resolution to the House from the Committee on Merchant Marine and Fisheries. At the time of writing, Congress had not yet adjourned. The committee in its report on this resolution says:

"The Committee on the Merchant Marine and Fisheries, having considered House Resolution No. 548, reports the same to the House without amendment, with the recommendation that the resolution be passed. The members of the committee are unanimous in their approval of the resolution.

### Request Prompt Action

"The House recently passed House bill 13773. In the preparation of that bill the members of your committee felt constrained to limit its scope because of a lack of accurate information on certain important phases of the general subject of Radio. That bill, therefore, dealt only with those matters concerning which we were advised and upon which we deemed it vital that there should be prompt action by the Congress.

"It is a matter of common assertion that the development of the art, its use and enjoyment, is being hampered and restricted through the acquisition by a few closely affiliated interests of basic Radio patents, and that the intent and effect of the practices of these interests is to establish a monopoly in Radio instruments and parts thereof. It is charged that agreements have been entered into between manufacturers and dealers in Radio apparatus the purpose and effect of which is to eliminate competition, to restrict the sale, and to unwarrantably maintain the price of instruments and their parts. There is evidence of record of contracts or agreements made, which purport to give exclusive rights in the transmission, reception, and exchange of Radio messages, with the result that no competition in service is possible in the localities covered by such contracts.

### Ask for Truth

"Your committee feels that an investigation should be made to ascertain the facts in connection with the matters specifically suggested and more generally covered by the reported resolution. We desire to know the truth. We must have this information in order to satisfy ourselves whether unlawful agreements have been entered into, whether unlawful practices have been and are being engaged in, and to guide us in framing legislation for the consideration of the House. The Members of this House must have the facts if they are to legislate advisedly in the public interest on this subject."

**PROLONGS LIFE OF TUBES**  
**AMPERITE**  
 CURRENT ADJUSTER  
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 EXPELS ALL TUBE TROUBLES  
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**RADIALL COMPANY**  
 69 WARREN STREET NEW YORK \$1.10 MOUNTING

### INCREASE YOUR RANGE

BY ADDING A PERFECTLY CONSTRUCTED VARIABLE CONDENSER TO YOUR SET

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23 PLATE.....	1.40
43 PLATE.....	1.75

Mail Orders Filled Same Day  
 Postage Extra No Personal Checks Accepted  
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# Book Reviews

**How to Make Radio Receiving Sets.** This booklet describes ten different receiving sets and amplifiers which have been constructed in the research department of the Federal Telephone and Telegraph Company of Buffalo, N. Y. The booklet is fully illustrated. It is free to all who ask for it by writing the firm mentioned.

**Revolutionary Theories in Wireless.** By Frank E. Summers. A treatise in the how and why of Radio and science. A practical result of years of careful study and research by the author. Non-technical, written so you can understand it. Price, \$2.50.

**The Armstrong Super-Regenerative Circuit.** By George J. Eltz, Jr., E. E. This is a De Luxe edition of this famous circuit. Profusely illustrated and fully explained. Fifty-two pages. Price, \$1.00.

**How to Retail Radio.** A new book telling of tested plans and methods and policies for the dealer in Radio. Financing, location, store equipment and arrangement. Price, \$2.00.

**Radio First Aid.** Illustrated with working drawings and complete data as to the necessary equipment and cost of constructing from the simplest to the most modern Radio outfits at home. Price, \$1.

**The Radio Amateur's Handbook.** By A. Frederick Collins. A new revised edition of this book is just out. It is complete, authentic and informative work on Radio. Fully illustrated. Price, \$1.50.

**Vacuum Tube Receivers.** By O. F. Hessler. A book that tells how to make a simple set. How to make a cabinet. It includes a 27 by 36-inch layout blue print. Price, 75 cents.

**Home Radio—How to Make It.** By A. Hyatt Verrill. This book is particularly adapted for the amateur who desires to know how to make Radiophones. Twelve full page illustrations and diagrams. Price, 75c.

**Elements of Radiotelegraphy.** By Elery W. Stone. The text was written for the guidance and instruction of Radio students in the communication service of the Navy. It is an instruction book for Radio schools. Price, \$2.50.

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

**Letters of a Radio Engineer to His Son.** By John Mills. A series of interesting letters written to a boy. Each letter is full and complete and the most advanced student can skip over some of the letters and get just the information he desires. Price, \$2.00.

**Radio Experimenter's Hand Book.** By M. B. Sleeper. This book will help in the selection and the construction of simple apparatus for transmission and reception of Radio telegraph and telephone signals. Price, \$1.00.

## TWO SUPERSENSITIVE CIRCUITS

(Both Copyrighted)

My Highly Improved Reinartz brings in all important stations on both coasts and Mexican border, loud, clear and without distortion. We dance to music from Atlanta received on one loud Baldwin unit. Build one of these wonderful sets from my blueprints and specifications, price 50c, or with a perfect and complete double wound spiderweb coil, \$3.00 by mail. No other windings used. Photo of my set on a glass panel with every order.

My W. D. II Circuit is especially designed for use with the "Piccolo" tube and brings out the full value of that little tube as no other circuit can. Stations 1000 miles away come in clearly on one tube. This set is small, complete, portable. For the man who wishes the highest efficiency this is the set to build. Price of blueprint and specifications \$1.00, or with complete and perfect windings \$5.00. Photo of set with every order.

Either set is cheap and easy to build, easy to operate. Everything clearly shown. Please don't send stamps. S. A. Twitchell, 1925 Western Ave., Minneapolis, Minn.

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Alaminated Phenolic Condensation Product  
**SHEETS TUBES RODS**  
**RADIO PANELS**  
 POLISHED BLACK FINISH

CUT PERFECTLY SQUARE TO ANY SIZE

1/32" THICK	1/2¢ PER SQ. INCH
1/16" THICK	3/4¢ PER SQ. INCH
3/32" THICK	1¢ PER SQ. INCH
1/8" THICK	1 1/2¢ PER SQ. INCH
3/16" THICK	2¢ PER SQ. INCH
1/4" THICK	2 1/2¢ PER SQ. INCH
3/8" THICK	4¢ PER SQ. INCH
1/2" THICK	5 1/4¢ PER SQ. INCH

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 PROMPT ATTENTION TO MAIL ORDERS  
 DEALERS PRICES ON APPLICATION

**STARRETT MFG. CO.**  
 519 SOUTH GREEN ST. CHICAGO

# KRUMM ACCLAIMED AS FATHER OF 360 WAVE

## Sees Advisability in New Code of Regulations

COLUMBUS, O.—In an interesting talk given before the Columbus Radio Club, L. R. Krumm, of the Erner & Hopkins company, it developed that Mr. Krumm, more than any other man, was responsible for the fixing of 360 meters as the standard wave-length of popular broadcasting. This fact was learned while the speaker was giving a short history of the Radiophone as a prelude to his explanation of the White Radio bill.

While with the Westinghouse company, Mr. Krumm obtained the first broadcasting license for that concern. It was an entirely new subject to government officials. As a standard for this service, Mr. Krumm suggested the 360-meter wave length and it was adopted. He admits that at the time he could not foresee the tremendous increase in broadcasters, but now sees the advisability of a new code of regulations, such as embodied in the White bill.

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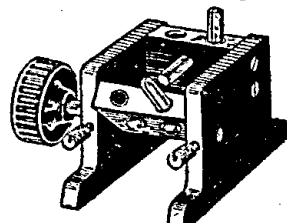
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## Big Development for Field

COLUMBUS, OHIO.—"Although Radio has taken rapid strides in the short time that people have known about it, it is destined to advance further in the next three years," declared R. C. Bohannon of the Erner & Hopkins company in his talk on "The Development of Radio" at the convention of the Ohio Engineer society at the Southern hotel this week. "It is impossible to predict what future development will be, but it is practically certain that within the next three years we shall see some remarkable and revolutionary changes in Radio."

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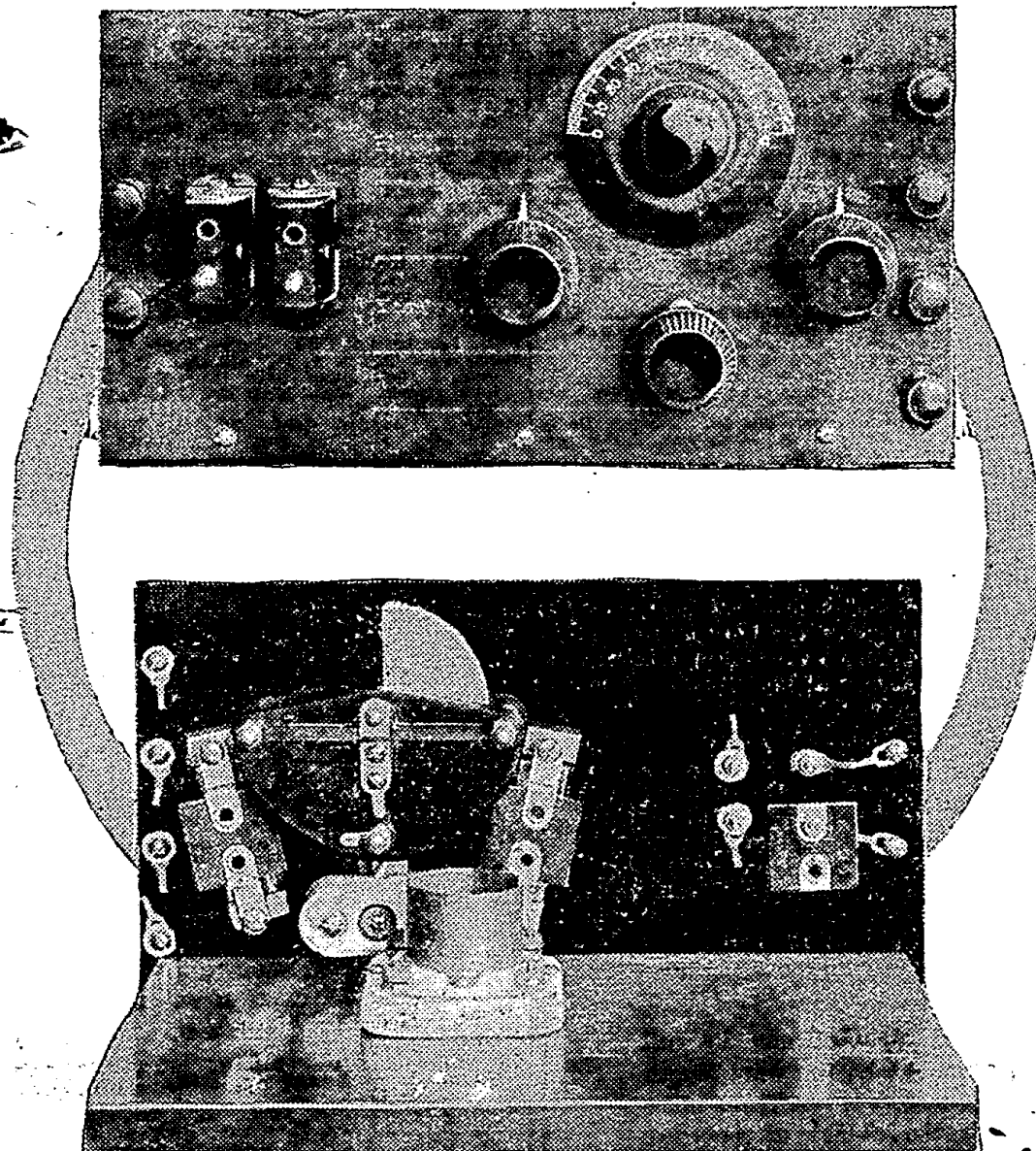
# The "How" of the Simplified Super Circuit

