LIST OF STATIONS BY CALL LETTERS!

April 6th, 1929  
15 Cents

Interference Cures  
By Standards Bureau

Moore-Daniels  
As AC Receiver

McMurdo Silver On  
New AC SG Tube

LACAUULT’S LAST CIRCUIT—RE 29!

“The most sensitive receiver I ever developed,” said R. E. Lacault, speaking of the RE 29, illustrated here. See Lacault’s article on pages 12 and 13.

Saltzman  
Appointed to Federal Board

Boys to Sail 'Round World  
In Radio Test!

Crooks Prey  
On Listeners in Sales Talks

RCA Television Being Sent in Regular Tests!
In this issue of "Radio World" there appears the Bureau of Standards report on Electrical Interference. Trutone executives, after careful reading, fully concur with the statements made by the Government investigators and further state:

"Trutone engineers after years of experimentation produced the Si-Len-Ser line noise eliminator, a true choke coil and filter condenser device."

The tremendous success of the Si-Len-Ser is due to its practical working efficiency and the fact that where filtering devices are imperative radio dealers, fans and listeners prefer to buy a ready-made, efficient device that can be instantly installed without tools or trouble, than to try to build one.

Si-Len-Sers are sold by all good dealers and stocked by the country's best jobbers. Dealers and jobbers should write to the TRUTONE RADIO SALES CO., 114-116 Worth Street, New York City, for details of this marvelous selling proposition. Radio fans, custom-set builders and others may buy the Si-Len-Ser from all good dealers, list price, $12.50. If your dealer does not stock it, it will be sent you direct on receipt of price.

**Bureau of Standards Report on Interference**

**Conirms Design**

**Good Receivers Deserve Good Parts** Logically the Designer of the MOORE-DANIELS RECEIVER Uses the HAMMARLUND Midline Condenser and Drum Dial

Hammarlund Condensers, Drum Dials, Space-Wound Coils, R. F. Chokes and Equalizers make any receiver better. Your dealer sells Hammarlund Parts

**Hammarlund MFG. CO. 424-438 W. 33rd St., New York**

**Moore-Daniels Coils-Kits-Parts-Sets**

Blue Prints $1.00 MOORE RADIO CO.

74 Cortlandt St., N.Y.C. Suite 302

**VICTOREEN Super Coils** Write for Free Bulletins of New Victorian Circuits

Geo. W. Walker Co. 255 and 256, for standard use in first and second stage respectively. Each $6

255 Output Transformer... $5

Also a full line of push-pull transformers and chokes.


**RATHEON MFG. CO. CAMBRIDGE, MASS.**

"Aero-Call" SHORT WAVE CONVERTER Factory-Built, Ready to Plug Into Your Set This amazing instrument now sets a new peak for your set. You can plug it into your set, and within minutes you can receive short wave stations in all parts of the world.-England, Germany, Holland, India, Australia, Brazil, Argentina, and many others! Write for catalog and price.

**Kino-Lamp Photo-Cell**

Already Raytheon has stacked television tube past the "something that works" stage to a point where reliability and long life are added to practicality. The Raytheon Kino-Lamp is the latestтелевизионный приемник, классифицированный как "лучший" адаптирован для всех систем и сделан в нескольких типах.

List Price, $7.50

**RADIO WORLD** April 6, 1929

Two Outstanding Raytheon Television Achievements

**HAS YOUR SET WEAK LUNGS?**

Does it seem to that clashing with a full voice? Probably your volume is too low for the room or if operated on low resistance in one or more sections of valve circuit. Use a STANDARD CLAROSTAT across various sections. You'll be surprised. But that's only typical of what CLAROSTATS can for weak radio lugs.

**CLAROSTAT MFG. CO., INC. 291 North 6th St., Brooklyn, N. Y.**

**Lynch Tub-adaptors for Better Tone.** Installed in ONE minute. Small cost.

**Arthur H. Lynch, Inc.** 1757 Broadway New York City
A new sea radio station, WHDC, has been installed on the fifty-foot sail boat, The Nomad, on which two young adventurers sailed from San Francisco to Los Angeles. Trip around the world in quest of adventure and education. The boy mariners are Dan C. Blum of Chicago, son of a retired merchant, and Stephen Miranda, of Los Angeles.

In a small radio shack on board the sailing craft, now being fitted out in Seattle, both a short-wave and a long-wave set have been installed. For the antenna installation they have used the only available points of suspension, about fifty feet between the two masts.

