

Tuning for Beginners—Flewelling—Portable Set

Radio Digest

EVERY WEEK

Illustrated

TEN CENTS

REG. U. S. PAT. OFF.

Vol. V

Copyright, 1923
R. D. F. Co., Inc.

SATURDAY, JUNE 16, 1923

No. 10

AIR USED TO AID REDS

DENY AIR SERMONS HURTING CHURCHES

'AWAKEN CARELESS SOULS'
—BOSTON CLERGY

Opinion Crosses Opposition Stand Taken
by Minneapolis, Minn., and
Newark, N. J., Ministers

BOSTON, MASS.—Boston clergymen differ with Rev. Phillips E. Osgood of Minneapolis, Minn., and Bishop Wilson R. Stearly of Newark, N. J., regarding Radio and the Church. According to these three clergymen, Rev. Arthur T. Brooks of the Dudley Street Baptist Church, Boston, Rev. A. Z. Conrad of the Park Street Church, Boston, Dean Rousmaniere of the Cathedral of St. Paul, Episcopal, and others, attendance at church has not decreased in the slightest as a result of the Radiophone broadcasts of church services.

Many are of opinion, on the other hand, that has actually increased interest in the church because it has awakened many careless souls who had grown somewhat lax in their church attendance.

AGENTS FIND PROPAGANDA BROADCASTER

Private Plants Radical
Citizens' Complaints Cause Investigation—Believe Soviet
Russia Behind Move

By W. E. Johnson

PHILADELPHIA.—Federal agents and city police authorities are investigating the reports of the practice of private broadcasting stations in this city in spreading radical propaganda. The situation is such that hundreds of citizens have sent letters of protest to the federal authorities complaining against the disloyal messages that have been sent out.

Joseph McDevitt, a Department of Justice agent, has conferred with Director James Cortelyou, of the police department, in the hope that steps will be taken to suppress the radical program.

Russian Backing Seen.

Russian backing is seen in the Reds' new enterprise. The most violent attack against the government was made on Sunday, May 20, through a Philadelphia station, William F. Forster, chief of the Department of Justice agents in this city declared. He would not, however, reveal the exact location of the station, although admitting it had been under investigation for some time.

(Continued on page 2)



Top photo is Belle Bart, astrologist, who has foretold accurately many important events, heard every Monday evening at 9:15 Eastern Standard Time on WOR, the L. E. Bamberg station, Newark, N. J. Readers who would like to have their horoscopes read can have this done by writing care of WOR, giving their date of birth and three initials, and three questions they desire answered. In the canoe below Miss Bart is Irma Faas of Minneapolis, one of the season's early portable Radiophones. Note the loop aerial Miss Faas has strung on her parasol. Lower Photo © Keystone

ALL DETROIT'S BLIND WILL GET RECEIVERS

DETROIT.—Every blind person here is to be furnished with a receiving set. The Detroit Welfare League, under the direction of Grace D. Davis, has undertaken this task and announces that many afflicted persons already have been supplied. "No one can realize what a blessing Radio is to persons without sight," Miss Davis says.

First Broadcasts from Mexico
MEXICO CITY.—The first Radiophone broadcasting station ever successfully operated in Mexico now is sending out programs from the Regional Exposition of Nuevo Leon. The station uses a wave length of 400 meters.

Beach sets allow one to utilize not only the wet but the electromagnetic waves, too. At least Rita Walker, prominent film star, thinks so. Witness the set she uses at Neptune Beach, Alameda, Calif. © Keystone

CALIFORNIA TO GET MAMMOTH STATION

GENERAL ELECTRIC PLANS DUPLICATE OF WGY

Oakland to Get New 1000-Watt Plant—Reserve Power for Tests—Building Now

By C. H. Huntley

SCHENECTADY, N. Y.—Faith in the permanence of Radio broadcasting is demonstrated by the recent announcement of the General Electric Company that the first plant to be constructed exclusively for popular broadcasting will be erected in Oakland, Calif., to house the large Pacific coast station of that company. Work will be started this month on a two-story studio building, the antenna towers and the power house. Workmen are already assembling the Radio equipment. It is expected that the new station will be in the air within six months.

The station will be located on East 14th Street, Oakland. The site was selected after a thorough inspection of available properties in San Francisco and vicinity. The Oakland plot was chosen because of its technical advantages, the availability of musical talent and the proximity of the site to San Francisco, the great commercial center of the Pacific coast.

Two Story Brick Structure

The plans provide for a two-story brick structure. On the first floor will be the office of the studio manager, a general correspondence room, a reception room for artists and quarters for motor-generator sets and storage batteries. There will be two studios on the second floor, the main studio large enough to accommodate large bodies of musicians such as a band or symphony orchestra, and a smaller studio from which solo numbers and addresses may be broadcast. The use of two studios will make possible continuous broadcasting. The Radio control room will be on the second floor.

One thousand feet back of studio building will be the power house and antenna system. The antenna will be multipletuned and strung between two steel towers, each 150 feet high and placed 260 feet apart. Beneath the antenna proper will be the counterpoise consisting of a network of wires, fourteen feet above the ground, covering an area of 150 by 300 feet. In addition to the power house, which will be one story high, 71 by 32 feet, there will be a small building for the tuning apparatus at the end of the multiple-tuned antenna.

Transmitter Similar to WGY

The transmitter will be similar to that which is now used almost daily at WGY. Many developments which have brought this station a reputation for exceptional transmission quality will be part of the Pacific coast station equipment.

The new station will be operated with 1000 watts in the antenna but the equipment will be designed in excess of that power for test purposes.

Every part of the equipment in the power house and in the control room will be in duplicate, assuring uninterrupted service. If one outfit or part of an outfit breaks down during the operation period another part will be ready to be brought into the circuit.

It is probable that an auxiliary studio, connected with the transmitting equipment of the station by telephone lines, will be located in San Francisco.

The Pacific coast station of the General Electric Company will utilize remote control to broadcast church services and musical entertainments from San Francisco and Oakland. The Pacific Telegraph & Telephone Company has offered to provide land wire connections for this service.

WHK Starts Cop Program

CLEVELAND, OHIO.—WHK, the broadcasting station of the Radiovox Company, has made special arrangements with the Police Department of the City of Cleveland, by which special bulletins of public interest will be broadcast at 6:00 P. M. each evening.

TUNES IN FOR MUSIC; GETS STATION H—L

COLUMBUS, OHIO.—Alex Harris tuned his set one night recently with the intention of listening to a concert from RSVF or some other place but for a time he thought he had Station H—L. He was called away from his set and while he was gone a droplight wire became entangled with the set. The result was a fire.

LISTEN TO BIRTHDAY PARTY FOR ALFONSO

NEW YORK.—Many Radiophans in the United States as well as in the South American republics listened with interest on an evening recently to the broadcasting by Station PWX Havana, Cuba, of speeches and music from the Spanish Casino there in honor of the birthday of King Alfonso, of Spain.

"OLD RELIABLE" PIANIST POPULAR



Miss Jeanne Wynne, one of the best known Radiophone entertainers in the country. She is a pianist of widely recognized ability and is an exclusive star at WGM, "Old Reliable," the Atlanta Constitution, Atlanta, Ga.

STREET LOUD SPEAKER SILENCED BY OLD LAW

City's Police Chief Holds Horns Are "Nuisances"

ELIZABETH, N. J.—Years ago the local board of works passed an ordinance prohibiting peddlers and others from making noises on the streets. This ordinance was invoked only recently to stop the use of large loud speaking horns in front of stores of Radio dealers. Chief of Police

Mucahy says use of these horns violates the ordinance as a "nuisance." The dealers argue that the ordinance was passed before Radio was thought of, but the Chief was obdurate and said the use of such horns will have to end. The dealers indicated they will fight the police ruling.

Omaha Citizens' Club Meets
OMAHA, NEBR.—The Citizens Radio club of Omaha held its initial meeting recently. All present members are also members of the American Radio Relay league.

VOYAGERS ENJOY SHIP-TO-SHIP TALK

VOICES FROM ONE VESSEL CARRY TO SECOND

Pacific Coast Ships in Epochal "State-room Radiophone Confab" Unique Experiments

By Strachan McMillan

LOS ANGELES, CALIF.—For the first time in the history of shipping on the Pacific Coast, if not in the entire world, passengers while enroute on two liners, more than a thousand miles apart, were able to carry on telephone conversations with each other from their private state-rooms. This was revealed recently at Los Angeles Harbor with the arrival of the liner H. F. Alexander from San Francisco.

Passengers who arrived on the liner, stated that on Thursday evening, just as the ship was nearing Los Angeles Harbor, Radiophone communication was established with the S. S. Dorothy Alexander, of the same line, just as that vessel was pulling into the Puget Sound.

Equipped with Radio Switchboards
The two ships, together with the S. S. Matsonia, were equipped with Radio switchboards a short time ago, but this was the first time that the instruments were experimented with to any degree of success. Both liners, which belong to the Pacific Steamship Company, were equipped with phones for the use of interstateroom communication. The installation of the radio switchboard is stated to be inexpensive and mechanically simple, and permits the plugging of any stateroom of the ship onto the other line.

Capt. A. P. Bartlett in command of the S. S. H. F. Alexander stated that he expected, on account of the success of the recent experiment, that all ships will be so equipped and that it will be only a short time until then. "And," continued the captain, "if telephone companies on shore will install Radio switchboards, it will permit of anyone ashore to get into instant communication by telephone with almost any ship at sea."

Avilion, Santa Catalina Island, is now equipped with Radio switchboards, and persons who are on the mainland may secure telephonic communication with the island from an ordinary telephone.

Wave Bath World's Latest in Wonders

But, Dear Reader, This Radio Dip Is Medicinal—Not Your Saturday Night Favorite

NEW YORK.—The Radio bath is now added to the long list of other wonders. Two physicians, after months of experiment, declare they have perfected a process of providing an electric bath by Radio. But this bath is medicinal, not the ordinary Saturday night favorite, and those who joyfully conceived the idea of bath broadcasting stations, fitted to throw a bath about one while walking on the street, or working in the office, are doomed to disappointment.

Cures Nervous Afflictions

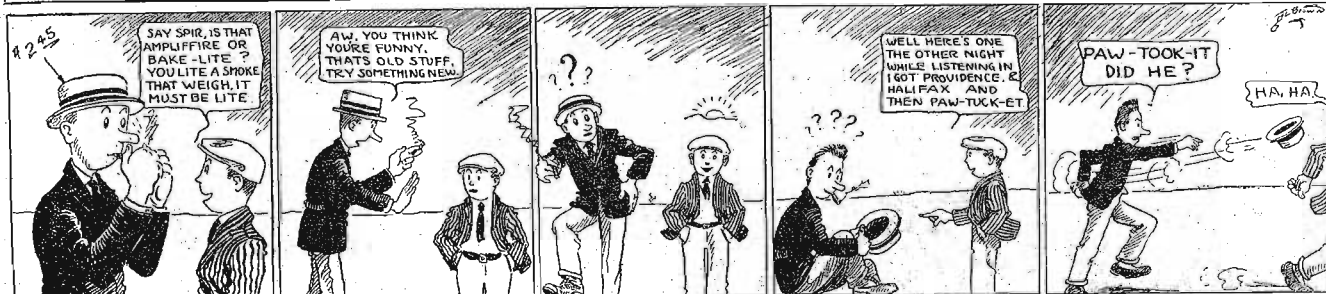
The process, invented by Dr. W. S. Benson and P. B. Schanne, both of Newark, N. J., consists of baking or sweating patients in strong electromagnetic waves diffused over the entire body. A cabinet is used for the purpose. The ailments which it is declared to treat with success are rheumatism, neuritis, pneumonia and nervous afflictions.