## Part VI—Putting the "Flivver" on the Panel

By E. T. Flewelling

IT IS presumed that all those who have followed this series now have all the data necessary to build a Flewelling super set properly. Mounting of the various parts is, of course, optional with the one who builds his set to meet indi-

vidual requirements. No doubt there is plenty of room for improvement in the Flivver circuit and more or less opportunity for those who may wish to experiment. This is one of the reasons for the prize contest that has just been closed by Radio Digest.



The Flewelling super has a peculiar characteristic, for at times distance will make no difference whatever. It is a consistent receiver as compared with other sets. To get a comparable audibility with other sets, I have been forced to equalize things by putting the Flivver on a 2-foot loop, or even robbing it of any energy collector whatsoever. These tests were, of course, in comparison with other single-tube sets. The Flivver is simply a step farther in the right direction, for reducing first and upkeep cost. The Flivver always

operates from any light socket. Price only \$2.00.

rank high in comparative tests, especially where cost is considered. For the fan desiring a suggestion for mounting his set the method shown in the accompanying half-tone is given. These pictures show the front and back view of

a panel mounting which is laid out with a view to maximum results and ease of

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operation. The views were taken before the set was wired in order to show the simplicity of the outfit and to avoid any possibility of hiding any mounting feature with the wiring.

The 2-coil mounts are placed on the left of the panel for the following reasons:

The 50-turn coil is placed in the extreme left mount and is only moved when it is necessary to secure out of the ordinary conditions of coupling between the coils. The antenna post is placed near to this coil. Both the antenna post and the coil are connected to the grid of the tube. There is considerable body capacity effect centered around these points and for this reason they are placed as far out of the way as is possible. This applies, of course, only to the right handed operator.

**Important to Have Grid Leads Short**

The 75 or 90-turn tickler coil is placed in the mount on the right. This coil is then moved to vary the coupling. It swings to the right and for this reason the condenser and other controls are placed as far to the right as is possible in order to avoid interference with the coil when it swings.

The view of the rear shows the socket for the tube placed very close to the adjustable grid leak and its condenser C2. This construction makes it possible to have a lead to the grid of the tube of minimum length, which is important.

One of the condensers of the condenser bank C3C4C5 is placed directly on the coil mounting stud, another is placed on the mounting of the grid leak R2, and the third may be placed in the most convenient position to suit individual needs.

Both binding posts on the left are directly connected to the 50-turn coil mount. Only one is used as a rule, the one that is connected to the grid side of the coil, but the second one may be used for loop work.

Of the four posts on the right of the panel the two upper ones are for the phones and the two lower ones for the filament or A battery connections. The B battery leads would ordinarily be taken from the rear of the set but the A leads are mounted on the panel so that the filament current may be easily carried to an amplifier if one is used.

The control knobs of the variable con-

denser, rheostat and variable grid leaks, are all placed close together so that practically all of the control of the circuit is at one's finger tips and will enable one to secure maximum ease in tuning.

**Mount in Cabinet to Exclude Dust**

If the panel is fastened to a baseboard, as shown, the board will serve as a support for the panel, tube socket, etc., and will not interfere with mounting the set in a cabinet. It is much easier to work on a set that is mounted in this manner than it is on one that has no support for the panel. It is strongly recommended that the set be enclosed in a cabinet in order to exclude dust which will often seriously affect the grid leaks. No peep holes are cut in the panel to observe the tube for the same reason.

Radiophans are using almost any tube they have in stock on the Flivver circuit. For this reason it is not necessary to make any expenditure for building a set if you have a tube. If a tube is too soft, that is, gas filled or low vacuum, it will not operate correctly. One reason for this is because it is not possible to control the blocking action. The charge on the grid will leak off through the tube itself instead of through the leaks where the circuit is controlled.

**Discussion of Tubes for Circuit**

Among the list of tubes that will operate in the Flivver are the WD-11, Myers, UV or Cunningham amplifiers, and the 202 5-watt power tube. Audibility will depend to a great extent upon the kind of tube used. Some tubes deliver a greater volume of sound than others. This part can only be made known by trial. The WD-11 tube is as good as can be asked so far as its ability to bring in long distance work is concerned, but it does not deliver the volume characteristic of other tubes.

When one is desirous of securing maximum volume from his set he must take into consideration other factors along with the tube. Any given tube will deliver its maximum in a given circuit only when other things being right, the filament and plate voltages are exactly right. This means that no two tubes, even of the same type, will yield their best work on the same setting of the A and B voltages.

(Continued on page 15)

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Published by the Radio Digest Publishing Company, Inc.  
123 West Madison Street  
Telephone State 4844-4845  
Chicago, Illinois

E. C. RAYNER, Publisher  
Chas. F. Smisor, Editor  
Harry J. Marx, Technical Editor

Eastern Representative, Jacob Miller, 2126 Broadway, New York  
Telephone Columbus 2390

Pacific Coast Representatives  
E. J. Wood, 251 Kearny St., San Francisco  
Telephone Kearny 1472

H. M. Morris, 417 Western Mutual Life Building, Los Angeles  
Telephone 12911

58  
PUBLISHED WEEKLY

SUBSCRIPTION RATES  
Yearly.....\$5.00 | Foreign.....\$6.00  
Single Copies, 10 Cents

Vol. IV Chicago, Saturday, March 10, 1923 No. 9

## Influence of the Amateur

### Epoch-Making Invention Work of Experimenter

THE American amateur, under the law of 1912, was given limitations as to power, wave length and decrement, which were considered by the framers of the law as placing the amateur under such a handicap that he would never be able to reach out far enough to make any trouble with commercial and military communication. The handicaps were considered sufficient to prevent his signals from reaching beyond the distance of a mile or two.

Ten years of extensive study, patient research and epoch-making invention, he has today produced short wave Radio transmitting and receiving apparatus which enables him to reach into the thousands of miles to cover a continent where it was thought he would only cover a city square. Before the World War the American amateur had actually developed a Radio relay system which extended across the American continent from coast to coast. At the time the war called him from his work he had organized his fellows and covered the entire country with a network of amateur lines. Messages were handled at the rate of several hundreds a night, and they reached into every state in the Union.

The contributions to the art made by the Radio amateurs have not been fully told without reference to their far-reaching effect in other countries. European amateurs have not enjoyed liberal laws in the past. The exhibition made by American amateurs in the war, and the achievements made since the war, have awakened other countries to the value of the Radio amateur. The result has been that the laws of Canada, England and France have been modified and regular international amateur communication is a thing of the immediate future.

## Composers Want Money

### Broadcasting Stations Face Invoices from Authors

RADIO broadcasting has been running very smoothly, with the possible exception of the general commotion resulting from the lack of proper legislation to handle the phenomenal increase in the number of stations desiring to transmit.

Out of the clear sky now comes a new obstacle to its progress. Authors of books and writers of popular songs are beginning to ask for royalties whenever their favorite successes are sung over the Radio, or passages from a literary success are read to the invisible audience.

They propose to levy a fee, through their organization, on those stations which broadcast their music, literature and songs. It should be remembered that the various broadcasting stations throughout the country, for the most part, are maintained at considerable expense. The only return for the money invested is a certain amount of advertising. This same advertising is also received by all artists who perform at these stations and to all whose material is used.

Common business sense ought to be applied to this situation. We are trying to recover from the effects of the war; business for none of us is what we would like it to be, and for one concern, set of men or association to deliberately carry out a plan that not only will wreck another industry, but at the same time seriously injure their own, is quite inconceivable.

If the law is on the side of the artist, author or song writer to give them the right and power to drive, and if they elect to drive broadcasting out of business then all that can be done is to submit, take the loss in broadcasting investment, and pass it up. It can be done quickly.

There is surely another way out of this trouble. It is suggested that broadcasting stations announce the name of the publisher, song writer or composer before and after the broadcasting of each number. While at present there is no compensation to broadcasting stations other than the advertising, every person should lend a hand and take advertising for pay in a like manner. There will be no loss from the artist, composer or song writer, for their work will become better known. There is no question of doubt but what this is good publicity for there are too many examples to prove the point. Recently a New York theatre, that had been running at a loss, broadcast a performance of their show and the next night the entire house was sold out.