Will Rely on Radio

On top of these they have built two spruce towers, giving the aerial a height of 55 feet at one end and 45 feet at the head-end, giving excellent facility for short wave system. By the combination short and long-wave sets the juvenile adventurers will be able to send and receive distress signals, get radio compass bearings and weather reports.

With this equipment, designed by Otto Johnson, the Nomad expedition is assured of a clear, high-fidelity 1,000-cycle note when either set is functioning on the ship's motor generator; also a 120 cycle low pitched note which has proven to carry well at great distance under heavy interference.

Miranda an Amateur

WHDC is not only identified with the Amateur Radio Relay League by virtue of the designer's membership, but will be operated by Miranda, who also is a member. Round-the-world direct communications schedule will be attempted between stations WHDC and W6BRO, of Los Angeles. The transmission experiment is planned to last during the entire cruise of the Nomad.

The Nomad will sail from Seattle to San Francisco, where it will make a week's stopover before proceeding to Los Angeles. Several weeks will be spent in Los Angeles, where motion picture equipment will be taken aboard with which the boy Nomad will build and develop their world adventures. The Nomad will embark under the auspices of the Adventurers of the World, whose flag the craft will fly.

From North Sea to Home

The itinerary will then take the ship from Panama to the South Seas. From there the Nomad will sail for Australia, the Philippines, China and Japan. Next come Siam, Africa and the Mediterranean sea ports, finally the North Sea.

Europeans take the radio seriously; Americans do not.

Glady's M. Petch, pioneer woman broadcaster of Europe, expressed this opinion recently over KGO, the General Electric station at Oakland, Calif., as follows:

"In London of English and Irish parents, Mrs. Petch has lived in Los Angeles, for four years.

"Norwegians," she explained, in a still-English accent, "are most frightfully keen about anything that will improve their minds. For years I taught English over the radio in Norway, and had a most enthusiastic audience.

"In other countries of Europe," declared Mrs. Petch, "people are equally anxious to learn by means of the radio. Shakespearean plays are very popular over the air, and as on the stage, and the very best music is in great demand.

"Here in America the radio is thought of more as a medium of pleasure. But I do think that the standard of programs in this country is being raised. I can notice the improvement that has taken place since I visited the United States last year."

WTIC ON MOUNT TO USE 50 KW

HARTFORD

WTIC, the station of the Traveler's Insurance Company of this city, will go on the air with its new 50-kilowatt transmitter. The plant is located on top of Avon Mountain at an elevation of 700 feet above sea level. This location was selected as the best after a series of tests, in which ninety different places were tested for interference, terrain and power absorption.

Three 200 foot towers support the antenna, which has been constructed so that most of the power will be radiated westward. The towers are painted with orange and black with white stripes separating the colors. This coloring will be a guide to aviators, and the towers will be illuminated at night so that aviators will be able to see the towers at all times.

The exterior portion of the plant, which is finished, covers an area of 75x45 square feet. The building is shielded with copper wire screening, which is electrically connected with all structural steel, plumbing and the specially constructed grounds.

The studios will be in the city where the programs will originate.

2 BOYS IN BOAT TO SAIL 5 YRS. IN RADIO TEST

WASHINGTON

President Hoover has appointed Major General Charles McK. Saltzman, former Chief of the Army Signal Corps, as a member of the Federal Radio Commission, to represent the Fourth or Middle Western Zone. Major General Saltzman succeeds Sam Pickard, who resigned February 1st to join the Columbia Broadcasting Company as vice president.

With U.S. Listeners

President Hoover was debating whom to appoint to succeed O. H. Caldwell, who resigned from the Commission on February 23rd. Arthur Bacheller was nominated by former President Coolidge to succeed Mr. Caldwell, but the Senate failed to confirm the nomination.

One of those considered to fill the vacancy caused by the resignation of Mr. Caldwell was Captain David W. Dodd of the Navy. Capt. Dodd, who is eligible for retirement, has been chief of the Division of Communications of the Army. He is a Democrat.

In order that Captain Dodd may receive the appointment and the confirmation of the Senate he must qualify as a Democrat. The law creating the Radio Commission provides that no more than three of the members shall be members of the same political party. Three of the present Commissioners are Republicans and only one is a Democrat.

Dr. J. H. Bellinger, chief of the radio laboratory of the Bureau of Standards, who had been acting chief engineer of the Radio Commission, returned to the Bureau of Standards. He had been loaned temporarily by the Bureau of Standards to help the Commission with the frequency allocation problem.