At no time during the treatment, according to the physicians, is the patient in direct contact with an electric primary circuit. So powerful are the waves inside the cabinet that a disconnected electric light bulb, held within the field of the waves, will glow with light. The waves penetrate every cell and tissue of the human body, energizing cells and exercising muscles.

THE ANTENNA BROTHERS

Spir L. and Lew P.

Aw That's Tube-Bad



A. R. R. L. DON'T LIKE "SILENCE" PERIODS

CUTS OUT AMATEUR AID IN EMERGENCIES

Relay League Thinks That Enforcement Would Destroy Co-operation with Commerce Department

WASHINGTON, D. C.—Enforcement of a quiet period for amateur Radio operators between 7:30 and 10:30 P. M., as proposed by the department of commerce, would prevent the valuable assistance of amateur stations in emergencies, such as storms, floods and wrecks arising during those hours, according to the American Radio Relay League. The board of direction which has submitted recommendations to the department through its secretary. A special meeting of the league was held in New York recently to consider amateur regulations originally discussed by its representatives and the chief supervisor of Radio.

Now Voluntarily Observed

Since the period of quiet hours between 7:30 and 10 P. M. now is being adhered to voluntarily by amateur operators throughout the country and has been extended in some instances to the hours between 7:30 and 10:30 P. M., through a definite local agreement, the board considers it unnecessary for the department to enforce this regulation.

"It is our conviction," the recommendations state, "that if transmission is prohibited between certain hours, it will destroy rather than create amateur co-operation with the department; whereas if voluntary quiet hours are permitted, the past records show that we can count on nearly perfect observance of the plan."

Want Wave Band Subdivided

The board went on record as being in favor of a virtual subdivision of the amateur wave band between 150 and 220 meters, recommending that this band be available for special license continuous wave transmitters, that wave lengths between 150 and 200 meters be open to continuous wave general transmitters, that all modulated services, including spark, AC tone, CW, ICW, unfiltered CW and phone, be restricted to the band from 170 to 200 meters, and that all types of transmitters be permitted "to operate at will on any wave length within the band to which that type is eligible."

SPRAY SERVICE TO SAVE FRUIT CROPS

WMAK Furnishes Daily Advice of Specialists to Eastern Growers

LOCKPORT, N. Y.—Station WMAK of this city, located in the heart of the Niagara fruit belt, has inaugurated a Radio spray service for farmers and fruit growers. A fruit specialist makes the announcements relative to spraying daily at 11 A. M. Eastern time. It is estimated that fruit growers in western New York have lost thousands of dollars worth of apples and peaches in past years because they were not familiar with the opportune time to spray and what chemicals to employ. It is expected that the Radio Service will not only improve the quality but also the quantity of the 1923 harvest.

Club Makes Fan Directory
Tiffin, Ohio.—A Radio directory giving the names of owners of receiving sets and description of their apparatus, is being compiled in this city by the Tiffin Radio club.

AMPERITE
AUTOMATIC FILAMENT CURRENT ADJUSTER
EVERY STANDARD TUBE
ELIMINATES RHEOSTATS
EXCELS ALL TUBE TROUBLES
FROM YOUR DEALER OR BUY AT
154 GRAND AVE., NEW HAVEN, CONN. \$1.50

RUSONITE
CRYSTAL RECTIFIER
MULTIPOINT (Patent Pending)
A Synthetic CRYSTAL DETECTOR
Sensitive over its entire surface
Eliminates all detector troubles. Extraordinary clearness and volume. Endorsed by Radio experts and press. Sold in Smallest Packages only. Join the ever increasing Rusonite fans.
Price mounted, Sensitivity guaranteed..... 50c
RUSONITE CATWHISKER
14 Karat Gold Multiple Contact Super Sensitive..... 25c
Order from your dealer or direct from us.
RUSONITE PRODUCTS CORP.
19 Park Row, N. Y.

Numerous Letters from Fans Show Listener In Audience Wants Variety

Entertaining a Million Persons a Night Proves Big Job but Program Directors Get Valuable Hints from "Bouquets and Brick" Letters from Fans

By William H. Easton

If the Radio audience could realize some of the problems that have to be solved by those who are engaged in preparing the programs, they would, I am sure, not only sympathize with them but would wonder how they preserve their sanity. No one before has ever had to entertain a million or so people every night, and consequently those who have undertaken this simple little task have had to stumble along as best they could, learning as they go, and profiting wherever possible by their mistakes. They are, however, exceedingly fortunate in having an audience that tells them frankly just what it thinks about their efforts; and with the hundreds of letters that reach them daily as a guide, they have been able to work with some degree of certainty.

First Rule, Give Variety

The first rule that the letters lay down is: Give the Radio what it wants, variety. If you were to open their mail some morning the first letter would probably say, "I enjoyed your concert so much last night. That's right; give us more good music and do away with those execrable popular selections." Then the second letter would say, "The love of Mike, cut out the UP'roar and give us good old American Jazz." Letter number three would read as follows: "Prof. Simpkins' address on 'The Color of Cats' was the most interesting speech I ever listened to," and letter number four would state, "Why do you inflict your audience with such stupid stuff as the talk on cats? I hung up my receiver in disgust."

Hard to Satisfy Everybody

With testimony like this it is quite evident that it is very difficult to satisfy everybody all the time. The only thing to be done is to draw from the entire field of music, literature, science, politics, culture, hygiene and religion, and thus please every one at least part of the time. Consequently, those who do not like jazz music must bear in mind that many will listen to nothing else; while those who do not like speeches must remember that a very large number of Radio listeners are isolated or are invalids and absolutely depend upon Radio for their contact with the outside world.

Must Keep Improving

The second point that the letters prove is, there must be constant improvement in broadcasting both technically and artistically. No station can maintain its interest on a dead level and retain the interest of its audience. The complaints soon begin to come in. Curiously enough, they are all to the effect that the programs are getting so poor. This is not the case. They are just as good as ever; but this

taste of the audience has improved. It is for this reason that Westinghouse Station KDKA is experimenting so constantly in every direction. Its engineers are incessantly striving for better tone reproduction and for the elimination of unpleasant noises. Its program staff is incessantly working for better artistic effects and for entirely new features. They began with the phonograph; then introduced artists and speakers in person; then went outside of the studio for church services, important meetings, symphony concerts, operas and sporting events, and recently established an orchestra so that incidental music could be rendered in the best possible manner. Thus, in accordance with the well-known formula "Every day in every way we are getting better and better," they no one realizes more fully how much more must be done in order to continue to preserve the good opinion of the Radio audience.

Want No Interference

The third important fact that develops from the correspondence is, interference must be eliminated. Not only must the audience be able to hear this station clearly and distinctly whenever they wish to hear it, but they must also be at perfect liberty to eliminate its signals and receive equally clearly the program to some other station that may, for the moment, please them better. This is their most serious problem at present. The great increase in the number of stations has filled the ether with chaos and confusion, and if this is not remedied broadcasting will die out. The government, the Radio engineers, and those broadcasting stations that are interested in Radio for its own sake, and not for selfish reasons, are struggling with it valantly. Though the situation may at times look hopeless, one should not forget that worse troubles

than this have been smoothed out. Broadcasting is only an infant. If it develops as rapidly within the next two years as it has in the past two (and there is every reason to believe that it will), interference will disappear; trivial programs will make way for those of real interest and importance; and it will be possible to hear not only the large American stations clearly and distinctly almost anywhere in the United States, but stations in London, Paris and Rome as well.

Give Radio Instruction

CEDAR RAPIDS, IOWA.—The Board of Education here has gone on record as favoring Radio instruction. Receiving sets will be used for instruction during class hours, and will be operated for the benefit of the parents in the evening.

Wayfaring "Ham" Tells Story
MILWAUKEE, WIS.—Upon his recent return from California, Charles S. Polachek addressed the Milwaukee Radio Amateurs' Club, Inc., under the title of "Some experiences of a Wayfaring 'Ham' in the West."


When telephones are of the same resistance, connect them in parallel. If they are of different resistance, connect in series.

CUNNINGHAM TUBES REPAIRED
C-300 or UV-200.....\$2.75
C-301 or UV-202..... 3.00
C-302 or UV-203..... 3.50
C-303A or UV-204..... 3.50
WD-11 or UV-201A..... 3.50
Morehead Detectors..... 2.50
Morehead Amplifiers..... 3.00
D.V. 6 or D.V. 10..... 3.00
Also the new UV-199..... 3.50
NEW DX 1/2 VOLT TUBES..... 4.00
All tubes guaranteed to work like new.
Mail Orders Given Prompt Attention
"24 Hour Service"
RADIO TUBE CORP.
55 Halsey Street Newark, N. J.
TUBES SENT PARCEL POST, C. O. D.

SUMMER CLEARANCE
Price List
NOW READY
Send for list of BARGAINS
ECONOMY RADIO CO.
132 Nassau Street, NEW YORK CITY

Summer Static Overcome
"Good-bye Aerial"

ANTENELLA
No aerial or antenna needed
All outside wiring, aerial, lightning arresters, switches and other inconveniences so indicative to static are eliminated. Merely plug Antenella in any light socket and you can enjoy all Radio pleasures in any room in your home, apartment or hotel. No current consumed.
New Improved
ANTENELLA
NOW \$1.25 ONLY formerly \$2.00
At your dealer's—otherwise send purchase price and you will be supplied postpaid.
Chas. Freshman Co. Inc.
Radio Condenser Products
106 SEVENTH AVENUE, NEW YORK

Doctor Mu, Sage of Radio
will soon reveal the innermost secret of his **TREASURE CHEST**
His revelation will gladden, beyond measure, those who have awaited the coming of the perfect broadcast receiver.

A. H. GREBE & CO.
RICHMOND HILL, N. Y.

The Qurad Folding Loop Aerial
A Summer Necessity
The Qurad Folding Loop Aerial embodies the most practical and efficient methods in loop construction. It FOLDS in every sense of the word and is so constructed that the wires cannot tangle. By merely raising the arms into their proper position, leverage is brought to play which draws the wire tight insuring perfect alignment and rigidity.
It is designed for use with radio frequency receivers but can be used effectively with any circuit. Undesired stations can easily be tuned out and interference from static is greatly decreased.
It is of rugged construction, yet attractive in appearance and will withstand hard usage. Finished in Walnut and strung with green silk covered wire. The Loop is mounted on a pivot base and arms are provided for shifting its direction.
Suitable for use in the finest home and especially desirable when genuine portability is required.
Folded, 21" high; open, 30" wide.
Price, complete, ready for use..... \$12.50
Manufactured and guaranteed by
QUINCY RADIO LABORATORIES
Dealers are invited to write for our proposition
QUINCY, ILLINOIS

GLOBE PICK-UP PICTURES AUDIENCE



Here is the control operator at WJY-WJZ with the new double pick-up microphone half open. All of the harsh, mechanical parts are enveloped and hidden by the unique globe arrangement. The globe is about eighteen inches in diameter and stands on a mahogany pedestal.

The heart of WJY-WJZ, an oscillograph that shows the Radio waves as they leave the antenna. This allows corrections to regulate the modulation, etc. There is an actual "motion" picture of the wave on the revolving square mirror. Operator W. E. Tesch is observing.

Reputed the finest and most modern station, WJY-WJZ, atop the Aeolian building, New York City, has probably the most novel pick-up microphone in use today. This transmitter is shown above in the Classic studio. (There is also a Jazz studio.) At the left, the pick-up is shown closeup. The globe is really a sphere atlas and typifies the world, the invisible audience of Radio. The sensitive microphone is concealed within the thin gauze globe, painted to make it more realistic. The seas are deep green while the continents are tan. The unique arrangement is meant to aid many other artists who have found it difficult to give their best in a soundproof studio with no visible listeners or applause. Photos © K. & H.