## Condensed

By DIELECTRIC

The Cleveland Radio Association has urged all listeners in to report any flagrant violation of the silent hour rule which was established to enable listeners in to hear broadcasting with the minimum of interference. This idea is worthy of experiment by other communities and should be much appreciated where practiced. In speaking of silent hours maintained by broadcasters themselves, it is of course fair to remember that crystal sets are still in use and that the majority of owners are new at the game. They should not be deprived of entertainment for the sake of DX fans. Yes, but look at the records made by some of these galenas! Precisely, but do they constitute the majority? I have been hammering away for "silent periods" and shall continue to do so in the hope that we may all benefit, even the crystal owner, for he may be encouraged to get a tube set, which is the ultimate in Radio reception.

Such are some of the utilitarian possibilities of broadcasting for the farmer. But one may well doubt if the service should be placed ahead of what broadcasting can do to make the farm a happier place in which to live. The cultural and spiritual possibilities of broadcasting are a gold mine that has been scarcely touched.

None of us can expect to get away with a policy of limiting broadcasting to those features which happen to make a greater appeal than others. My favorite numbers on a program may be decidedly unattractive to the rest of you and vice versa. But for those who do not like grand opera music for instance, there are a great number who do and they are entitled to their enjoyment as well as the first group. So my reiterated plea for the spread of opera broadcasting is simply for the sake of adding something to the usual program, and not to eliminate other popular features. The number of letters received by WNAC upon transmitting the Chicago Opera performances, and at WIP in regard to the German operas, is a fair indication of the degree of interest in this particular music. Both the Boston and Philadelphia stations deserve to be commended for their recognition of Radio opera audiences.

If the White-Kellog Radio bill has to lie over for possibly another year before becoming a law of the land, it will be a very unfortunate thing, for the benefits likely to accrue from such a measure as this are very much needed right now. We surely need regulation in the matter of broadcasting in order to lessen interference between stations transmitting on the same wave length, and we certainly need the Jones amendment to safeguard ourselves (the Radio Public) from a too voracious appetite which is rapidly developing in some quarters of the industry. Thousands of sets are tuned in just waiting for the announcer to say that the White bill has become a law.

You can hear 'em all with a receiving set nowadays, from the world's most famous boy movie actor to—a United States Senator! Jackie Coogan complained of the heat in the studio of Station WOR, when he spoke there recently, though he was not addressing his Radio audience. It was an "aside" remark that the microphone picked up. Just prior to that he told a Radio joke. He said he had a Radio receiving set and upon opening the window got chilly. Now that would be some record, and I'm inclined to think it would be a rather cold day when the average bug could get Chile. This little chap is more accustomed to warm receptions than to chilly ones, so naturally such an incident as he related would be novel. I would be willing to wager that the thrilling experience of listening to Jackie's voice by boys and girls—and grownups—would outweigh in enthusiasm the reception given to some men of broadcasting fame. It is just such unique features as I have alluded to which make Radio take on fresh interest.

While the broadcasting stations in this country are being improved and more powerful ones being built, other parts of the globe are aiming to attract attention to themselves. According to latest reports South Africa is to have the largest Radio station in the world. Engineers report that the vicinity of Cape Town is ideal both for reception and transmission. When the station is completed it will add another and quite important one to the ever increasing number of Radio stations in the British Empire. The French are responsible for the plan to open the Orient to occidental influences through establishing a series of Radio stations, one of which is located at Beirut, Palestine. And so it goes; and so it will come eventually to cover the earth.

When you wish to let your family or friends back home hear your voice, and any others who may care to listen, all you need do is hire a broadcasting studio for a few minutes. If the publicity of the thing is not objectionable to you, you may unburden yourself of some choice observations which it would be unhealthy to deliver were you face to face with the head of the house at home. No such thought as this prompted Alma Gluck to speak into the microphone at WPAL, during a visit in Columbus, Ohio; nor to Harriet Williams, who was heard on the program of PWX, Havana. The one was speaking that her children in New York might hear her voice; the other selecting the numbers her mother in Toledo, Ohio, was fond of. I merely suggest the possibilities provided through the use of a transmitter.

What a difference in the manner of teaching code lessons exists among the various broadcasting stations. WGI, at Medford Hillside, Mass., seems to be going at the thing in a way to benefit the largest number of novices devoting some of their time to this interesting subject and it is a pleasure to be instructed by them.



## RADIO INDI-GEST

(This column is open to all aspiring Radioknuts who tender suitable contributions. Try to "make" the column if you can. All unsuitable manuscripts are turned over to the Office Squirrel who does not guarantee their return or anything else for that matter.—Indi.)

### Willie Wonders Will He Win?

"Willie," said Mrs. Fan, to their young offspring. "Daddy and I have arranged that he shall give you a dime every time he is caught swearing." "Gee, that's great!" cried the youngster. Then he added hopefully: "When are you going to tune the Radio set, Daddy?"

### But the Waves Are Undamped

The Director of Radio, or whatever his title may be, will have his hands full controlling the waves, it is pointed out by one fiend on history, who recalls that old King Canute got into difficulties some years ago and wet his feet terribly trying to do the same thing.

### You Can Listen in But Not Cash in

"Have they arranged to send money by Radio yet?" "Probably not. Too many people would 'pick it up.'"

### The Current Raised and the Station Called

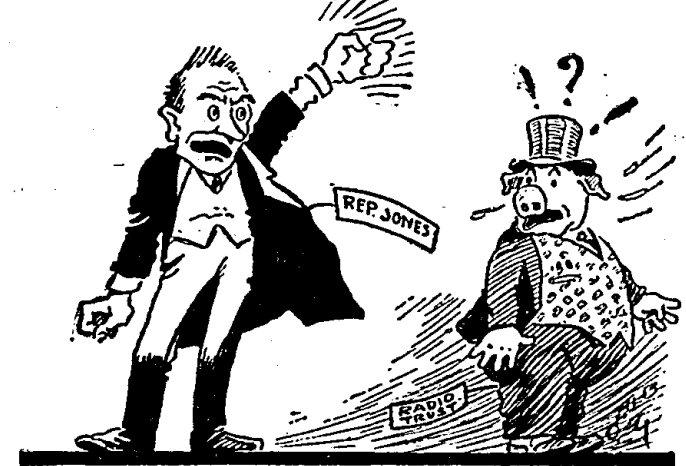
A news item announces that a quartet had the place of honor in a Radio program. We suppose some one's sense of humor selected that place for four of a kind.

### We Keep Tuned in for the Tiernans

The Radio gossip should always bear in mind that there are a million and a half receivers now in American homes, and little receivers often have big ears.

### Hey! Trust, Listen in on This

Dear Indi—  
If the Radio Trust keeps on growing at the present rate we are going to take down our KU Klux Klantenna, capture this d'hog in the manger, make a twenty-five turn honeycomb coil around his neck and string him up to the middle of a wheatstone bridge. We will then request



Mr. Hoover to install a variable grid leak across his pituitary gland (or however you spell it) to stop his growth. We will then watch him oscillate and howl at audio frequency. When all oscillations cease and we are sure his B battery is completely exhausted we will take him down and send him to the Radio museum at Arlington.—Go GETTEM.

### Right on the Dot He Dashed Off

A young woman arriving in New York from abroad received a Radio code proposal of marriage. Her answer was "Yes." We hope the sender got the code signals straight. If he pounded out on da-di-da-da dit di-di-dit and it should have been da-dit di-dit da-di-da it might have caused an embarrassing situation.

# A. B. C. Lessons for Radio Beginners

## Chapter X—The Vacuum Tube as a Detector

By Arthur G. Mohaupt

**T**HE first important function performed by the three-electrode vacuum tube is to detect Radio frequency oscillations. This action as a detector depends upon the fact that variations in the potential impressed upon the grid cause corresponding fluctuations in the current flowing in the plate circuit of the tube.

Furthermore, there is a certain filament temperature and plate pressure at which the detector action of the tube is most pronounced. At this "critical point" the variations in grid potential will cause maximum changes in plate current. A slight increase in the change on the grid may mean an increase of from five to ten-times in the strength of the direct current flowing "via the electrons" from the plate to the grid. Thus the vacuum tube acts not only as a detector or rectifier of alternating current oscillations, but also as an amplifier or relay. It is for this reason that the tube is often termed an "electron relay" for the electrons emitted from the filament cause the electrical oscillations to be "re-layed" from the grid to the plate circuit. And during this relay process the oscillations are both rectified and amplified.

### Fundamental Detector Circuit

Although numerous vacuum tube detector circuits have been devised and are now in use, they are really all only modifications of the fundamental detector circuit as is illustrated in Figure 39. The operation of this circuit is briefly as follows:

The Radio ether waves in moving through space are intercepted by the antenna and induce in it electrical oscillations of the same nature and frequency as were originally set up in the transmitting antenna from which the waves were sent out broadcast. In order that these induced oscillations may be of maximum intensity, the receiving antenna circuit must be adjusted or tuned so that its natural wave length will be the same, or nearly the same, as that of the impinging ether waves. This tuning is accomplished by adjusting the switch lever S until the correct number of turns are cut in of the primary L-1 of either a loose or variocoupler.

By electromagnetic induction similar oscillations are then set up in the secondary L-2. In order that maximum results will again be obtained from these oscillations, a variable condenser C-1 is shunted across L-2; and by varying the capacity of this condenser, resonance is established in the closed circuit L-2C-1. This causes maximum voltage variations to be set up across the condenser terminals, and these pulsations are then impressed upon the grid and filament of the detector tube.