Captain Guy Hil, an Army engineer temporarily in charge of broadcasting for the commission, it is said, will succeed Dr. Bellinger as chief engineer.

Vol. XV, No. 3. Whole No. 267 April 6th, 1929

Eighth Year

Latest News and Circuits Technical Accuracy Second to None

"UNINTERRUPTED READER INTEREST EVERY WEEK—EVERY YEAR"
RAYTHEON HAS TUBE LICENSE; FIRST BY RCA

The Radio Corporation of America has licensed the Raytheon Manufacturing Company of Bridgeport, Conn., to manufacture and sell tubes under the patents held and the processes developed by the RCA and its associates. General James G. Harbord, president of RCA, announced.

General Harbord declared that the arrangement would give additional stabilizing influence to your industries.

"The leading electrical interests of the country associated with the Radio Corporation of America," General Harbord said, "have spent millions of dollars in research and development to perfect the modern radio tube, which is the heart of the all-day radio set. The ordinary efficiency of the modern set rests largely upon the developments given to the world through these electrical laboratories.

Extension of Policy

"Approximately thirty of the leading manufacturers of radio receiving sets now share the licensing policy of the Radio Corporation of America. In granting this license to Raytheon, the Board of Directors extends a policy that affects the interests of the great listening public as well as the industry as a whole.

"Raytheon First Licensee

"Raytheon, through extensive laboratory research, is the leader in the developments that have resulted in electric power sets and made valuable contributions in producing effective tubes for B battery elimination. The rapid growth of incandescent lamps is a further contribution to the tube's part in better reception.

"It is fitting that the Raytheon Company, which has rendered so much engineering service to the industry, should be the first to take a license from Radio Corporation of America, which will insure a closer cooperation between the laboratories and should result in benefit to the radio industry in general."

‘And So to Bed at 10’

Not the Rule Any More

"People used to go to bed at 10 p.m. because there was nothing else to do after that," said C. A. Earl, president of the Charles Freshman Company.

"Recently a representative visited every home in a group of ten apartment houses in the center of a residential section of New York City from 10:30 to 11:00 p.m. to find out what percentage of the families were awake at that time and to whom they were listening. He knocked on 424 doors during the course of his survey and found that 200 families were awake.

"The investigator, Joseph M. Kohler, reported:

"Of two hundred families who were awake, one hundred talked to your investigator, and the rest shut their doors in his face. There is no doubt to the fact that they weren't dressed to receive visitors."

Oil Prospectors Get Wave Lenses

WASHINGTON: Twelve licenses for radio stations to be used in exploration for oil and in communication between geophysical exploration parties have been granted by the Federal Radio Commission to the Interstate Geophysical Exploration Company of Texas, Louisiana, and New Mexico.

Under the terms of the licenses, communication on any frequency assigned shall be confined to messages and signals concerned with geophysical surveys in the field. The Federal Radio Commission issued the sixteen licenses for the twelve licensees for WCR, WRF, WRT, WRS, KRF, KPU, KPT, KPF, and KOA.

At the hearings on the applications for these licenses representatives of the applicants enjoyed the experience of testifying in the only practicable means for communication, as telephone lines cannot be established in the barren oil-field areas.

WGY RELAYS DUTCH STATION

Schenectady, N.Y.—WGY’s 50,000-watt transmitter got behind PXI of Huizen, Holland, recently, and as a result everyone tuned to the Schenectady station enjoyed the experience of listening to music and speech from the land of tulips, canals and windmills.

For 36 minutes the signals of the Dutch station were on air by WGY, and listeners found that at times the signal quality was as clear as the studio output of the General Electric Station. The strength, as a whole, was on a par with any rebroadcast of a foreign station made by WGY.

For years WGY, through its short wave station, has been promoting good-will. foreign countries toward the United States. Four years ago WGY first rebroadcast 2LO of London. The English station has been heard many times since. In 1927 WGY relayed station 2FC of Sydney, Australia.

The station acquired from PXI gave its announcements in both English and Dutch and requested reports from the Dutch listeners on the quality of the signal.

PXI operates on 16,88 meters, and the schedule is Monday, Wednesday, Thursday, and Friday 8:00 to 11:00 o'clock a.m., E. S. T. WGY will again rebroadcast the station if the signal is received with adequate volume. The signal is picked up at the receiving laboratory of the General Electric Company, several miles from the transmitting station, on a number of cases of the country comparatively free from man-made forms of interference.

Subjects to be Reported

"No advertiser using the facilities of this station shall be permitted to broadcast any accepted form of advertising into disrepute.