CFCN PLANT HELPS TO CALIBRATE SETS

CANADIAN STATION SENDS ON VARIED WAVES

Announcer Begins at 10:30 O'clock and Works on Rising Scale from 200 Meters

By Jeffrey J. Dingman
CALGARY, ALTA.—With the object of aiding Radiophans to tune in more easily and expeditiously on broadcasting stations on their scheduled times and wavelengths, CFCN, the broadcasting station of The W. W. Grant Radio, Ltd., at Calgary, is now conducting a service which will enable listeners to calibrate their receiving sets.

One night a week the announcer at CFCN broadcasts on many different wave lengths, varying from 200 metres to 750 metres. The announcer commences at 10:30 o'clock, Mountain Standard time, and announces that CFCN is working on 200 metres, asking Radiophans who are on their air to note carefully just what position on their dials the pointers are in while signals are being received on this wave length.

Great Aid to Listeners
 This is repeated every few minutes on rising wave lengths, and thus listeners are able to record on the dials of their receiving sets the various wave lengths. This tends to allow them to tune in more quickly when they know a certain station is broadcasting on a regulation wave length at a set hour.

Many communications have been received by CFCN congratulating the management on this Radio service feature, which, judging by the number and tone of the communications received, popular and much appreciated.

Phones Repaired
 Phone expert. Repaired phones for U. S. Navy. Can repair yours. Work guaranteed, rates reasonable.
RADIALL ELEC. CO., Passaic, N. J.

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 Reinartz unit. Build one of these wonderful sets from my blueprints and specifications, price \$30.00 or with perfect and complete double wound spirovocal coil, \$35.00 by mail. No other windings used. Photo of my set on a glass panel with every order.
 This copyrighted circuit is the most successful of any Reinartz modification yet produced, and is limited the most. Thousands are in use.
 My W. D. 11 Circuit is especially designed for use with the "Pickle" tube and brings out the full volume of that little tube at other circuit can. Stations 1000 miles away come in clearly on one tube. This set is small, compact, portable. For the man who wishes the highest efficiency, this is the set to build. Price of blueprint and specifications, 50c, or with complete and perfect windings, \$35.00. Photo of set with every order.
 Either set is easy to build, easy to operate. Everything clearly shown.
 Sets built from these plans will receive all broadcasting stations operating under the new laws. Their wave length range is from 140 to 670 meters.
S. A. TWITCHELL
 1925 Western Ave. Minneapolis, Minn.

FLEWELLING ANSWERS

By E. T. Flewelling

(Editor's Note.—This department is written by Mr. Flewelling, the inventor of the famous super circuit. From the questions sent him each week care of Radio Digest, he picks the one considered most informative for all and answers it in this column.)

Use of Loop Aerial
 (Submitted by A. W. H., Osceola, Iowa.)
Question.—In using the Flewelling Super on a loop should I connect the two ends of the loop to the binding post in the regular way or how should the loop be used?

Answer.—The Flewelling Super picks up so much energy through its own wiring that a loop is not of very much use. If you use a short piece of wire, say 5 to 6 feet long and let it hang down from your set, you will secure as good results as you would with a good loop. Due to this habit of picking up its own energy, the Flewelling set robs a loop of any attempt that it might make to show directional effects as it does on, say, a Radio frequency set. The writer's own personal preference is to simply connect his set to the nearest radiator or water pipe and "go to it." Fully as good and generally better results are obtained in this way as upon a regular set with a good antenna.

They Didn't Like the Paint and He Didn't Like Radio

CHICAGO.—John P. McNamara painted the front steps of a house he owned at 1355 Taylor street recently. This did not please the tenants, Mr. and Mrs. Frank O'Connor, and to show their displeasure they walked down the newly painted steps and went out. When they returned they found the aerial of their Radio set torn down. Yesterday O'Connor obtained a warrant for McNamara charging disorderly conduct.

WJAX INSTALLS NEW LIGHT-SIGNAL SYSTEM

Announcer Can Communicate with Operator Without Speaking

CLEVELAND, O.—In order to insure the highest class of service from WJAX, the Union Trust Co. is planning to install a soundproof announcer booth inside its studio. While the program is going on the announcer will remain within the booth and so can communicate with the operator at all times over a private telephone, even though the operator is only in the next room.

A system of signal lights will be installed for immediate communication between the announcer and the operator. These lights will be amber, green, red and white. When the announcer is ready to proceed with any number on the program, he will flash the amber light to the operator. That will mean, "I am ready." The operator will then flash a green light, which will mean, "The set is in operation." He will follow this with a red flash which will mean, "The microphone is ready—go ahead." The flash of a white light to either the announcer or the operator will mean, "Answer the telephone."

In this way, even while the programs are going on, the announcer can talk to the operator, arrange for the next number on the program, and so forth, without in the least interfering with the actual broadcasting.

The ringing of three silver chimes is the signal that announces programs from KPL.

MAGNAVOX TYPE R3. Latest nationally advertised models in original sealed factory cartons. List \$35. Special introductory offer \$25. Radio Central, Dept. D, Abilene, Kansas.

This Convict Eases His "Time" with Receivers

Ohio Penitentiary Inmate Asks to Install His Set

COLUMBUS, OHIO.—The most rabid Radiophan in this section has been found. He is Erwin F. Kumber, an inmate of the Ohio penitentiary serving from three to five years for automobile stealing. He was returned recently to Cleveland to testify at the trial of his alleged partner and was given permission to return to his cell with his Radio outfit.

Kumber brought the set back from his trip and has installed it in the prison. The concert hours have been set from 6 to 7 P. M. and a loud speaker will be used. After these hours, Kumber will be allowed to continue his listening in with an individual headset.

WE REPAIR YOUR VACUUM TUBES

WD-11, WD-12, UV-199, UV-201-A, C-300A..... 2.75 each
 UV-200, C-300, AP Inductors..... \$3.50 each
 UV-201, C-301, AP Amplifiers..... 3.00 each
 DV-8, DV-8-A, \$3.50; UV-202..... 4.00 each
 And Guarantee Them Equal to New
QUICK SERVICE Include with your order re-ferred parcel postage for one month per tube. If preferred, tubes will be returned C.O.D. repair charges.
Abalene Radio 416 D Broadway New York, N. Y.

The latest and most essential part of an efficient tube set



Variable Resistance Leaks FOR PANEL MOUNTING

Mounted on any panel in a few seconds—2 screws serving as connections behind panel.
Get stations you never heard before
 No pencil markings—assure unbroken range of 130 degrees. Clarifies signals—eliminates humming. Complete with ether .00025 or .0005 mfd. Micon Cond. **\$1.00**
Without Condenser.....75c
 At your dealers—otherwise send purchase price and you will be supplied postpaid.
Chas. Freshman Co. Inc.
 Radio Condenser Products
 106 Seventh Ave. New York

WILLARD RADIO COMPANY

291 Broadway New York City

FLEWELLING CIRCUIT
 Every part complete, including drilled panel and book of diagrams and instructions. **\$11.95**

REINARTZ CIRCUIT
 Every part complete, including drilled panel and book of diagrams and instructions. **\$10.95**

Two-stage Audio-Frequency Amplifier. Every part complete for above circuits at **\$11.00**

CONDENSERS

3 Plate Variable; value, \$1.75	1.05
13 Plate Variable; value, 2.50	1.20
23 Plate Variable; value, 3.50	1.35
43 Plate Variable; value, 4.50	1.55
13 Plate Vermer; value, \$3.50	3.75
23 Plate Vermer; value, 6.00	4.00
43 Plate Vermer; value, 6.50	4.25

Honeycomb Coils, 50 turns mounted..... .95
 Honeycomb Coils, 75 turns mounted..... 1.00
 Double Coil Mountings..... 2.45
 Triple Coil Mountings..... 3.55
 Reinartz Coils and Mounting..... 1.45
 Jacks, Single Circuit; value, 65c, special at..... .50
 Double Circuit; value, 80c, special at..... .45
 Multiple Point Inductance Switch with Knob and Dial (15 Switch Points)..... 1.45
 Lightning Arresters, approved..... .50
 Three-Inch Dials, unbreakable, heat resisting composition, high finish; special..... .50
 Two-Inch Dials, same design, for rheostats and potentiometers; special at..... .25

Audio Frequency Transformer, Designed for use with W. D. 11 tubes; list, \$4.50; price, \$2.75

Variocoupler—Litz Wire Wound Secondary; value, \$4.50; special.....	2.25
Ball Bearing Inductance Switch; value, 75c; special.....	.40
V. T. Sockets, nicked, brass, slow, composition base; value, \$1.00; special at.....	.50
Aluminum Loud Speaking Horn, nickel plated, highly polished; \$3.00 list.....	3.75
Filament Rheostat, 6 ohm.....	.65
Filament Rheostat, 20 ohm.....	.80
Filament Rheostat, 50 ohm.....	.90
With 2" Dial, 15c extra.....	

Every article advertised above is guaranteed by the manufacturer and by us. Mail orders filled immediately. Transportation PREPAID on all orders of \$5.00 or over east of the Mississippi River. All others include postage.

LEVIATHAN'S OUTFIT KING OF THEM ALL

TWO MOTOR-DRIVEN LIFE-BOATS TO BE EQUIPPED

Huge Shipping Board Vessel's Installation Will Connect Boat with Two Continents

By F. N. Hollingsworth

BOSTON, MASS.—Surpassing even that of the Majestic, which has hitherto been credited with having the most powerful and up-to-date Radio equipment of any ship in the world, the United States Shipping Board's steamship Leviathan, now being refitted and equipped in Boston in the largest drydock in the world, will have everything in Radio that is necessary to make her equipment the greatest on earth. It will be eclipsed in importance only by her powerful machinery and delicate controls. The contract to equip the Leviathan, whose call letters are WSN, with a super-power marine Radio installation has been let and completion of the work will give America the greatest of Radio supremacy on the high seas.

Can Talk with Two Continents

She will have a six kilowatt tube code transmitter. This is six times as powerful as that carried by the average great Atlantic liner, and assures uninterrupted communication with points 3,000 miles distant, or with Europe and America en voyage. In addition to the telegraph apparatus she will have two kilowatt Radiotelephone installation, which will provide voice contact with other vessels and stations on both shores of the Atlantic as well.

With the increasing number of ships having Radiophone installations, it is likely that land stations will soon be erected to handle voice messages from the regular land wire systems. The Leviathan will have a special emergency 600-meter spark transmitter in addition to the regular tube receiver which will be installed for reception, including Radio frequency amplifiers and interference eliminating devices.

Radio on Motor-Driven Lifeboats

The two big motor-driven lifeboats, the finest that marine engineering can devise, and primarily designed for towing other lifeboats in case of emergency, will be completely Radio equipped. Each motor lifeboat will carry a crew of eleven in charge of a second officer, and two Radio operators. One of these boats will be located on each side of the ship on the boat deck. Each is 32 feet long, 10 feet wide, and is propelled by 100-horsepower standard marine engine, and by means of the main shaft drives a 4-blade towing pitch propeller.

Each boat is equipped with a one-quarter kilowatt transmitting outfit and is capable of sending and receiving messages at distance of at least 250 miles. The operators will be specially trained men, whose duty will be to see, with frequent tests, that the outfit is always in working order.

SPECIAL OFFER LIST

(Continued from page 2)

Dublier Ducon; Dublier Meadon Type 606 (.006 mfd.); Dublier Meadon Type 610 (1.01 or .32 mfd.); Dublier By-Pass Condenser (1 mfd.); Premier Universal Radio Jack; Filament Control Five Spring; CRL Variable Grid Leak, without condenser.