The circuit between the grid and filament is called the input circuit, or better, the control circuit of the tube, for it is the actions going on within this circuit that control the entire operation of the tube. It corresponds to the valve on a steam engine—the distance the valve moves determines the amount of steam that is let into the cylinder and hence controls the functioning of the entire engine.

### Action Within the Tube

The filament of the tube is supplied with electric current from the A battery. As long as the rheostat R is in the off position, the filament is cold and no electrons are being emitted. The space between the plate and filament is thus an insulator, and no current can flow in the plate or output circuit of the tube.

As soon as current is sent through the filament, it becomes heated and negative electrons are emitted. Due to the presence of the B battery connected as is shown in the figure, the plate is charged positively; and as a result the electrons are immediately attracted to it. This closes the plate circuit and allows the B battery to send a current through the telephone receivers PH. However, as long as this current is steady in value, no sounds are produced in the phone. A variable or pulsating current only, can produce sound in the telephone receivers.

At this point the control action of the grid becomes effective. The electrons in passing from the filament to the plate must first pass through or encounter the grid, and their action can be retarded or accelerated according to the electrical condition of the grid. The electrical condition of the grid, in turn, is influenced by the presence of the small condenser C-2 connected in series with the grid circuit, and by the high resistance grid leak GR shunted across the grid condenser.

The high frequency potential oscillations set up across the condenser C-1 and impressed across the filament and grid, occur or come in groups, the groups themselves, however, occurring at an audio frequency. As one of these groups or trains of waves moves toward the grid, it encounters the small grid condenser C-2. Through the action of this condenser, each individual wave of the group causes a negative charge to form on the grid. This charge accumulates during the occurrence of one wave train; but as soon as the wave train

ceases, there is nothing to hold this negative charge, and hence it leaks off again through the high-resistance grid leak. The action of the grid condenser is thus to allow a negative charge to accumulate on the grid, while the grid leak allows the charges to escape between the successive

ohms and a current carrying capacity of one and one-half amperes. The telephone condenser is similar to the grid condenser, and should have a capacity of about .000025 mfd.

The quality and loudness of the signals received will depend to a great extent upon

wire, or that it may have a serious ground leak at some point. The lead-in wire should be securely soldered to the antenna, and both should be well insulated from the ground. Good electrical contact should also be made to the lightning switch, both from the lead-in wire and to the wire leading to the set within the room. Only after examining all these and making sure that they are in good condition should investigation be begun on the receiving set itself.

The first step in setting a vacuum tube detector into operation is to throw the lightning switch into the upper position, and then connect the lead-in wire and ground wire to the receiving set. Be sure that the ground connection makes good contact, for this is very essential to the proper working of the apparatus.

After the rheostat has been turned completely to the left so that all resistance is cut in, the A battery and B battery are connected to their respective terminals. The apparatus is now ready for tuning.

Place the telephone receivers to the ears and turn the rheostat to the right until the tube burns nearly but not quite at

(Continued on page 12)

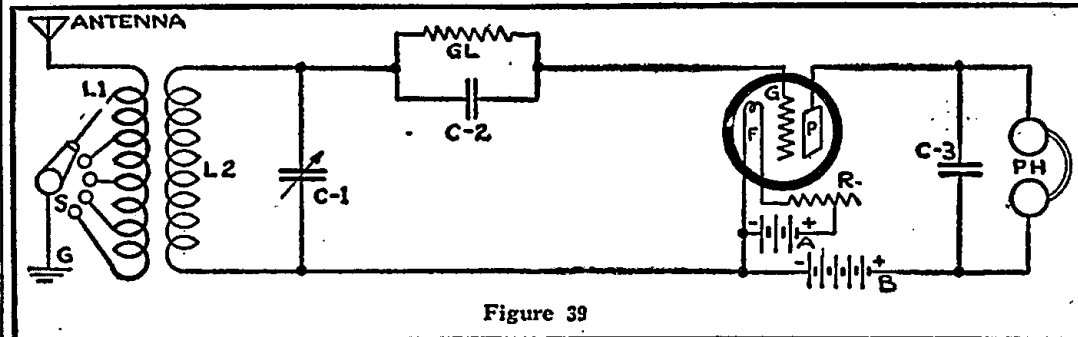


Figure 39

wave trains. The leak thus always maintains the grid at zero potential as long as new wave trains are being received.

### Rectifying Action of the Tube

As long as the negative charge exists on the grid, the electron movement is hindered and reduced, and consequently the flow of current in the plate circuit is also decreased. Between wave trains, this retarding action of the negatively charged grid disappears, and the plate circuit current increases to its normal value.

Now when the filament temperature and plate pressure are of just the right value, that is, are at the critical point, a given negative charge on the grid will cause a greater decrease in plate current than an equally intense positive charge will cause an increase in plate current. Consequently, the current in the plate circuit becomes a pulsating direct current with the decreases or hollows greater than the increases. Also, the "envelope" of the hollow in the plate current corresponds in every respect to the envelope of the trains of waves that originally existed in the grid circuit.

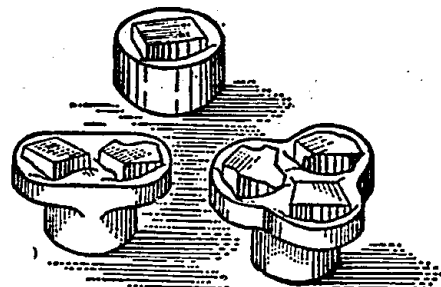
Since audio frequency pulsations are thus created in the plate circuit of the tube, the telephone receivers will be duly affected and produce sounds corresponding to the nature of the electrical pulsations supplied to it. Since these electrical oscillations are identical with those sent out from the transmitting station initially, the sounds heard in the telephone receivers will also be identical with those that entered the microphone of the transmitting circuit.

The detector action of the vacuum tube is thus in many respects similar to the action of a crystal detector. The advantage of the tube, however, is that it is more sensitive, and that it not only detects the weak signals but also amplifies or strengthens them to a very great extent. Another desirable feature of the tube, is that if it is at the proper filament temperature and plate pressure, it does not require the location of a sensitive spot before the detector action can take place.

### Constructing a Vacuum Detector

The circuit illustrated is a very satisfactory and efficient one for using a vacuum tube as a detector. L-1 and L-2 are the primary and secondary of a standard variocoupler, while C-1 is a 23-plate variable condenser. The grid condenser C-2 is a smaller condenser having a capacity of .000025 mfd. The grid leak is a very high resistance, from one-half to two megohms. A megohm is equal to one million ohms.

The battery for supplying current to the filament of the tube is a 6-volt storage battery, preferably of the lead-acid type, while the B battery is a 22½-volt standard battery used for supplying the positive potential to the plate of the tube. The rheostat for controlling the filament current should have a resistance of about 6



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the sensitiveness of the telephone receivers. Therefore, it is not advisable to economize by purchasing a cheap set. Money spent for a good head set is a safe investment, for they do not deteriorate and will give a much cleaner and purer tone.

### Operating a Vacuum Tube Detector

The successful operation of a vacuum tube detector depends to a great extent upon the patience and skill of the person in charge. Skillful and rapid tuning can be acquired only with practice and experience. Every receiving set has its own individual characteristics, and it is up to the operator to become acquainted with these peculiarities before he can rapidly and successfully operate his set and obtain best results.

However, if at first no results can be obtained, do not immediately condemn the set as being no good or defective, for the fault may not lie in the receiving apparatus at all. It may be that the antenna has a serious ground contact at some point through which the electrical energy leaks away. It may also be that the lead-in wire makes poor contact with the antenna.

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23 Plate Variable; value, \$3.50....	1.35
43 Plate Variable; value, \$4.50....	1.65
13 Plate VERNIER; value, \$5.50....	3.75
23 Plate VERNIER; value, \$6.00....	4.00
43 Plate VERNIER; value, \$6.50....	4.25

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# How to Prevent Howling in a Set

## Condenser in the Grid and Filament Circuit

All that is needed to make the tryout is a .001 fixed condenser—a phone condenser of the right size will do. Attach leads to each end of the condenser and

### WORKSHOP KINKS? EARN A DOLLAR—

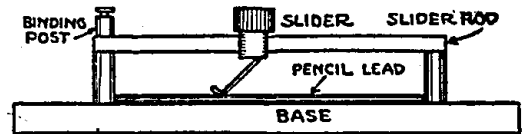
THERE are many little kinks worked out at home that would aid your fellow Radio worker if he only knew about them. There are new hook-ups, new ways of making parts and various unique ways of operating sets that are discovered every day. Radio Digest is very much interested in securing such material.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

connect one wire to the post marked "grid" on the amplifying transformer of the second step, the other to the negative of the tube socket of the first tube. A mica condenser is best for this purpose. Make sure the condenser has been tested and is not shorted. If more than two tubes are used, follow the same method. The diagram shows the connections.—Joe McCormack, Godsden, Alabama.

### Non-Inductive Potentiometer

The illustration shows a non-inductive potentiometer or rheostat which can be made cheaply. The materials needed are



one slider, one rod, four Fahnestock clips and the lead out of an ordinary lead pencil. The Fahnestock clips serve as binding

## A. B. C. LESSONS

(Continued from page 11)

maximum brilliancy. First adjust the switch S until the antenna circuit is tuned to the desired wave length. Next turn the rotor of the coupler until the desired degree of coupling is obtained between the antenna circuit and the closed oscillation circuit. Finally the set is thrown into resonance by adjusting the variable condenser C-1.

The filament rheostat is another important factor to consider in tuning the set, for as stated before, the filament temperature as well as the plate potential must be of the correct value to secure most effective operation of the tube. Consequently, if the signals cannot be brought in very clear or loud by manipulation of the coupler and condenser, try adjusting the filament rheostat, and generally this will be found to do the trick. In fact, at times the rheostat adjustment is so critical that a vernier attachment is necessary in order to bring the tube into the proper operating condition. By a vernier attachment is meant merely an auxiliary resistance adjustment capable of making very fine changes in the current flow or filament temperature.