"All material used by this station, in the furtherance of the interests of any commercial institution using the services of this station, shall be accurate and truthful.

"So far as it is within their ability so to do, this station will not furnish material used by representatives of the commercial institutions who have engaged the services of this station, shall be accurate, truthful and not in conflict with the ordinary tenets of good business and fair play.

Six Vice-Presidents

M. H. Aylesworth, president of the National Broadcasting Company, announced today the appointment of six vice-presidents, who will serve in addition to George F. McClelland, functioning as executive vice-president and general manager. The new vice-presidents are:

John W. Elwood, present manager of Program Department, New York; George Engels, present managing director of the National Broadcasting and Concert Bureau, New York; Frank Russell, formerly of the Department of Agriculture, Washington, D. C.; Niles Trammel, present advertising director, Western NBC offices; and Don E. Gilman, present manager of San Francisco NBC offices. A. L. Ashby, New York, will be vice-president and general attorney.

The Code ADOPTED TO RID AIR OF FRAUD OFFERS

St. Louis.

A movement to prevent the broadcasting of misleading, fraudulent or misleading advertising over St. Louis commercial radio stations was inaugurated by KMOX, KWK and WIL in conjunctin with the Better Business Bureau of St. Louis.

Standards suggested by the bureau and governing the type of material used by radio stations have been adopted. Any radio station already strict censorship being exercised over the present material sent out over these stations.

Dr. Poor, general manager of the Better Business Bureau of St. Louis, said: "Fraudulent advertisers are attempting to use the facilities of commercial radio stations in various parts of the country to foist their schemes upon the public. Barred from newspaper advertising and in many instances barred from radio advertising, individuals are turning as a last resort to the radio stations to get their messages to the public."

The standards adopted by the St. Louis stations follow in part:

"This radio station agrees to refrain from doing or saying anything which might bring any accepted form of advertising into disrepute."

Standards Given

"This radio station agrees to a just respect and consideration for competitors, avoiding derogatory statements regarding the advertising, advertisers, equipment, quality of programs, etc., of competitors.

"This radio station agrees to the policy of clearly indicating to listeners the source and purpose of all commercial advertising matter broadcast."

"All material used by this station, in the furthrance of the interest of any commercial institution using the service of this station, shall be accurate and truthful."

"So far as it is within their ability so to do, this station will not furnish material used by representatives of the commercial institutions who have engaged the services of this station, shall be accurate, truthful and not in conflict with the ordinary tenets of good business and fair play."

Appointed by NBC
RCA TELEVISION SENT STEADILY FOR 8 MONTHS

A regular schedule of television transmission is now being maintained by the Radio Corporation of America at its plant at 411 Fifth Ave., New York, according to Dr. Alfred N. Goldsmith, chief broadcast engineer and vice-president of the corporation. Work began about eight months ago, or in August, 1928, and much experimental work has been conducted since that time, although few listeners have been aware of it.

Daily Schedule

The present daily schedule is from 7 to 9 p.m., and the transmission is on the channel 2,000 to 2,100 kc. (145.9 to 148.2 meters). The pictures are 60 scanning lines high and 72 equivalent elements wide. The speed is 20 pictures per second, requiring a speed of 1,200 revolutions per minute of the scanning disc.

Synchronous speed is at present maintained by means of a 60-cycle synchronous motor, but many other methods of synchronization have been tried, according to Dr. Goldsmith. The direction of scanning, and therefore the received picture, is from left to right and from top to bottom, or in the same direction as printed matter.

Expects a Public Service

Dr. Goldsmith said: "This work, it is contemplated, will in due course evolve into a service to the public on a commercial basis similar to broadcasting. Actually, there are several purposes being pursued."

"First, we are making a radio survey of the field strength, absorption and fading of a television modulated wave in New York and vicinity. We are investigating the possible production of multiple pictures, such as occurred during transmissions on sixty meters, when we found multiple pictures only several miles away."

"Our second purpose is to study and improve transmitter apparatus. We are learning many things from practical experience here in the studio."

"In the third place, we want to know the receiving conditions best for television service, and the best types of receiving arrangements."

"Our fourth reason, which is the most important one, is the laying of a foundation for something that may evolve into a service for listeners."

"Meanwhile, another station is being completed by the Jenkins Television Corporation in Montgomery County, Maryland, under a license calling for a band between 2,850 and 2,950 kc., or approximately 103 meters, with unlimited time."