Class D Articles

For eight consecutive coupons and one dollar and twenty cents (\$1.20) any one of the following articles will be sent: 1 Carter 20 Ohm Varactor Control Rheostat; 1 Martin-Copeland Radio Frequency Transformer; 1 Martin-Copeland 12-Point Inductance Switch; 1 Martin-Copeland 15-Point Inductance Switch; 1 Martin-Copeland 15-Point Inductance Switch; Walnut Variable Condenser (5-Plate .001 mfd.); Ray-O-Vac No. 4151 B Battery, 22½ volts; Ray-O-Vac Dry Battery, 3 cells 4½ volts; Quadra Variator with auto condenser; Dublier By-Pass Condenser (3 mfd.); CRL Variable Grid Leak with Condenser.

Class E Articles

For ten consecutively numbered coupons and one dollar and fifty cents (\$1.50) any one of the following articles will be sent: 1 Carter 20 Ohm Varactor Control Rheostat; 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser.

Class F Articles

For twelve consecutively numbered coupons and one dollar and thirty cents (\$1.30) the following will be sent: 1 Arma Pot-Rho (potentiometer and rheostat); Walnut Variable Condenser (53-Plate .0005 mfd.); Ray-O-Vac No. 2151 B Battery, 22½ volts; Dublier By-Pass Condenser (3 mfd.); Premier Variable Condenser without dial (.00025 mfd.).

Class G Articles

For fourteen consecutively numbered coupons and two dollars and forty cents (\$2.40) any one of the following articles will be sent: 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser.

Class H Articles

For sixteen consecutively numbered coupons and three dollars (\$3.00) any one of the following articles will be sent: 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser.

Largest Radio Store in America

RADIO BARGAINS

Buying Direct—in Quantities—for Cash, and Operating on a "Small Profit—Big Sale—Quick Turn" Basis Makes Possible These Values
Radio Supplies Purchased Here Are Sold Under a Positive Guarantee of Satisfaction. We Carry the Largest New Stock of First Quality New Merchandise.

Largest Radio Store in America

BUILD YOUR OWN SET! All Panels Drilled—Results Guaranteed If You Use Our Instructions

COMPLETE PARTS FOR KNOCKED-DOWN RECEIVING SET
\$17.95

Consisting of	Reg. Price	Our Price
1 Variometer	\$10.00	\$2.90
2 Variable Condensers	3.00	1.75
3 Bakelite Dial	3.00	.75
Remier Bakelite Socket	1.00	.45
Howard Rheostat	1.10	.40
Cunningham C-300	5.00	4.45
Receiver Tube	5.00	4.45
Mahogany Cabinet	4.50	2.75
Genuine Formica Panel	2.25	1.75
8 Binding Posts	.80	.40
Switch Lever	.50	.25
12 Switch Points	.40	.20
Freshman Grid Leak and Condenser Combined	1.00	.65
Complete Drawing for Assembly and Wiring	1.00	.50

Regular Price.....\$30.85
Our Price **\$17.95**

COMPLETE PARTS FOR REINARTZ SETS
\$11.45

Consisting of	Reg. Price	Our Price
7x18 Formica Panel	\$1.89	\$1.70
Remier Bakelite Socket	1.00	.45
Howard Varior Rheostat	1.50	1.35
23 Plate Variable Condenser	3.30	1.45
11 Plate Grid Variable	3.10	1.35
1 Switch Lever	1.50	.75
2 Dosem Switch Points	.80	.40
1 Schonhauer Reinartz Coil and Condenser	3.00	1.85
Freshman Variable Grid Leak and Condenser	1.00	.85
8 Binding Posts	.80	.40
35 Feet Platted Wire	.30	.20
Baseboard for Mounting	.50	.25
Blueprint with Complete Instructions for Assembly and Wiring	1.00	.50

Regular Price.....\$21.69
Our Price **\$11.45**

COMPLETE PARTS FOR 2-STEP AMPLIFIER
\$12.45

Consisting of	Reg. Price	Our Price
7x18 Formica Panel or Other Suitable Size	\$1.89	\$1.70
High Ratio All-American or Thordarson Transformer	4.75	3.95
Low Ratio Transformer	4.50	2.95
2 Howard Rheostats	2.20	.90
2 Remier Bakelite Sockets	2.00	.90
3 Double Patent Jacks	6.00	1.50
12 Binding Posts	1.20	.65
Baseboard for Mounting	.30	.15
Regular Price	\$20.10	
Wiring Diagram, with Complete Instructions for Drilling and Assembling Panel		\$2.45

Regular Price.....\$20.10
Our Price **\$12.45**

COMPLETE PARTS FOR FLEWELLING CIRCUIT
\$12.45

Consisting of	Reg. Price	Our Price
6x14 Formica Panel	\$1.26	\$1.10
23 Plate Variable Condenser	3.30	1.45
Three .006 Mica Condensers	3.60	2.25
CRL Variable Grid Leak	1.85	1.35
2 Coil Adjustable Honeycomb Coil Mounting with Knob	4.00	2.65
75 Turn Honeycomb Coil	.80	.40
2 Remier Coil Mounts with Straps	1.20	.80
1 Remier Bakelite Socket	1.00	.45
Howard Varior Rheostat	1.50	1.35
1 Bakelite 3" Dial	1.00	.25
8 Binding Posts	.80	.40
1 Baseboard for Mounting	.30	.20
1 Blueprint with Complete Instructions for Assembly and Wiring	1.00	.50

Regular Price.....\$22.16
Our Price **\$12.45**

COMPLETE PARTS FOR SINGLE TUBE REFLEX CIRCUIT \$22.65

Consisting of	Reg. Price	Our Price
4x14 Plate Varior Variable Condenser	\$7.00	\$3.95
Radio Loop Aerial	8.50	5.95
Cunningham C-314 Tube	8.00	5.65
Growth Glass Inclosed Detector	2.00	1.65
Radio Frequency Transformer	4.50	3.45
All American 5 to 1 Hi-Freq. Audio Frequency Transformer	4.75	3.95
2 .001 Micon Condensers	.70	.20
1 .002 Micon Condenser	.45	.35

Regular Price.....\$30.85
Our Price **\$17.95**

COMPLETE PARTS FOR ULTRA AUDION CIRCUIT \$11.90

Consisting of	Reg. Price	Our Price
18 Switch Points	.50	.30
2 Switch Stops	.10	.05
8 Binding Posts	.80	.40
Genuine Solid Mahogany Cabinet with Hinged Top	5.00	2.05
25-ft. Hookup Wire	2.00	1.10
Regular Price	\$19.30	
Our Price		\$11.90

Regular Price.....\$19.30
Our Price **\$11.90**



Original Baldwin Phones
These are the Genuine Nathaniel Baldwin "Mica Diaphragm" Phones, complete with silk cord and headband.
Special **\$9.95**
Genuine Baldwin "Mica Diaphragm" Type "C" Loud Speaking Units. Special **\$4.65**

\$10 Value Long Range Headset \$3.65
Made in style and design proved by use and experiment to be the best. Coil wound with about 6,500 turns of No. 40 enamel coated copper wire. Direct current resistance approximately 1,600 ohms. Impedance at average music and voice frequency (600 cycles) is 21,000 ohms.
\$3.65
MASTER BALDWIN PHONES
Type C with head band and cord.....\$6.95
Type C unit.....\$3.95
Branded superior headset.....\$6.75
300 Ohm Guaranteed Headset.....\$6.65
value.....\$6.65

FORMICA PANELS
Cut to Any Size
3/16" Thick
SQ. IN. 1 1/2c
We Engrave Panels at
3c a Letter
We Drill Panels at
5c a Hole
All drilling or engraving orders must be accompanied by drawing or template.

Thordarson Amplifying TRANSFORMERS [High and Low Ratio] \$2.45

HONEYCOMB COILS

1,500 Turns, Coto-Coil.....	\$1.50
1,200 Turns, Coto-Coil.....	1.25
1,000 Turns, Coto-Coil.....	1.00
750 Turns, Coto-Coil.....	.75
500 Turns.....	.50
300 Turns.....	.30
150 Turns.....	.15
75 Turns.....	.07
50 Turns.....	.04
25 Turns.....	.02
10 Turns.....	.01
Rubber Spaghetti Tubing, yard.....	.10
Artichoke-Use Electric Lamp Socket for aerial.....	1.15
25½-Volt B Batteries (stock replenished every day).....	1.65
Diaks—2, 3 and 3½ inch.....	.25
Ultra-Audion Bank Wound Coils.....	2.95
Growth Detectors.....	1.45



BRACH'S LIGHTNING ARRESTER
Approved by underwriters; fully protects your home from danger of injury by lightning.
Signal Corps Super-Sensitive Microphone Transmitters.....\$2.45
Thordarson Amplifying Transformers, High and Low Ratio, \$4.50 Value, now.....2.45
Our Price.....95c
Outdoor Type.....\$1.45

JACKS AND PLUGS

Patent single circuit.....	\$0.35
Patent double circuit.....	.50
Federal Single circuit, filament control.....	.35
Federal double circuit, filament control.....	.50
Patent plugs.....	.45

Jacks are polished nickel, nickel-silver springs, pure silver contacts. Nickel washers for mounting on any panel 3/8 to 3/4 inch thick. Spread terminals make soldering easy.

ELECTRIC SOLDERING IRON \$2.45
Specially adapted for radio work. Simply attach to any light socket 110-120 volts. Complete with six foot cord and attaching plug. Lasts a lifetime for ordinary home or light shop work. A real bargain.

VARIABLE CONDENSERS

\$7.00 value, 48 Plate Varior.....	\$3.95
\$6.50 value, 22 Plate Varior.....	3.45
\$5.00 value, 11 Plate Varior.....	2.95
\$1.75 value, 3 Plate Varior.....	1.15
\$5.20 value, 48 Plate NOW.....	1.45
\$3.70 value, 22 Plate NOW.....	1.35
\$2.20 value, 11 Plate NOW.....	1.25
\$2.25 value, 6 Plate NOW.....	1.25

Western Electric No. 10A Loud Speaker \$98.45
Complete with loud speaker horn, 3 stage power amplifier and 3 216A Western Electric amplifier tubes.

VARIOCOUPERS

180 Degree Coupling.....	\$1.75
90 Degree Coupling.....	\$1.95
Moulded Couplers, 180 Degrees at \$3.45	

VARIOMETERS

Diamond Lattice at.....	\$2.95
Moulded.....	3.65
\$5 Value Mahogany Variometer.....	1.95

Signal Corps Super-Sensitive Microphone Transmitters \$2.45

FRESHMAN VARIABLE GRID LEAK AND CONDENSER \$1.00 Value 65c

RADIO BOOKS

101 Receiving Circuits, by M. B. Sleeper.....	50c
6 Successful Radio Sets, by M. B. Sleeper.....	50c
100 Radio Hook-Ups.....	25c
Loud Talkers, How to Build Them.....	25c
How to Tune Your Radio Set.....	25c

We Guarantee All Merchandise Purchased of Us
Mail Orders Receive Immediate Attention

CHICAGO SALVAGE STOCK STORE

509 South State Street, Chicago, Ill. Dept. RD 6

STATION SCHEDULES

(Continued from page 8)

WOS, Jefferson City, Mo. 441 meters. 1,500 m. W. Missouri State. Daily ex Sun, first 15 min. of every hour from 8 a.m. to 2 p.m., markets. Daily 5 p.m. music, news, Mon. Wed. Fri. 8-10 p.m. concert. Central.