Sometimes improved results can also be obtained by altering the plate potential a few volts. If it seems as though the tube were not functioning at its best, change the B battery contact from the 22½-volt tap to the 21 or 19½-volt tap, or even as low as the 18-volt tap. This will often bring about surprising results.

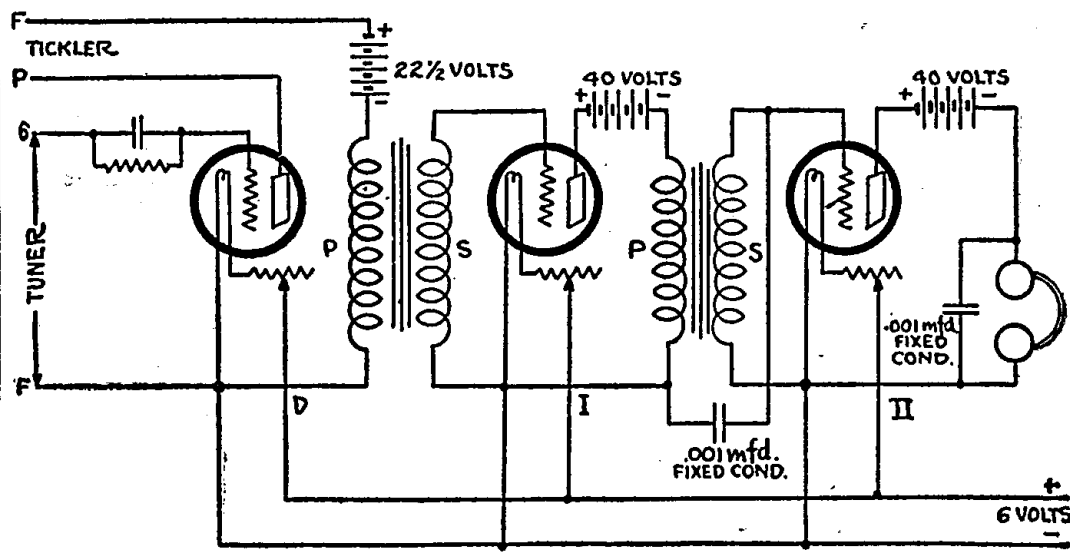
### Important Points to Remember

In order that a receiving set can operate at maximum efficiency, the resistance of the interior circuits should be as low as possible. Therefore all interior wiring should be done with copper wire at least No. 18 in size, although No. 14 or 16 is better. All contacts should be well soldered so as to insure perfect electrical contact. It is a good idea to cover all wire with insulation tubing so as to prevent any possibility of a crossed or short circuit occurring.

The various pieces of apparatus should be arranged so that all the necessary connecting wires will be as short as possible. Furthermore, to present a neat appearance, all wires should be run in straight lines and turn at right angles. Try to avoid running two or more wires parallel to each other for otherwise inductive interference between the several wires is likely to cause serious trouble. For the same reason all wires should be arranged to cross each other at right angles.

Often a change in the value of the grid

## HOOK-UP THAT REDUCES NOISE



posts and holders for the lead by fastening two of them at each end of the lead and passing a wood screw through the holes in their ends and into the base. When both pairs are fastened on in this manner the lead is passed through the two under the rod and connections are made to the other two. When used as a potentiometer leads are taken off at both ends of the lead and at the slider rod. Connections are made at the slider rod and at one end of the lead when used as a rheostat.—Earl Litt, Cherryvale, Kansas.

### Aerial Construction

One pound of No. 14 copper wire generally provides the correct span for the receiving antenna which picks up the broadcasting stations operating on 360 and 400 meter wave lengths. In comparison with this the aerial of the powerful navy Radio station at Annapolis, Md., consists of 10 miles of wire, weighing approximately seven tons. The great mass of wire is held aloft by six 600-foot steel towers. The natural period—that is the wave length of the aerial alone—is 4700 meters. The station operates on a wave length of 17,145 meters. Heavy accumulations of ice on the wires would cause great strain and break many

leak resistance will add greatly to the better operation of the set, for if the resistance of the leak is too low the negative charges will not accumulate sufficiently on the grid but leak off too quickly. This, of course, will not allow the plate circuit current to be affected with maximum intensity. On the other hand, if the grid resistance is too high, the negative charges will experience too great difficulty in escaping between wave trains. The result is that an excess negative charge will accumulate on the grid and choke the tube, thereby greatly interfering with the best functioning of the tube.

Hence, since each tube has its own individual peculiarities as to the best filament temperature, plate potential and grid leak resistance, the operator will get best results by experimenting with these various factors until maximum intensity of signals will be received. After he has once determined these values, he can quickly set the adjustments to these values each time the set is set into operation.

The essence of a vacuum tube is the filament, and the life of the filament depends upon the temperature at which it is operated. Consequently an important rule to observe in operating a set is never to burn the filament at a greater brilliancy than is necessary to secure best results. If the filament can be burnt at a lower temperature, the life of the tube will be greatly prolonged; but if the filament is burnt at too high a temperature, the tube life will be greatly decreased.

Another important point to observe is never to connect the B battery across the tube filament or A battery terminals, for the high pressure of the B battery will cause such an excess current to flow that the filament will be burned out immediately. The same may happen if the interior wires are not insulated and should accidentally come in contact.

If all the above suggestions and warnings are carefully observed and followed, successful operation of the outfit is bound to be secured. However, a little slip here or there may so seriously interfere with the functioning of the various parts, that many an evening's pleasure can quickly be spoiled.

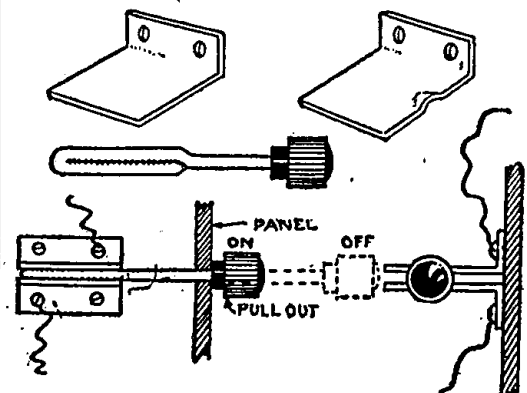
### Chapter Eleven

In the next chapter we will consider the second important function of the vacuum tube, namely its action as an amplifier. We will discuss the general subject of amplification, and show how additional vacuum tubes can be used to intensify the signals detected by the detector tube. It will be a most interesting and important article.

of the wires, but this is guarded against by an electric heating circuit which melts the ice as fast as it collects. Signals from Annapolis have been heard in Australia.

### Homemade Battery Switch

Procure two small strips of light copper sheeting and bend the ends of each as shown and drill the holes marked. Bend the edges of both pieces so that there



will be a pocket for the plunger end. Procure a piece of copper wire, number 6 or 7, and thread one end to fit the nut or knob of a binding post. Bend the opposite end over to make it double and round off the end. This makes the plunger. When the plunger is pushed in the connection is made.—Daniel H. Mowat, Joliet, Ill.

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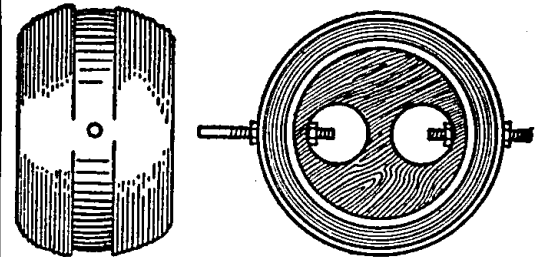
**QUALITY RADIO SHOP, RICHMOND, IND.**

## Simple Construction of Variocouplers Rotors

One of the simplest and easiest ways to make a variocoupler or variometer rotor is to use an old croquet ball as a base. Place the ball in the top of a standard Mason fruit jar and mark a ring on the ball. Saw it off, and then mark another ring on the opposite side of the ball, parallel with the first ring. Cut this portion off also and the rotor section will be the right size.

In boring the shaft hole, wrap a slip of paper around the circumference of the rotor and mark the length on the paper. Divide the paper in half up to the mark and place the half on the ball. Make a mark at the ends and these will be the through the bearings, or a hollow shaft Bore two holes, ¼ or 1 inch through the parallel faces to intersect the shaft hole. These are used for leading out the connections. The ends of the winding can be soldered to the shafts and so taken out through the bearings, or a hollow shaft can be used, and the wires run through it.

When starting the winding either tack



a circular piece of cardboard on each parallel face so as to project about ¼ inch all around, or put small brads around the edges of the rotor. These will hold the windings in place temporarily. When the winding is finished, paint it with water glass—sodium silicate. The water glass dries with a hard, glassy surface, which will hold the windings in place permanently. The brads or cardboard can then be removed. An oatmeal box or a salt box can be shellacked and used as the tube with this rotor.—G. F. Lamkin, Cincinnati, Ohio.

A bulb that gives a weird, blue glow when in use indicates that an over-supply of current is coming from the B battery.

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# Reinartz Panel Set Designed for Compactness

## Part V—Two Step Amplifier Construction

By H. J. Marx

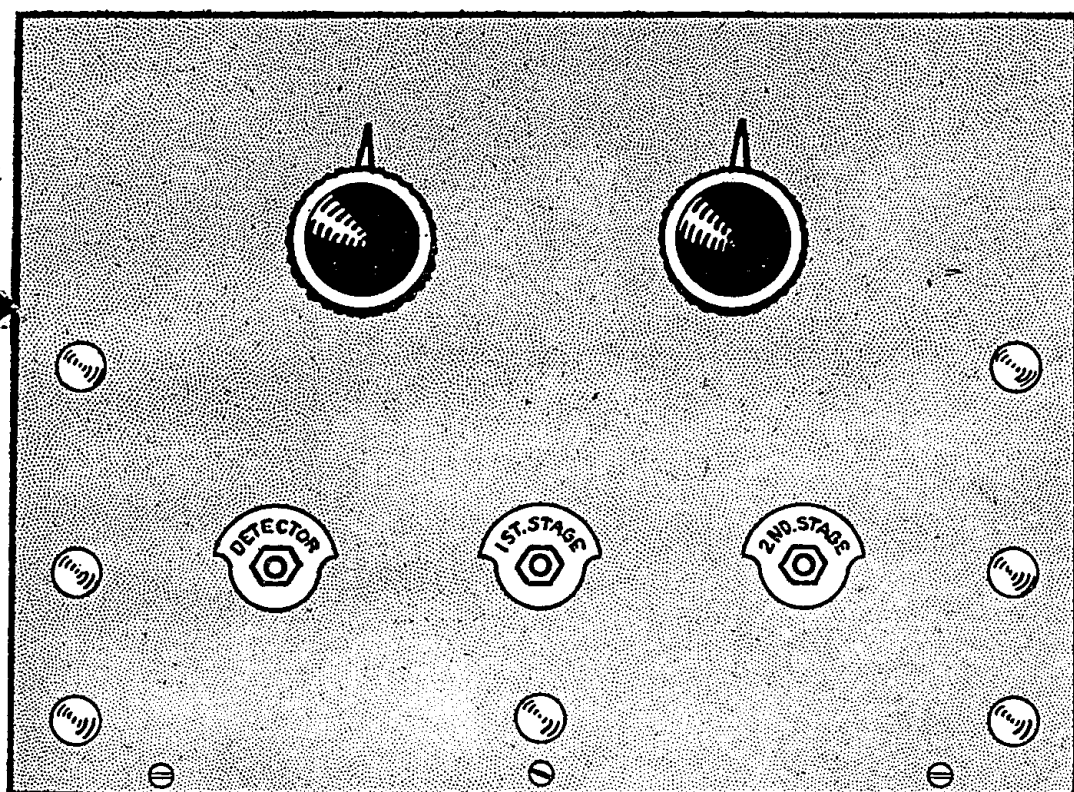


Figure 1

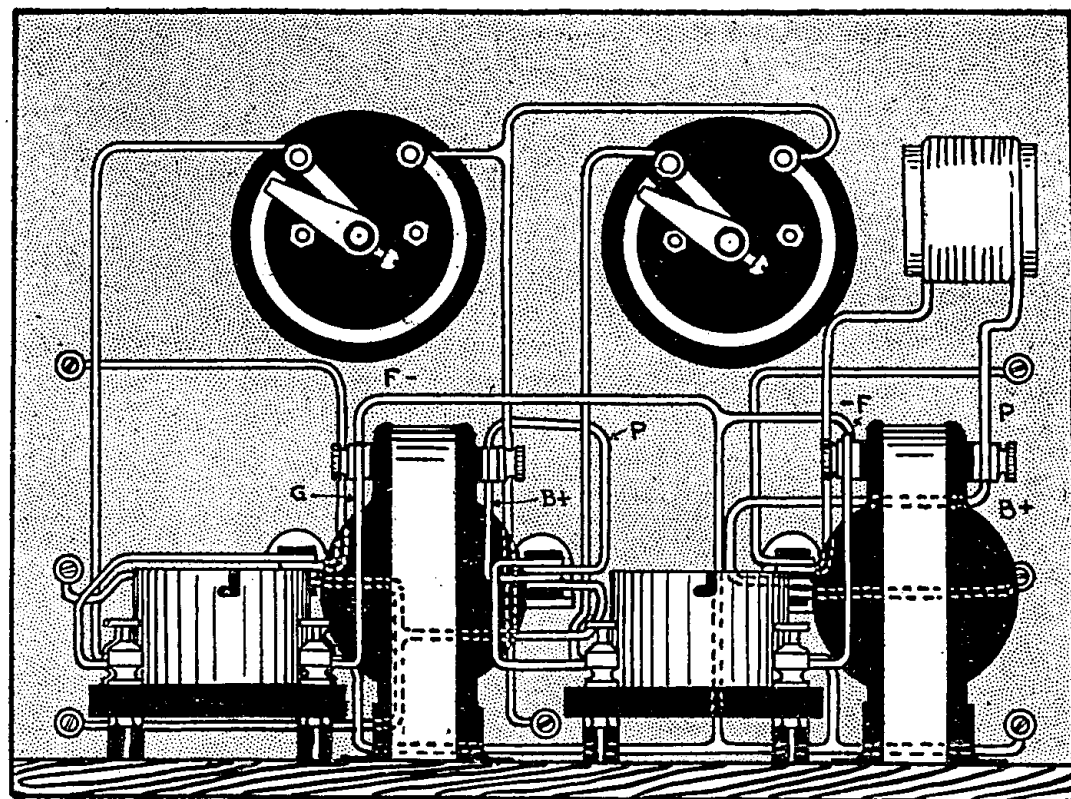


Figure 2

**A**FTER the panel has been drilled and the parts are all on hand, it is a simple matter to assemble them on the panel. The two tube sockets and the two frequency transformers are fastened to the baseboard.

In determining where to set them on the board, the constructor should bear in mind that it is advisable to keep both the grid and the plate leads as short as possible. In figure 2 the tube sockets and transformers are shown. It will be noticed that the grid and plate leads are kept to very short lengths. In addition care should be taken to avoid running any other leads very close and parallel to these. Outside of this last point, it is not of very great importance to try to limit the lengths of the A and B battery circuit leads.

**Keep Leads Away from Panel**

Another feature that the writer found of considerable importance was not to have any leads flat against the panel. They should be kept at least 1/8 to 1/4 inch clear of the panel. After the set accumulates a certain amount of dust and dirt it provides a series of leaks between any wires that are flat against the panel and in this way gradually decreases the efficiency of the set. Letters are often received, stating that some set used to work wonderfully well but of late it has not been giving satisfactory service. It is usually very puzzling to analyze difficulties of this nature but they can always be traced back to some seemingly little point of construction item as just mentioned.

It might be mentioned here that it is not advisable to lay out the panel with a pencil as this will also provide leaks between terminals.

**Jack Mounting and Soldering**

Before mounting the jacks, test them to make sure that the springs are making good contact and the separate circuits are

insulated from one another. Then insert the plug and examine to see whether the outside springs are making proper contact with the tip and sleeve of the plug.

In mounting the jacks on the panel make sure that they are fastened rigidly and securely. A loose jack will mean weak electrical connections and ultimate short circuits.

Soldering leads to jack terminals is a delicate operation and has been the cause of many vitriolic exclamations. Unless tinned wire is used, it will be found best to tin the lead wire before fastening it to the jack terminals.

For soldering jack leads a light soldering iron, preferably electric, with a long tapered, 1/4-inch wide chisel edge tip, should be used. A tip of this type allows insertion between the various jack leaves, without touching the adjacent ones and thus reheating a completed connection. If the leads come very close together at the jack terminals, it is best to cover them with spaghetti to safeguard against short circuits. Don't get the impression, however, that spaghetti is an insulator against induction from one lead to another. It is used merely to prevent actual short circuits between the leads.

**Details of Wiring and Assembly**

The choke coil can be supported by the two leads that run to it, or if preferred, it can be fastened to the panel by means of a fiber strip through the core, with machine screw holes at each end.

**Carter "TU-WAY" Radio Plug**  
take two head sets and all types cord tip terminals. Price \$1.50. Write for Bulletin on Carter "HOLD-TITE" Jacks and other products. CARTER RADIO COMPANY, 209 South State Street, CHICAGO

Except at the terminals where the connections are made, care should be taken so wire leads don't come in contact with metallic parts of the framework of the various pieces of apparatus, such as tube sockets, transformers, jacks or rheostats. Where two wires cross each other very close, it is advisable to put a semi-circular loop or "jump over" in one so that there is at least a 1/4-inch clearance.

It will be noticed that although both transformers are facing the same way, the cores are parallel but not in line. No detrimental effects were noticed in the compactness of this assembly, and shielding was never taken into consideration.

**The Cabinet**

The cabinet used for these amplifying stages is exactly the same as that described for the detector stage in Part III

of this series. When the two are used together the two binding posts on the upper right side of the detector panel (phones or output) and the two on the upper left side of the amplifier (input) are connected together. Separate batteries are not required for the amplifier.

**The Idle Battery**

Storage batteries which are to stand idle for a month or two should be fully charged before being put away. If the battery is permitted to stand for any length of time in a discharged condition, the plates will become white, an indication that sulphate is forming, which is very harmful to the cells.