WSP, Atlanta, Ga. 429 meters. 1,500 m. Atlanta Journal. Slogan. "The Voice of the South." Daily ex Sun, 12-1 p.m. music; 2-30 reports; 4-45 p.m. music, reports; 5-6 p.m. 10-15-12 music. Sun, 10-15-12, 4-15-30, 7-30-9 p.m. church services. Central.

ADVANCE PROGRAMS

(Continued from page 7)

KSD (Central, 540), 8:30 P. M., Opera. "The Fencing Master." WFLA (Central, Daylight Saving, 345), 8:30-8:58 P. M., Musical program. Lowell Gentry, soprano; Debra, "Is Coma's Royal"; Richard J. Flanagan, "C. C. Sanders, Julian Seltner, P. M. Antea. Sunday, 10-10-30, 10-10-30.

violinist; Bartolomeo, Alfred Butler; Intermezzo from Cavalleria Rusticana; Orchestra. KJL (Pacific, 400), 2:30-3:30 P. M., Musical nature. Bouquet Southernland Serenades; 8:45-9:30 P. M., Children's hour. W. W. Kimball, Calif. Program by Chamber of Commerce, Huntington Park, Calif.

Sunday, June 17

WBAP (Central, 476), 11:30 A. M. Church services. Methodist Church, Rev. J. W. Eberhart, pastor. WJL (Eastern, Daylight Saving, 395), 1:00 P. M., Church services. W. W. Kimball, Calif. Program by Chamber of Commerce, Huntington Park, Calif.

Monday, June 18

WBAP (Central, 476), 9:30-10:30 P. M., Concert. West Texas Orchestra. WDAZ (Eastern, Daylight Saving, 305), 12:00-12:54 P. M., Organ recital. Stanley Theatre; Arcadia Cafe Concert Orchestra; 2:00-3:00 P. M., Song recital; 4:30-5:00 P. M., Musical program; 7:30-8:00 P. M., Organ recital. Stanley Theatre; Dinner music, Arcadia Cafe Concert Orchestra; 2:00-3:00 P. M., Musical program; W. W. Kimball, Calif. Program by Chamber of Commerce, Huntington Park, Calif.

British Broadcasters Number 260

MANCHESTER, ENG.—About 260 Radio manufacturing firms have become members of the British Broadcasting Company, states Sir W. Joynton-Hicks in Parliamentarian Debates. The number of types of broadcasting receiving apparatus approved by the Post Office is 1,450. The number of Radio licenses at present issued is approximately 115,000, of which about 80,000 are in receipt of receiving sets bearing the trade mark of the British Broadcasting Company.

Recruit Reserves by Air

CHICAGO.—Recruiting by Radio has recently accomplished marvelous results for the Illinois Naval Reserve. The Zenith-Edgewater Beach hotel station, WJAZ, has broadcast several talks by Capt. E. A. Evers, commandant of the reserve. Practically the entire quota has been filled as a result.

a Chi-Rad Special! for 6VD 11 tubes - Standard, threaded rubber, Willard's specially adapted for use with WD 11 Tubes. Supply current at 2 volts to one WD-11 Tube for 200 hours on a single charge. Rechargeable. Brand new size 4x5 1/2 inches—Chi-Rad guaranteed.

Electric Soldering Iron \$2.50 A. C. OR D. C. CURRENT DEALERS—Attractive Discounts HUDSON-ROSS 123 W. Madison St. Chicago

Formica 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 SEND FOR COMPLETE PRICE LIST CHECKED AGAINST MAIL ORDERS DEALERS PRICES ON APPLICATION STAR-TRON MFG. CO. 519 SOUTH GREEN ST. CHICAGO

Have you ever seen a Radio set that requires no outdoor antenna or loop? uses all kinds of tubes (4 of them) in any desired combination? employs perfect combination of both Regeneration and Tuned Radio Frequency Amplification with only 2 tuning adjustments? receives all broadcasting? may be set up and operated anywhere—by anyone—in a moment? You may see such a set at your dealer's on June 12th.

Radio Digest

Illustrated

REG. U. S. PAT. OFF.

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
Evans E. Plummer, Managing Editor
Harry J. Marx, Technical Editor

Eastern Representative, Jacob Miller, Times Bldg., Times Square,
New York; Telephone Bryant 4999
Pacific Coast Representatives
E. J. Wood, 251 Kearney St., San Francisco
Telephone Kearney 1472
H. M. Morris, 417 Western Mutual Life Buildings, Los Angeles
Telephone 12011

PUBLISHED WEEKLY

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

Vol. V Chicago, Saturday, June 16, 1923 No. 10

Future Possibilities

Applicable to Business and Social Life

FUTURE possibilities of Radio are inconceivable. Various principles which will make it more applicable to business and social life are having considerable research. The supreme inventive genius of the country, the greatest organizing ability and the most powerful resources at hand are now at the service of the new art, with the result that Radio has made greater strides in the past two years than in twenty years previous.

Receiving Sets in Camp

Broadcast Concerts Much in Favor of Vacationists

ONE feature of vacationing this summer in out-of-the-way places where mail and train service is infrequent but Radio instant is the fact that farmers throughout the country who cater to summer boarder trade are installing Radio sets. Of course countless farm homes in the land are already equipped with sets, many of which are high powered ones, which have been in use the year around. Now other farmers realize that in order to get the vacation boarder trade this year he must add Radio to his other attractions.

Radio baseball fans who feel they cannot exist without at least being in touch with the results of the game by wire and who begrudge taking a few weeks' rest in the country because of the delays in receiving returns, rejoice in the news that even though they are buried in forest's depths, a few turns of the dials will give them not only baseball returns but the latest market reports and news.

There is practically no limit of localities where Radio can be brought in by portable sets. Sets can also be put in motorboats, canoes and rowboats with equal success and, as tests show, these sets receive as well as any shore station.

Confirmed Radio bugs who had begun to fear they could not play with the dials if they took a vacation this summer have changed their minds and are now actively engaged in preparing to enjoy their "off to the country" period with the knowledge that they can sit around the camp fire after a day's pleasure and listen to the best entertainment programs.

Radio to Outdo the Wires

Cables Are Becoming Obsolete, Seemingly

THE success of the Radio talk across the Atlantic is a distinct step toward a complete globe girdling system of Radio. A distance of 3,400 miles across land and sea was bridged by a Radio conversation. The demonstration is vivid and dramatic proof of the giant strides being made in the improvement of Radio communication. Indeed, so rapid is this progress that laymen find it hard to appreciate its full significance.

It is planned in the near future to have President Harding and King George engage in a little transatlantic chat in the interests of science. The outlook is that telegraph wires and submarine cables must eventually give way to the more practical and less expensive system of long distance communication without wires.

Verbal transatlantic Radio communication is still more distant, in view of the fact that the number of available wave lengths is so limited. Now, only a few conversations can be carried simultaneously over the same wave lengths. The danger of "crowding" the air with messages is very apparent and the government is taking steps to regulate Radio communication. However, land and sea Radio telegraph companies are feverishly striving to produce apparatus which will insure a round-the-world, 24-hours-a-day service. No one can doubt, in view of recent improvement, that these difficulties will eventually be overcome.

At the present time not only do the land and sea telegraphs circle the globe, but Radio does likewise. However, only messages involving the dash-and-dot signals can be transmitted around the earth—Radio telephony has yet to be perfected to a degree permitting a message to be telephoned around the world. Yet Radio as a whole is affecting geography by linking up the continents with ether waves and thus bringing people nearer together. The days of the land and sea telegraph seem numbered—their wires are doomed. At some future day a new generation may recover a discarded cable from the depths of the ocean and smile to think that how crude were our methods of communication in the old days.

RADIO INDI-GESt

WALLA WALLA INDIGEST STATION ANNOUNCES FIRST NIGHT PROGRAM

WALLA WALLA.—Positively unique in all respects is the opening program of Indigest's brand new slightly used broadcaster recently erected here when it was built. The program, it was reported to a special Indigest reporter in an especially arranged interview, will be held on the night after the day before Sunday, June 31, if it ever is held that is.

Persone of dastardly competition on the night in question, it took several quarts of immoral persuasion and one and one-half Pittsburgh stogies before the musical director and announcer were sufficiently ready to club Palm trees and let the cat-out-of-the-bag. But they did. Translated from Walla Wallan, the native means of self-expression, the program finally looked like this:

(Tune to 90% foot on your Stobbinis Degenerative.)
Article A.—Antenna raising exercises at sun down. The Walla Walla flag will be brought down from the two coconut tree masts and the aerial clumb into position by Izzy and Mike, the station's particularly trained (Harvard Grads) Chimpanzees. Both belong to the I. R. E. and have Tree-climber's Union cards, so that all may listen in to this ceremony without fear of its being illegal.

Article B.—Antenna will be tuned. A very special expert piano tuner with complete set of tuning forks and diagram has been engaged parcel post prepaid.

In Quest of the Kanoofis Part I—The Search Begins



INTRODUCING THE AUTHOR

A Kanoofis is a funny thing, and very hard to find. (Look, look.)

There are only three in the whole wide world so bear this fact in mind. (Isn't it terrible?) Found first in the fork of a cooler tree not far from old Madrid, (Wah, wah, wah.) Where for years and years this little thing was tacked away and hid. (Now, you find me.)

I'll tell you a tale of a Radiophon who tried to build a set. (Go on.) He hunted high and low for parts but there's one he couldn't get. (How sad!) This part was called a Kanoofis and he tried and tried in vain. (Oh, ma.)

Until one day he heard someone say that one could be found in Spain. (Yes, we have no strawberries.) So he left one day in June, by, by, for the land of the Matador. (Sailing, sailing, over the bounding main.) Resolved to get what he wanted, if it cost a fortune or more. (Change a hundred?)

On reaching Spain this Radiophon went straight to the Onion King. (Yes, he has a horse, a bicycle.) Who promised to give them help to find a Kanoofis or anything. (The grandest king.) The King was a mighty man, yes, yes, who ruled with an iron hand. (Forward, march!) In fact he was the finest type of onion in the land. (Sliced or fried.)

So with the help and such, however much, they started on their quest. (Forward, march!) First going North, then going South, then East; last going West. (Directional I would say.)



After many days of travel, they stopped near a Russian river. (Shush, shush, a horse, a bicycle.) Because these boys were famished, and had to eat their liver. (Blah, Blah.) Then on again went the searching train, till they came to a forest great. (Wood, wood.) "Tis here," said one, "where we'll see some fun, or else we'll know our fate." (Oh, lady, lady.)

(Search to be continued.) —ROZEE.

Moral: Always Wear Your Headset

Dear Indigest: I had bekum sutch a konfirmed radeeo fan that I allus wear my hedset 2 bed with me. Last night I broke the turn thing and consequently had to leve it off. My wife saw me without it fur the fursal time in my mo, and yanked me with a coning pen act, of her thinking I wuz a stranger that had broke into our domicycle. —Zra hehT.

Oh Yes!—He Gave It To Flew Himself

Dear Indigest: Methuselakl ate no Skookum apples every day, did not walk a mile for a Camel, never read the Saturday Evening Post, did not chew Wrigley's, nor did he have his iron every day and yet he lived to the ripe old age of nine hundred years. I would like to know if he had a Flewelling Flivver. —IMP.

Sleeping here is Dan
Crazy Al Zapp.
He stuck his head
in a rotary-gap.

We Haven't Tried the Hook-Up Yet, but Wait—

My Dear Sir Ind: The writer was passing the time away with a number of congenial friends at the Marigold Gardens and the conversation was, as the poet said, "of women and other things." While tuning in on the latter we drifted to Radio. The audience with few exceptions was plainly bored. Then one Radiophon happened to say something about "Regeneration." Several faces brightened as if by magic, and the possessor of one asked us, "Do you really believe there is anything to this 'monkey' business?" —N. WAYNE BLACKFORD.