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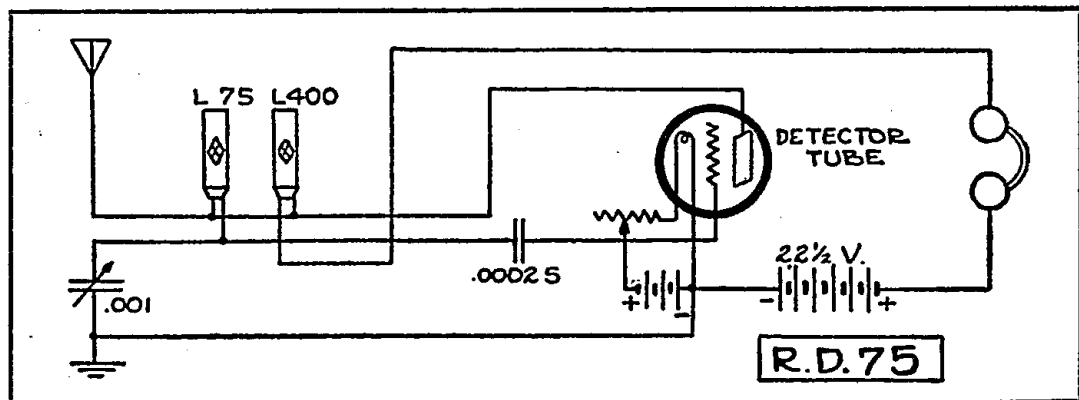
A combination of Practical Radio Equipment and a piece of attractive furniture for the home.  
The top is 31 1/2 by 19 1/2. A large receiving set can be placed upon it with space left for other purposes. The height, 31 inches, allows the operator ample knee room and comfort.  
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**R.D. 75 SHOWS SINGLE TUBE SET**



THE demand for simple forms of hook-ups has brought to light many unusual circuits. These simple diagrams are very often found to possess unusually good reception qualities, although difficulty is occasionally experienced in selectivity because of the set's simplicity. This circuit is very similar to the R.D. 74 of last week, with the exception that two honeycomb coils are used instead of one. An unusual feature, however, is the fact that the plate coil has 400 turns. For this reason, a rather loose coupling

is required. A WD-11 tube will operate successfully in this circuit, by merely substituting a dry cell instead of the 6-volt storage battery. A .001 mfd. variable condenser is indicated in the ground circuit. This can be reduced to .0005 mfd. if a long aerial is used, but vernier control is suggested for either condenser. A grid of .00025 mfd. is used with or without a grid leak. The vacuum tube is a soft or detector tube and only 22½ volts are required in the plate circuit.

**The Reader's View**

**Regarding the WHAM Situation**

The Times-Union and The Democrat & Chronicle bought the best broadcasting set obtainable and gave it to the Eastman School of Music. We are paying for the operation of this station. Erecting the station at the Eastman School makes it possible to broadcast the wonderful concerts that are given in the School of Music and the music of the orchestra which is rapidly developing into one of the best orchestras in the country.

After we have spent thousands of dollars and, thus, given Radiophans of this vicinity the best that can be obtained, it is rather irritating, to say the least, to get such a letter in regard to this station. Not until we attempted to do something in Radio has it been my experience to receive criticism for public benefaction. I can't understand the attitude of the owner of a Radio receiving set when he thinks he is privileged to condemn and criticize those who are giving him something for nothing. And yet, that is the spirit of the letter which you are publishing in the Radio Digest and also the spirit of your own letter to Mr. Eastman.

There is no reason in the world why we should be expected to go out and employ artists or an orchestra at the expense of thousands of dollars a year and give it to Radiophans. And, I feel that you are not justified in expecting us to do so. As a matter of fact it costs about a quarter of a million a year to maintain the orchestra at the Eastman School and as a result of our expense in operating the station, music of this orchestra is broadcast every night. We are sorry that we haven't a different program every night, but it isn't necessary for a person to listen to this program unless he wants to. We have received thousands of letters thanking us for this service. Evidently it is not possible to please everyone.

Some of the greatest artists in the world give concerts at the Eastman Theater. In every case Mr. Eastman has personally insisted that they permit the broadcasting of at least a part of their concerts. As a result of his personal interest and influence it has been possible for Radiophans to hear from Station WHAM artists whose work is not broadcast from any other station. Among these artists are the following: Mrs. Louise Stires, John Charles Thomas, Percy Hamus, Paderewski, etc. In the meantime dealers of this city who benefit most from the development of

Radio have raised a fund of several thousand dollars with which they intend to provide a program five nights in the week to supplement the music from the Eastman Theater. We have offered to broadcast their programs for them without any charge what-so-ever and in the very near future this additional service will be established. This will meet the unjust criticism which you raised and give the Radiophans in reach of Station WHAM a program that will not be surpassed anywhere.

Inasmuch as publicity was given to the letter criticizing the management of Station WHAM I think in all fairness this reply should be published.—Frank E. Gannett, Editor of Rochester Times-Union, Rochester, N. Y.

The time is approaching when every aircraft will be required by law to carry Radio equipment. At the first public session of the International Commission for Aerial Navigation it was agreed that all aircraft engaged in public transportation (carrying 10 or more persons) must carry a set.

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Consisting of 6x14 panel, one 23 plate condenser, one composition dial, three .006 Micon condensers, 2 honeycomb coils, one double adjustable coil mount, one Freshman variable grid leak, one condenser, one vernier rheostat, one bakelite socket, 8 binding posts, 25 feet wire and construction diagram, for only **\$11.95**

**Moco Wonder Circuit Complete Parts**

(Something new, wonderful and efficient.) 1,000 mile range and over. Consisting of 6x10 panel, 23 plate condenser, W.D.-11 socket, one honeycomb inductance coil, panel and coil mountings, one rheostat, .00025 fixed condenser with panel grid leak, 8 binding posts, 25 feet wire, and complete construction working diagram, for only **\$7.95**

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- 50 Turn coils.....34c
- Inductance switches.....\$1.20

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Basket wound VARIOMETERS (no dielectric interference).....\$2.90  
Two coil mountings, bakelite, knob control, \$3.50 value.....\$2.60  
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# Questions and Answers

### Set Advice

(1905) WFB, Dickinson, N. D.

Can you advise me regarding a receiving set? I desire to get a good receiving set capable of receiving over as long a distance as possible. I read in your publication of amateurs picking up foreign stations. I want to procure a set for use with a loud speaker for home use that is not too difficult to operate. What set or sets would you recommend? I am not trying to commit you to any one manufacturer's product. But it has occurred to me that there is probably some receiving set or sets that occupy the same relative position in the Radio field as do the Packard and Pierce Arrow cars in the automobile field; that you would know and perhaps you would advise me.

I have a friend who has a RC Westinghouse receiver and another has a "Zenith" made by Chicago Radio Laboratory from which they get fair results. The Radio Craft D-6, put out by a branch company of the De Forest Radio Tel. Co., has been recommended to me for long distance work; also the Mu-Rad MA-13, and the Kennedy sets have been recommended to me as the best. I will appreciate any advice you may give me. Are there new changes so likely as to make advisable now the purchase of only a small, inexpensive set?

A. Any one of the sets you have enumerated stand pre-eminently among the best. Personally the writer favors a circuit having the regenerative principle and employment of two or three stages of audio frequency amplification as given the best results without a high degree of knowledge and skill in operation.

While the claim is made that Radio outfits are well standardized, the fact of the matter is that it can never become standardized in any way whatsoever and the more we know about it the less apt shall we be to standardize it. What is new tomorrow will be scrapped two years hence. This is not said with any view to discouragement of buying complete outfits, nothing is further from our mind. The novice should, by all means, buy a simple outfit, which is the best possible thing he can do to familiarize himself with the art. Once the outfit has fulfilled its mission he can go in for parts to his heart's content, but to the man not elec-

trically and mechanically inclined, we would say buy the outfit by all means, because he would probably make a mess of it and become discouraged.

There are many things to be learned by experimenting with Radio and too much of it cannot be done. The more who do experiment, the better for all concerned. It is like no other thing of which we can speak. It has no precedents. So in this light we are loath to advise specifically any method of procedure. It is the rapid developments of the art that makes it so fascinating.

### Reinartz Circuit

(2027) EHR, Chicago, Ill.

Please state in order of value to the average "fan," Reinartz, Flewelling or hook-up employing variocoupler and two variometers. Which is best and why?

Is the WD-11 tube satisfactory? Does it give as great range as large tubes?

May it be used successfully for amplification?

How many would be required for a large horn?

What changes are necessary in R. D. 70 Circuit to get two stages of amplification?

Are honeycomb coils interchangeable? Is it necessary to keep on hand a number of variously turned coils for use in reception of different wave lengths?

What is the range of Circuit R. D. 70, Meters?

A.—It is best for a novice to begin with a simple tube set employing the regenerative principle until he has familiarized himself with the action. For selectivity, simplicity of tuning and operation generally it is best to use a variocoupler, and a two variometer circuit for a starter. The Flewelling and Reinartz are both good circuits of the regenerative type and either is simple of construction and operation.

The WD-11 tube are proving very satisfactory as detector tubes and afford a range equal to the ordinary six volt tube. However, it does not afford the volume of an ordinary tube when used as an amplifier.

Two or three stages of amplification are required for satisfactory employment of a horn.

No changes are necessary in Diagram R. D. 70 for use of amplification.

Honeycomb coils are not interchangeable nor is it necessary to keep on hand variously turned coil for different wave lengths. This is accomplished by tuning.

The range of circuit R. D. 70 should be one thousand miles or over.

### RD-66

(2051) IWH, Toledo, Ohio.

Will you please inform me as to the range and distance of your hook-up, No. R.D. 66, page 14, of the December 23, 1922, issue, also, is it capable of cutting out stations and receiving another with a minimum of interference?

A.—Answering your inquiry with reference to R. D. diagram No. 66, appearing in December 23rd issue, would advise that properly executed this is an effective and selective circuit and with proper tuning should afford a minimum of interference. It is difficult of course to tune out signals of mutual wave lengths on simultaneous broadcasting. The range of circuit above mentioned should be about one thousand miles.

### Five Tube Set

(2081) P. N., Gary, Ind.

Will you kindly answer a few brief questions in regard to Mr. Marx's tube set as described in Nov. 18th issue?

Could I use Dayton Fan link wound to 2,600 meters as a vario coupler and R. C. Radio frequency transformers which work to 5,000 meters?

Will this change the capacity of the condenser across the secondary of coupler?

Is this set regenerative?

Will the detector and 2-step audio without R. F. work the loud talker?

A.—Referring to the set described in November 18th issue will state that the inductance cited will serve effectively as suggested. No change in condenser necessary. The circuit in question is non-regenerative. Two stages of amplification are usually adequate for employment of a loud speaker.

### Ford Spark Coil Condenser

(2113) JRDP, Leominster, Mass.