Looking Ahead

A-B-C Lessons for Indigest Beginners will start with the next issue of Indigest. The novel style of describing what the various parts are, and why it so, will do it and those wishing to tear their sets to pieces. Buy Indigest for indigestion next week from your most dyspeptic newsdealer—10c.

Sam Takes His Set Along



Condensed

By DIELECTRIC

You don't often hear of a broadcasting station deliberately setting up a competitor right in the same town and donating call letters in the bargain. Well, it seems that that is exactly what a popular station in Atlanta did (in a way). WSB lengthened its call into Wiunifred Susan Beatrice at the request of Mrs. Coker whose baby will transmit compass signals under that call until further notice—years hence.

Now turn your loop due north and you'll catch a new wrinkle from Calgary, Canada, where it is contrary to Radio law for two stations to communicate with each other directly, via the ether, some other means must be found, and this CPON did. Wishing to hear from the station at Telegraph Hill, in San Francisco, regarding the reception of their test program, they had the latter play certain music which would indicate whether it came through well or otherwise. Announcers are clever, sometimes!

I should like to think that the letter written to our consul in Calgary, Canada, from someone in Philadelphia, was really intended for printing in the column to your left. Indeed there are parts of the Dominion of Canada which compare with most anything we can show in the States, and some of their hotels would make you stop around to find their equal here. Furthermore, broadcasting stations in that part of America are right up to the minute. I was a Philadelphian—once!

Since the broadcasting station in the famous Eiffel Tower in Paris was put out of commission through its antenna being struck and destroyed by lightning, it is probable that the neighboring Germans are making merry over the fact. They complained that their own programs were interfered with by some disturbance originating in France. For the rest of Europe, however, this will be a distinct loss, as they were in the habit of tuning in this station for special news service.

We may look for an additional South American country to have its own Radio stations before very long, if reports coming from Chile are true. The interest in this fascinating adjunct to a happy home is decidedly on the increase among the Chileans, who are buying receiving sets in anticipation of the coming of broadcasting stations. At the present time they have to rely on picking up the programs from other more fortunate countries. This will make them expert in tuning later.

Transatlantic ship service is subject to very disagreeable surprises in the summer months due to the ice that floats across this international highway. We have not forgotten the tragedy which befell the Titanic a few years ago. Two coast guard cutters are to patrol the danger zone and warn ships twice daily via Radio of any danger.

When the President finally reaches Alaska he will find how vitally Radio affects the everyday life of those living in remote sections of the world. Remote from large centers of population with their telegraph and telephone lines giving easy access to intercommunication he will find Radio really essential for sending and receiving advice. There is but one cable from Sitka to Seattle, which sometimes breaks and when it does, nothing is left but to use the ether.

It was suggested at the time that Station WEAF made its test in transmitting a full program from New York to WNAC in Boston that this would lead to a series of toll stations over the country. The new station in Washington, which is practically a duplicate of WEAF, may perhaps be so utilized when occasion warrants it. This is owned by a member of the Bell system and may indicate the beginning of such a policy.

First Steps for Beginners in Radio

Chapter V—Tuners and Tuning

By Thomas W. Benson, A. M. I. R. E.

A TUNER is simply an arrangement of inductances and capacities capable, by reason of either or both of these devices being adjustable, of being put in resonance with a current of a given frequency. We have learned from the previous chapter how condensers and capacities function to control the length of time it takes for a current to flow or oscillate in a circuit.

When a circuit contains both inductance and capacity we can increase the length of time for one complete oscillation by increasing either of these factors. Now it is reasonable to assume and in fact it is found that the time constant of the circuit or the period remains constant if we increase one factor and decrease the other the proper amount.

Without going deeply into the mathematics of Radio we find that so long as

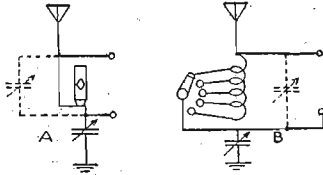


Figure 24—Various Tuning Devices for Single Circuit Tuners

the square root of the product of the inductance and capacity remain constant the period of the circuit and consequently the wave length it will respond to remains the same.

Tuners in Two General Classes
Returning to tuners, we can put them in two general classes, non-regenerative and regenerative. The former can be used with either crystal or tube detectors but the latter type can only be used with a three electrode tube. Non-regenerative tuners can be further divided into single and double circuit tuners. Regenerative tuners are also built in three circuit types.

A single circuit tuner is one in which but one circuit, the aerial, is tuned. In the chapter on aerials it was seen that the aerial itself accounts for half the wave length of the station to be received. The other half is made up by inserting inductance in the aerial lead and providing some means of adjusting the circuit to resonance. In Figure 24 are shown several methods of tuning the aerial circuit, the detector being usually shunted across the inductance to indicate the presence of currents.

Fixed Inductance

At A in the illustration is shown a fixed inductance, usually a honeycomb coil, with a condenser in series to tune the circuit. The effect of connecting the condenser in series with the circuit is to make the wave length shorter than if the inductance was used alone. The reason for this is that the tuning condenser in series with the aerial, also a condenser, is to reduce the total capacity in the circuit as we learned when considering condensers in series.

BEGINNERS will find the accompanying series by Mr. Benson very helpful in learning the rudiments of the popular science of Radiophony. The articles yet to appear are:

- Chapter VI—About Crystal Detectors.
- Chapter VII—Tube Detector Theory and Operation.
- Chapter VIII—The Regenerative Detector.
- Chapter IX—Radio Frequency Amplification.
- Chapter X—Audio Frequency Amplification.
- Chapter XI—How Super Regeneration Is Accomplished.
- Chapter XII—Reflex Circuit Operation.
- Chapter XIII—About Headsets and Loud Speakers.
- Chapter XIV—Batteries Used in Radiophony.

Should we desire to tune to a wave length greater than the inductance alone will give the condenser is connected in

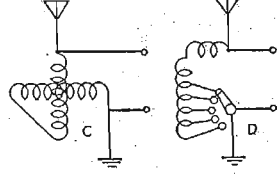


Figure 25—Types of Double Circuit Tuners

is shown a combination of a small variometer for fine tuning with a tapped inductance to increase the wave length.

The tapped inductance and stator of the variometer are all one winding, tapped about every 12 turns, and the rotor has 15 turns of wire. Thus with the switch on the first point only the small variometer is in the circuit. More inductance is then cut in with the switch as needed. This arrangement is selective and simple to handle.

In using these tuners it is always to an advantage to use as much inductance as possible and as little capacity as will give sharp tuning. The circuits shown are all non-regenerative and suitable for use with either crystal or tube detectors or for

aerial tuning when Radio frequency amplification is employed.

Double Circuit

We come now to double circuit, non-regenerative tuners. As the name implies two circuits are used, means being provided for controlling the coupling between them. The advantage of using a second circuit lies in the fact that we can construct this circuit with low resistance, with both capacity and inductance under control, thus enabling the oscillatory currents to build up to their maximum value without hindrance.

The old double slide tuner was really a two circuit tuner with close coupling. Thus, were we to take the arrangement shown at B Figure 24 and add another switch and a set of taps connected as shown in A Figure 25 we would have a double slide tuner circuit. There are now

two circuits, one from the aerial through the inductance and condenser to ground. (Continued on page 14)

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parallel with the product of the inductance and capacity remain constant the period of the circuit and consequently the wave length it will respond to remains the same. It might be worth noting at this point that should one experience difficulty in tuning the longer wave lengths with a series condenser it is only necessary to connect the condenser across the primary inductance to tune them easily.

Tapped Inductance

Considering the other circuits shown in Figure 24 we find at B a tapped inductance used with a variable condenser. This gives a wider range of tuning and is to be preferred to a large fixed inductance. With this arrangement the tuning is sharp and is as selective as can be obtained with a single circuit tuner. Here also the condenser can be shunted across the inductance but the series arrangement is preferable.

At C a variometer is used for tuning without a condenser. This arrangement is not so selective and is improved by the addition of a variable condenser. At D

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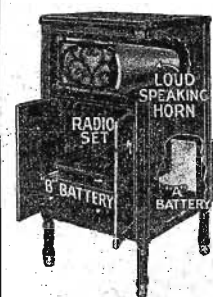
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Variations in Flewelling Circuit

Maker Claims Set Gets More Music, Less Noise

The two circuits shown are modifications of the Flewelling that have given the writer excellent results. The diagrams are self-explanatory. The top hook-up is

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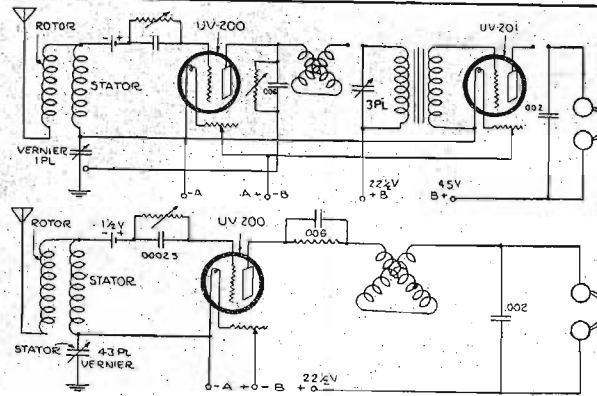
THERE are many little kinks worked out at home that would aid your fellow Radio worker if he only knew about them. There are new hook-ups, new ways of making parts and various unique ways of operating sets that are discovered every day. Radio Digest is very much interested in seeing such material. Send them in with full details, including stamped envelope so rejected copy may be returned. The work must be entirely original, not copied.

RADIO KINKS DEPARTMENT,
Radio Digest
123 West Madison St., Chicago, Ill.

the Flewelling variation with one step of audio frequency amplification. The bottom hook-up is the same variation practically with the exception that the stage of audio frequency has been removed. The binding posts are shown in the top diagram to explain how the step of amplification can be cut out.

The upper diagram shows a .006 mfd. condenser with a variable grid leak across it. Those who have had trouble with the critical Flewelling whistle can use this hook-up. It has volume galore, but for the person who has found the whistle a stumbling block let him use the second diagram. The volume produced by this hook-up is almost as good, with the added advantage of having the critical whistle eliminated. The lower hook-up is my favorite set, sometimes using one stage

ONE AND TWO TUBE CIRCUITS



has been a pleasure to tune in with the ten levers attached to the knobs.

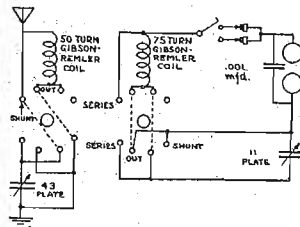
It is also quite necessary to keep the grid condenser and the 1 1/2-volt bias battery as far back in the set as possible.—O. F. Klein, Leduc, Alta.

Effective Height of Antenna

The element of the antenna which determines its ability to pick up or give off signals is its effective height. The term of effective height does not mean the height from the ground connection to its topmost point, but is more nearly the average height from ground connection to the center of its exposed area. For an antenna consisting only of a straight vertical wire the effective height is almost two-thirds its actual height, while for an antenna having a large horizontal top

Crystal Hook-up

The hook-up here given has proven very selective and effective on long distance reception for a crystal set. Some of the

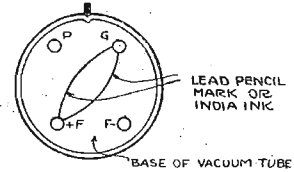


many stations heard are WEAJ, WOC, WLAG and WSB. A two-wire 65 feet in length aerial was used on the set.—Neill H. Martin, Wilmette, Ill.

Lines for Grid Leak on Bottom of Triode Tube

In operating vacuum tube receiving sets I have found that no two detector tubes are alike when it comes to the amount of current consumed and the resistance of the grid leaks which each requires. For the amateur who cannot afford to purchase several tubular grid leaks of different values, this kind which I have been using myself will prove quite a help.

Trace back from the tube socket and find which filament terminal of the tube is connected to the positive side of the A battery. After determining this, draw



with a soft lead pencil or a pen full of india ink, a line, or perhaps two lines, between this particular terminal and the grid terminal of the vacuum tube, as is shown in the accompanying illustration. The leak may be regulated by making the lines heavy or light as the case may be, and once adjusted it will always remain the same. Thus a separate grid leak may be had for each different tube used without changing any of the apparatus within the machine.

The one caution which must be observed is in determining the respective grid and positive filament terminals.—Howard R. Ackerman, Prairie City, Ill.

Use 25-ohm rheostats on 1 1/2-volt tubes.

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18	200	196	189	199	196	202	202	202	202	202	202	202
19	253	246	237	255	252	243	248	248	248	248	248	248
20	320	311	293	324	319	307	315	315	315	315	315	315
21	404	387	370	400	389	380	394	394	394	394	394	394
22	509	488	461	501	493	479	497	497	497	497	497	497
23	642	612	584	632	621	600	622	622	622	622	622	622
24	810	763	745	799	779	750	781	781	781	781	781	781
25	1019	952	909	1008	966	933	982	982	982	982	982	982
26	1286	1201	1118	1283	1202	1156	1232	1232	1232	1232	1232	1232
27	1620	1500	1422	1584	1543	1457	1548	1548	1548	1548	1548	1548
28	2042	1960	1759	1988	1917	1824	1946	1946	1946	1946	1946	1946
29	2570	2370	2207	2520	2485	2388	2433	2433	2433	2433	2433	2433
30	3213	2860	2529	3165	3009	2810	3031	3031	3031	3031	3031	3031
31	4022	3482	2768	3932	3682	3473	3793	3793	3793	3793	3793	3793
32	5132	4234	3737	4913	4654	4267	4737	4737	4737	4737	4737	4737
33	6445	5141	4697	6129	5689	5267	5956	5956	5956	5956	5956	5956
34	8093	6317	5153	7848	7111	6461	7427	7427	7427	7427	7427	7427
35	10197	7755	6737	9980	8856	7835	9207	9207	9207	9207	9207	9207
36	12890	9311	7817	12462	10869	9437	11455	11455	11455	11455	11455	11455

of amplification. However, it gives wonderful results with the detector tube only as shown.

It is important not to use plate voltage above the amount stated in each case, except where 45 volts is indicated. This may be increased to 67 1/2 volts, but I find 45 volts quite sufficient. In fact it will give results on one-stage of amplification with 22 1/2 volts.

Allow me to emphasize that connecting the variocoupler in this way saves one variable condenser. I have tried several variocoupler hook-ups and they will work, but when it comes to loud signals, mine seems to be best. The 1 1/2-volt grid bias battery on the detector tube is not an absolute necessity, but it helps to increase signals.

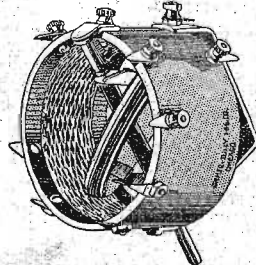
Stress should be laid on the little rubber covered levers that I attach to my dials. These are better than tin foil and other methods of shielding from body capacity. It is often impossible to tune without some means to turn the dial at a distance. It

structure the effective height is very nearly the actual height. The only purpose of the horizontal top element of a receiving antenna is to give a greater effective height for a given actual height.

The filament posts in 1 1/2-volt tubes are diagonally opposite, while in the 6-volt tubes they are adjacent.

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Characteristics of Some New Vacuum Tubes

Part III—Curves for Five More Triodes; Conclusion

By H. J. Marx

SINCE the first part of this series was written, a multitude of tubes have been tested. Often three and four of one type have been required in order to get the average value. Where unusual curves were discovered a number of the

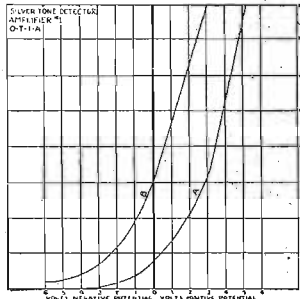


Figure 9

same tubes were obtained from average dealer stock, if possible, and were tested to substantiate the curves given. In one or two cases, however, only one tube was available and time was lacking to send for more. This is mentioned in the remarks referring to these particular curves.

Undoubtedly there will be many cases where occasional tubes will show much better curves—also some much worse. The curves given are presented as average values. Slight variations in filament voltages will usually make but little difference in the curves. As the plate voltage is increased the critical point of grid potential moves back further and the grid requires a more negative value.

"Bumpy" Curves

A "bumpy" or uneven curve, if very marked, makes the tube impractical for use. The uneven sections of the curve create an uneven plate flow, producing distorted reception. A tube of this type is very apt to be rather noisy in addition. If the filament of a tube lights unevenly, that is, shows brighter in some spots

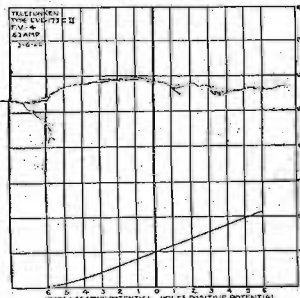


Figure 10

than others, then the chances are its life will be short. The bright spots are the thin or weak spots and will burn out rapidly. If uniformly lighted the filament resistance is uniformly distributed and gives much longer service.

Later on these characteristics of vacuum tubes which effect the methods of

coupling in stages of amplification, and circuit interaction will be taken up in conjunction with the characteristics of the balance of the apparatus used. The influx of new tubes on the market has made it difficult for the fan to realize that the transformers must be so designed as to work best with the particular types of tubes used. Most of the present transformers are not balanced well with the many new tubes that have been introduced. It is anticipated that quite a number of new tubes will be introduced in the Fall and also the Spring of next year. This naturally will necessitate numerous new transformers to work with these tubes.

Silver-tone Tube

This tube has aroused considerable interest because of several unusual characteristics. It operates on a filament voltage of 3 and consumes but .15 amperes. It has a standard base and fits the regular socket. A 6-ohm rheostat can be used if the storage battery is tapped at two cells. If three dry cells are used it is best to connect a fixed resistance of about 6 ohms in series in order to get the proper range of operation.

The first tube tested showed a remarkably good curve—so four were obtained—of these two were just as good while the

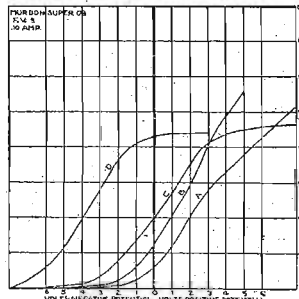


Figure 11

other two were rather mediocre but by no means bad. The three good ones were tried out in the Reflex De Luxe and the reception was exceptionally good although the tube was very microphonic, that is any mechanical disturbance or knock created an unpleasant clatter in the reception. It is understood that because of limited manufacturing facilities quite a few were made that do not show up so

well, but it is also said that these difficulties have now been overcome.

The curves of this tube, type OT1A, are shown in Figure 9. Curve A was developed with a plate potential of 22½ volts, when this was changed to 46 the curve B was worked out.

Telefunken Tube

The opportunity of testing an old type German tube was presented and taken advantage of for general interest. The date on this tube was March 6, 1920. The filament voltage was 4 and the current consumption was .63 amperes. The tube required a special socket. Only one plate voltage curve (85) was taken and is shown in Figure 10. Variations made but little difference. The curve is very uniform but its efficiency is low compared to the latest developed tubes.

Murdon Super 08

One of the more modern tubes is the Murdon Super 08. Its curves are given in Figure 11. This tube uses a filament voltage of three and consumes only .1 ampere. The curves are fairly uniform and good results should be anticipated from a tube of this type. No reception tests were made due to lack of time. Further details will be furnished later.

Curve A was taken with a plate voltage of 21; B with 29; C, 45; and D, 87.

This tube has a standard base and fits the regular socket. The same rheostat conditions hold true for this tube as for the Silver-tone. When the plate voltage runs above 80 a grid biasing battery is necessary.

Mercury Tube

Another tube, considerably advertised, is the Mercury 1½-volt tube. The current consumption of .98 ampere is rather high. If dry cells are used for filament lighting, about 3 should be connected in parallel, not in series. This tube has a standard base. The ordinary 6-ohm rheostat will give sufficient regulation of the filament current.

The curves are shown in Figure 12, A giving the values with 15 volts on the plate, B, C and D with 18, 21 and 22½, respectively. While the higher plate voltages show excellent curves yet the decided "bumps" in each curve is detrimental. If the grid potential is so ad-

justed that the operating range does not take in this part of the curve, then results will be satisfactory. Otherwise distortion will be noticed. Since only one tube was available for test, it could not be confirmed whether or not other tubes of the same

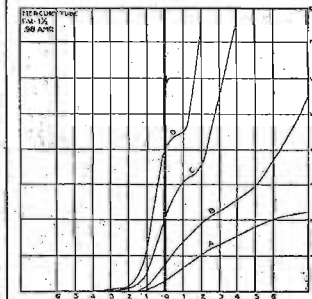


Figure 12

type would have similar characteristics. Undoubtedly there may be many such tubes. Although the curve may be more regular, yet they may not all show as efficient as the first would indicate.

Philips Amplifier

In the curves presented in Part II of this series was a set of a Dutch Detector (Continued on page 14)

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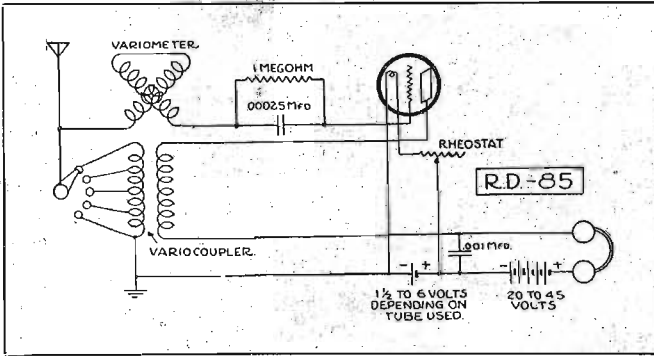
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A variocoupler is used, with the rotor acting as a tapper. The antenna circuit is tuned by means of the tap switch on the primary. The grid circuit is controlled by means of a variometer. This circuit permits strong volume and at the same time permits very good selectivity.

A variable grid leak can be substituted as the opportunity of grid adjustment will permit better results with any change in tubes used. The filament battery can be

made up of dry cells connected for the voltage required.

Any small suit case makes a convenient cabinet for a portable set. Half the space should be divided off for panel and instruments, while the other half should be laid out for battery cells and receivers. Apparatus preferably should be panel mounted—and the panel should be removable so that all apparatus is accessible. Tube sockets should be mounted on some form of cushion base in order to reduce the possibility of jars and shocks to a minimum, thus avoiding damage to tubes. This will also reduce the microphonic tendency of peanut tubes.

FIRST STEPS IN RADIO

(Continued from page 11)

the other comprising part of the inductance and the second variable condenser. Currents in the aerial circuit would induce a current in this second circuit and by tuning both circuits an increase in signal strength would be noted due to the low resistance of the second tuned circuit.