I desire to ask you a question about the construction of the condenser bank used in the Flewelling Super. I am using a piece of tinfoil and paraffined paper taken from a Ford spark Coil and would like to

know what the surface of each would be required to build a condenser of .006 capacity. Everybody is trying the Super but if you can make the condensers there will be about \$3.00 saved which is enough to buy the coil mounting.

A.—Answering your inquiry relating to construction of condenser of .006 mfd. capacity would advise that about twenty-four square inches would approximate it nearly enough. This, of course, means twelve square inches on each side.

### "HOW" OF SUPER CIRCUIT

(Continued from page 7)

The difference may be exceedingly small but it will always be there because no two things can be made identically alike in every respect. On the other hand this difference usually is quite large, and when a particular plate voltage is specified, that voltage should be taken only as a fair average. Then try out different voltages to procure final results. Remember that it is not the correct setting of the plate voltage or the filament or grid that gives the best results, but that they are only secured when these three factors are all working with each other. This point, of course, applies to any and all Radio tubes.

### Likes Power Tube

The writer is rather partial to the UV-202 tube, which although an expensive tube comparatively, is one of the best tubes for receiving that we have, volume and other factors considered.

The greater the plate voltage that we can control with our tube, the greater will be the volume and amplification secured. A hard tube will generally handle greater voltages on the plate than a soft tube. This is another argument for the use of hard tubes in the Flivver circuit.

If a soft tube is used in the Flivver circuit, and the grid leak is omitted, it will be seen that the blocking action can still be present because the charged grid will still be able to free itself through the gas molecules present in the tube. This means that we cannot control the timing. However, if the characteristics of the tube happen to be right, very good results may be obtained, although they are not comparable with a set in which the timing is under exact control.

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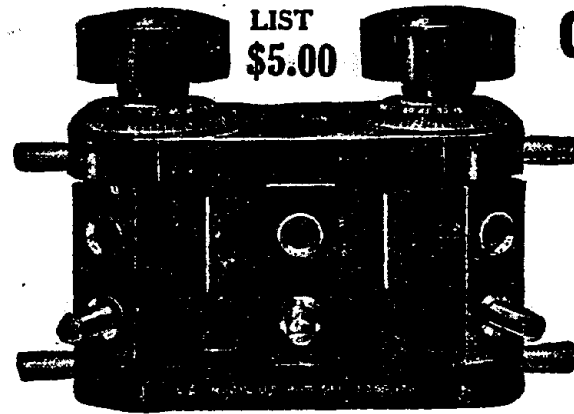
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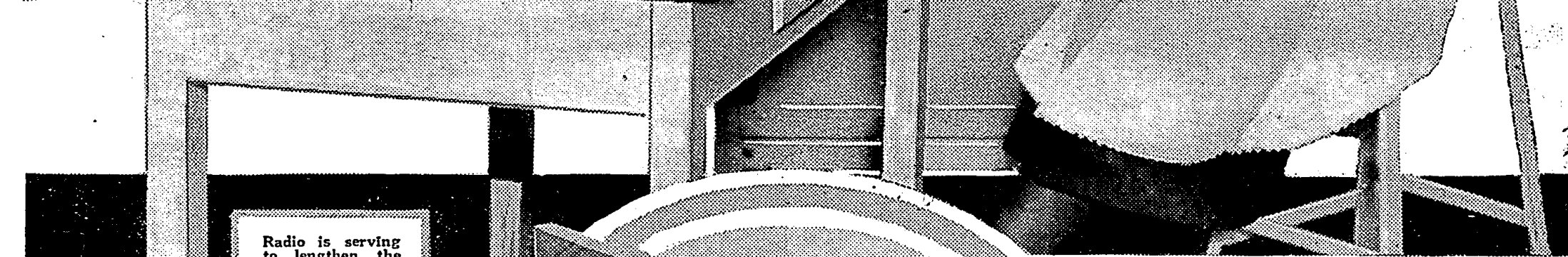
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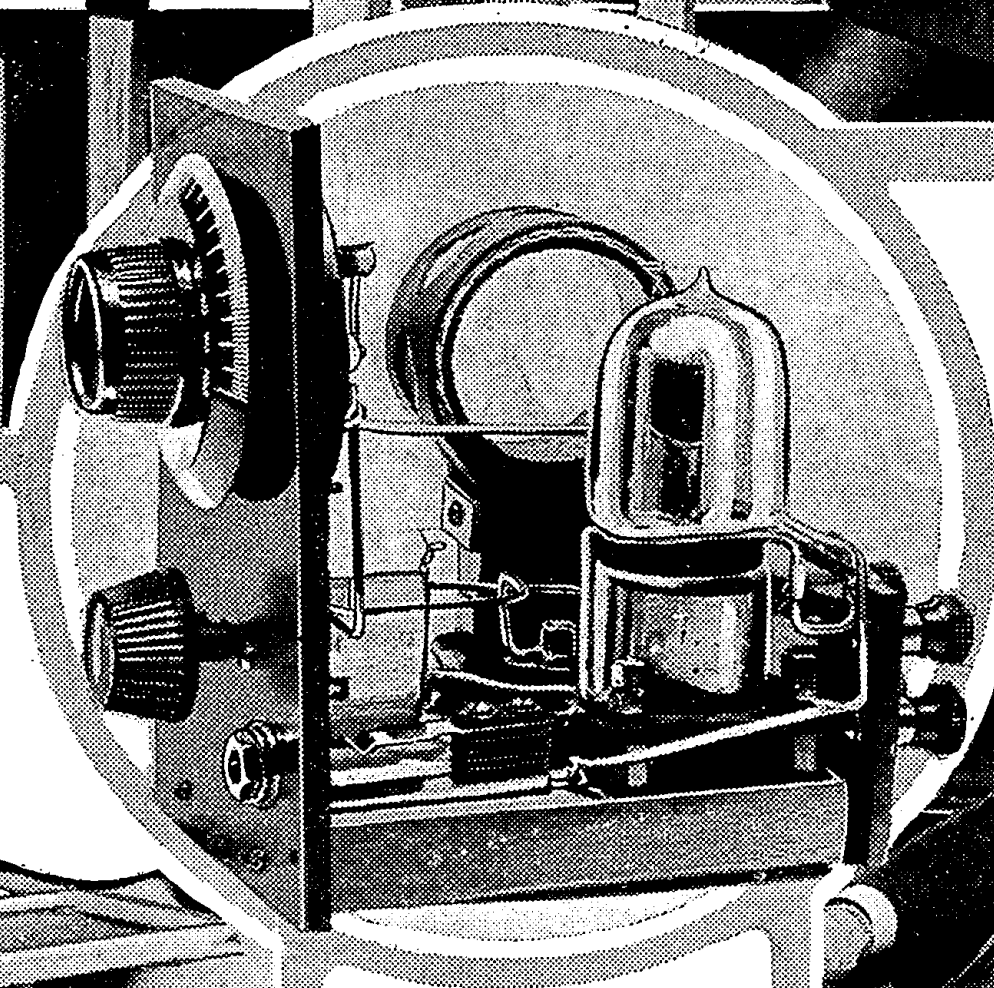
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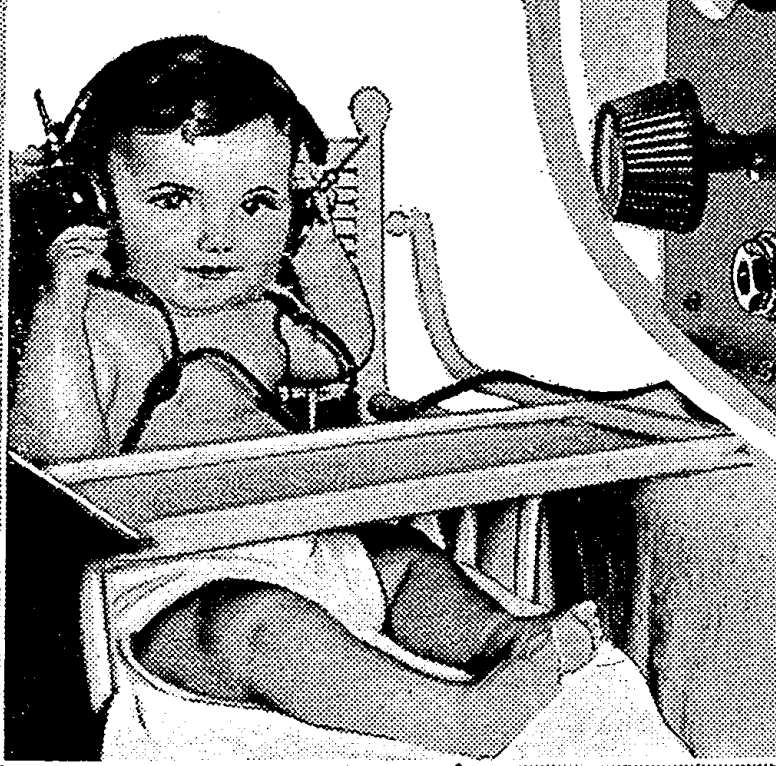
# Radio Illustrated



Radio is serving to lengthen the lives of many youthful bridegrooms. This picture shows a bride copying a recipe being given by Mrs. Anna J. Peterson of the Peoples' Gas Company, Chicago, from the Westinghouse station, KYW



This photo shows an exceedingly simple Radio receiving set perfected by W. E. Foster, of 2308 Bryant avenue, Minneapolis, at a cost of about \$8. With this little instrument programs have been heard from Louisville, Atlanta, Los Angeles and Fort Worth. It consists of a vernier rheostat, one 50-turn honeycomb coil, a grid condenser, 23-plate variable condenser and tube © Int.



Mothers have found a new way to keep the kiddies quiet while the housework is being done. The happy youngster above may not understand all the many strange things he hears over the ether, but he is highly interested © Keystone



The "Sheik" is seen above listening in on KHJ, The Los Angeles Times station. Rudolph is a true Radiophan and has a set installed in his dressing room at the studio as well as at his home © U. & U.