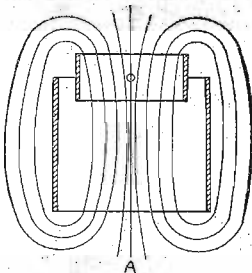


Figure 26A—Rotor of Coupler Lies Parallel to the Stator

However, the coupling between the two circuits in a double slide tuner is fixed so the second circuit cannot oscillate freely because some of its energy would be returned to the aerial circuit. To overcome this retransfer of energy two separate coils are employed as shown at B Figure 25.

These coils are usually wound on tubes of such a size that the secondary winding will slide into the primary or aerial circuit winding. By sliding the secondary in and out the coupling, or the number of magnetic lines of force from the primary coil acting on the secondary is varied. With this arrangement, known as the loose coupler, the secondary can oscillate freely and the amount of energy retransferred to the aerial circuit kept at a minimum.

Honeycomb Coils as Tuner

Two honeycomb coils mounted in a two-coil mount with variable condensers for tuning is another form taken by two circuit tuners suitable for use with crystal detectors. As a rule a 43-plate condenser having a capacity of .001 mfd. is used in the primary circuit while nothing larger than a 23-plate or .0005 mfd. variable condenser should be used in the secondary circuit. The use of a larger condenser will reduce the signal strength by reducing the voltage applied to the detecting device.

The more modern form of the double circuit tuner utilizes a variocoupler, turning the secondary winding at an angle with the primary to vary the coupling instead of sliding the secondary out of the primary as was done in the loose coupler.

The action taking place in a variocoupler is shown in Figure 26. In Figure 26A the rotor is shown lying parallel to the stator in which position the lines of magnetic force from the primary moving at right angles to the turns on the rotor induce a maximum amount of current in the rotor or secondary circuit. This means the energy transfer is the greatest when the rotor is in this position.

When the rotor is turned at an angle (Figure 26B) the lines of force do not cut

the coil at right angles and the transfer of energy to the rotor is much less, thus the coupling between the circuits is looser.

In a plain two circuit tuner using a variometer, a condenser is connected across the rotor to tune the secondary circuit or a variable inductance such as a variometer is added in series to tune the circuit. With the average variocoupler the inductance of the secondary is so low that a large variable condenser is required to tune the circuit which has the effect of weakening the signals so an additional inductance is usually necessary.

It is not necessary that the primary of a double circuit tuner be tuned as sharp as the secondary and for that reason use

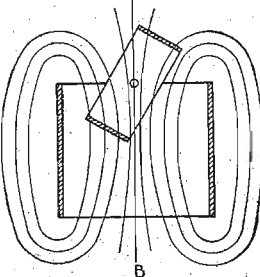


Figure 26B—Reducing Energy by Turning Rotor Nearer Right Angles

is often made of single taps for fine tuning. This will usually be found sharp enough for most conditions and the variable condenser can then be eliminated in the primary circuit.

The three circuit tuner mentioned previously is not suitable, in fact, cannot be used with a crystal detector and is of the

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regenerative type and will be taken up in detail later. All the tuners described in this chapter can be used with a crystal detector, and with modifications to be covered later, are used with regenerative tube detectors.

Selection of a Tuner

In selecting a type of tuner it is well to bear in mind the following:

A single circuit tuner gives the loudest signals, is easier to tune and simpler in construction. However, it is not as selective as a double circuit tuner and is more subject to interference from spark sets, static, etc. On the other hand the double circuit tuner is more selective and works more consistently over long distances and will work through heavy interferences where a single circuit tuner would be practically useless. It is interesting to note that single circuit tuners were declared unsuitable for long range work back in 1912 and more than ten years later we find them the most generally used type.

Methods of employing regeneration with these tuners will be taken up in the chapter on regeneration while the next chapter will cover crystal detectors and give instructions for obtaining the best results with these instruments.

(TO BE CONTINUED)

CURVES OF NEW TUBES

(Continued from page 13)

Tube. The amplifier of the same make known as Type D11, has a similar filament voltage of 3.5 and current consumption of .5 ampere. Like the detector bulb it has a standard socket base.

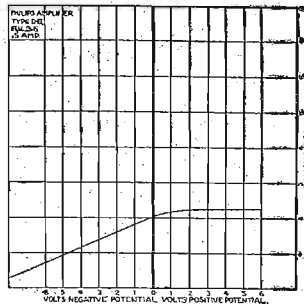
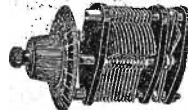


Figure 13

The characteristic curves are given in Figure 13. Variation in plate voltage made but little difference in plate current so only one set of readings for the curve were taken, leaving the plate voltage at 75. It might be stated that on previous tests of this type of tube the curves were very much more efficient. No other tubes were immediately available, however.

This concludes the series on tube characteristics. As new tubes are placed on the market they also will be tested and the curves and full details will be given.

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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, 75 cents.

Elements of Radiotelegraphy. By Elyer 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. Packard 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.

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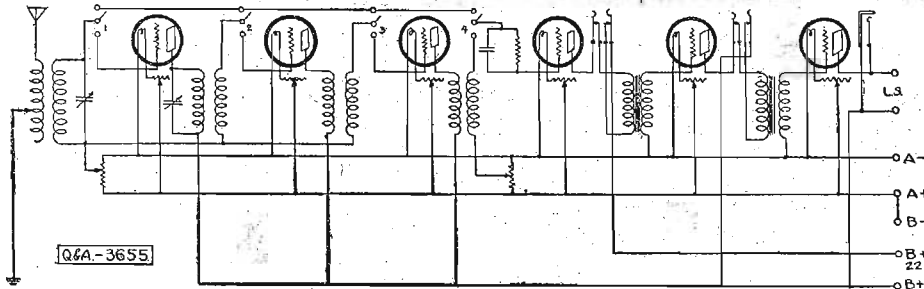
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Questions and Answers

Six Tube Circuit

(3645) CH, Chicago, Ill.
 Can you show me how to put switches on my set which I am using, having three stages of Radio frequency, detector and two of audio? I want to cut out the Radio amplification by means of switches when getting local stations. I do not want



to use filament control jacks for the audio frequency.
 A.—In circuit diagram given above, the switches are single pole double throw switches. If the detector alone is to be used, without R.F. amplification, the switch arms of one and four are thrown up while two and three are left open. When R.F. amplification is desired, four and one are both thrown down, then the position of two and three can be set for the number of stages desired.
 The audio frequency jack system is standard and requires no explanation. The condenser in the primary of the first R.F. transformer is a variable with a capacity of about .00025 mfd.

Condenser Capacity

(2854) L.L.H., Long Branch, Ontario.
 I have a good number of copies of your paper and keep them on file for the valuable information they contain. However, I have had some trouble in calculating the capacity of a condenser by the formulae given by P. J. M. Clute in September 2, 1922 issue, page 11. In the formula

$$C = \frac{4 \times 8.1416 \times D}{\text{Mr. Clute says } S \text{ is}}$$

the area of one plate. According to this a condenser with one plate would have the same capacity as one with 100 plates. Is not something wrong with this formula?

Even with a two plate condenser it seems to talk nonsense. Is it intended that this formula should apply to all types of condensers?

I have made several condensers out of brass tubing, one tube sliding inside the other, with wax paper for dielectric. Length, 5 inches; inside diameter of larger tube, 1 1/8 inches; outside diameter small tube, 1 1/4 inches. Please tell me as nearly as possible the capacity of this condenser, using wax paper, and also mica as dielectric?

A.—Answering your inquiry with reference to formulae for computing capacity of condensers, as appearing in Radio Digest will advise that it is correct for a condenser of two plates. For additional, multiply by the increased number.

I would estimate the capacity of condenser described as approximately .0005 mfd. The difference in thickness of the waxed paper and mica is not stated, so it would be impossible to estimate the capacity of condenser of mica construction.

B Batteries

(2896) C.I.W., Washburn, N. Dak.
 I have recently purchased storage B batteries and I am obliged to ask that you

advise me how I may determine the condition of the batteries as a whole or in part. I find that a hydrometer cannot be used satisfactorily for this.

Since you recommend the use of a voltmeter I am obliged to ask that you advise further as to type of voltmeter required for giving correct reading of A and B bat-

I have been unable so far to receive anything during the daylight broadcasting hours, and would appreciate any information you could give me in regard to what to do in order to receive daylight broadcasting.

A.—We are glad to congratulate you upon your satisfactory operation of the

teries, also ammeter for testing A batteries. I am considering incorporating both instruments in panel form in my set and will ask that you advise proper type to procure. I believe these should be for direct current, but am not sure what divisions should be or capacity best suited for my needs.
 A.—Answering your inquiry with reference to testing B batteries will advise that a voltmeter should be placed across them while set is in operation. If a 22 1/2-volt battery tests lower than 18 volts it is ready for the ash can. This test must be made while set is in operation as batteries will almost immediately resume their rated voltage otherwise. This method may also be applied to A batteries, although a hydrometer will more nearly determine actual condition.
 Any standard D. C. voltmeter with scale reading from 0 to 25 or 50 will serve.

Daylight Reception

(2894) G.W.D., Laurel, Miss.
 I have been a reader of your Radio Digest for the last five or six months, and wish to congratulate you on publishing one of the most wonderful pieces of Radio literature in the Radio field.
 Through the information and recommendation of your paper I ordered one of the famous Flewelling circuits. This circuit has just been completed and placed in operation, and has proven to be a most wonderful receiver.

For an illustration, the Friday midnight concert broadcast by Station K.Y.W. of your city was brought in as clear as if it were Detroit, Michigan, also came in very loud and as clear as any station brought in that is not over two or three hundred miles distant.

Flewelling circuit. It has many enthusiastic users and never fails under skillful construction to afford the results claimed for it.

In the matter of daylight reception of broadcast it is recognized to be less favorable than at night due to the partial ionization of the air by the sun's radiation. There is less reflection of what is known as space wave in the daytime consequently guided wave (electromagnetic) will not be assisted materially by any reflected or refracted part of the space wave. At night, however, when the upper boundary is more sharply defined, there is more reflection of the space wave, and in general signals received at night are stronger than in the daytime.

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R.D.-73
 (2281) A.B.B., Fond du Lac, Wis.
 I wish to build Hook-up Diagram R.D.-73. Please explain coils L1, L2 and L3, also other coil in middle left of diagram. I wish to use set for 350 and 400 meters. Can the new type C-301A Cunningham amplifier tubes be used in this set?
 A.—Referring to Radio Digest diagram 73, the descriptive details accompany diagram as does also table for computing wave length values of honeycomb coils to be used if chosen; variocoupler or loose coupler may be employed if preferred. Further details will appear shortly giving constructional data, panel layout, etc. The new Cunningham 301A tube will work to perfection in this circuit.
Glass Panel
 (3478) GAL, Olustee, Okla.
 I am making a Flewelling set on a glass panel. Have all the holes bored and about all installed. I have had Radiophans tell me that glass will not work for a panel, and that it is not a good insulator. Please advise me, as I have always thought that glass was as I near 100 per cent as any material.
 A.—Answering your inquiry with reference to the properties of glass used as a panel for Radio receiving set, we are advising that it makes a wonderful panel, being one of the best insulators known.

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Della Vanna, formerly of the Greenwich Village Follies and now one of Hollywood's film colony, is not only a favorite with KFI listeners but is herself an ardent Radiophan. Miss Vanna says that nothing is more relaxing after a hard day's work at the studio than to make herself "comfy" and tune in on local stations. There is no better tonic for the tired nerves than good music. With the Radio set entertainment may be had with little effort



When you go parading or shopping on Fifth Avenue take along your receiving set. This is accomplished by placing the set on a tea wagon. The picture shows Miss Anna Tinsler parading on Fifth Avenue, New York City © K. & H.

Even the largest set can be made portable. Gladys Jones is shown with a long distance receiver in the North Woods, where she is on a camping trip.