Indirect Scanning Used

Transmissions now consist of pictures, signs and views of persons and objects. Frequently announcements are made by transmitting a picture of the call letters of the station, W2XBS. The equipment is in a room adjacent to one of the recording studios of Photophone, Inc., an RCA subsidiary. Actors from the sound movie studios frequently appear before the photocells which pick up the television signals.

The power of the transmitter is 250 watts. The indirect method of scanning is used. That is, a fine beam of light scans the picture and the light reflected from the picture is picked up by four large photoelectric cells.

TELEVISION TRANSMITTING EQUIPMENT AS USED BY THE RADIO CORPORATION OF AMERICA IN ITS REGULAR SCHEDULE FROM 411 FIFTH AVE., NEW YORK CITY. AN ACTOR FROM THE PHOTOPHONE RECORDING STUDIOS, WHICH ARE IN THE SAME BUILDING, IS STANDING IN FRONT OF THE TELEVISOR. THE FOUR LARGE CIRCULAR DEVICES ARE PHOTO-ELECTRIC CELLS.

EYE PROGRAMS TO START MAY 1

Construction work is well under way on a 5-kilowatt television transmitter to be installed on the roof of the Jenkins Television Corporation plant building on Claremont Avenue, Jersey City, N. J.

The Federal Radio Commission has granted a license calling for a band between 2,100 and 2,200 kc., or approximately 140 meters, with unlimited time.

"These sample television receivers" states James W. Gariside, "are to be used out in the field, under all manner of everyday conditions, to check up on our broadcast signals and to learn more about television in practice."

"Already many changes and refinements have been scored over the original Jenkins television receiver which serves as the basis for our engineering efforts, notably in an improved mirror drive, an adjustable speed control, and a better optical system. Our engineers have evolved a vastly improved amplifier, both for the transmitting and the receiving end, insuring maximum detail within the limitations of our present screen."

NEW CORPORATIONS

RADIO WORLD
Four Stations In the South Added by NBC

The National Broadcasting Company added four Southern stations to its coast-to-coast network. These are WSMB, New Orleans, La.; WAPI, Birmingham, Ala.; KTHS, Hot Springs, Ark.; and WIOD, Miami Beach, Fla. These stations hereafter form an important network with the network in the United States with the best radio programs available," M. H. Aylesworth, president of the company, said.

Will Continue Policy

"We intend to carry out this policy even though we do so at a temporary loss, for we believe the NBC as a national institution must not hesitate to make its program available to everybody everywhere. WSMB has a power of 750 watts and is operated by Saenger Theatres, Inc., and Maison Blanche, a New Orleans garment firm. It operates on a wavelength of 227,1 miles, or 1,320 kc.

WAPI has a power of 10,000 watts. It operates on a wavelength of 3,748 meters or 800 kc.

WAPI, Alabama Polytechnic Institute, is one of the pioneer radio transmitters to be operated in connection with educational institutions. Under arrangements made with the National Broadcasting Company, WAPI will be operated in cooperation with the Polytechnic Institute, the University of Alabama, and the Alabama College for Women. WAPI has a power of 5,000 watts. It operates on a wavelength of 263 meters or 1,100 kc.

Farthest South

WIOD, Miami Beach, is operated by the Wonderful Isle of Dreams Broadcasting Company, the initial of the operator comprising the call letters of the station. It has been a temporary outlet of the NBC System for several months as it was added to the network at the time President Hoover was spending a Winter vacation in Florida.

It is located further South than any other broadcasting station in the United States with the best radio programs available." M. H. Aylesworth, president of the company, said.

Kentucky Churchills and the actual preparation of radio announcers by nation-wide listeners was spending a Winter vacation in Florida. The National Broadcasting Company, WAPI, has a power of 5,000 watts. It operates on a wavelength of 263 meters or 1,100 kc.

Brooklyn Asks 'Place in Sun'

Representatives of four Brooklyn, N. Y., broadcasting stations appeared before the Federal Radio Commission in connection with the applications of two of the stations for modification of their broadcasting licenses with a view of obtaining additional time on the air with increased power. WLTH and WBCC request full time on 1,400 kc., with an arrangement between them in the division of time. They also seek increases in power of from 500 watts to 1,000 watts during daylight and 500 watts at night. At present, WAPI, Alabama Polytechnic Institute, is one of the pioneer radio transmitters to be operated in connection with educational institutions. Under arrangements made with the National Broadcasting Company, WAPI will be operated in cooperation with the Polytechnic Institute, the University of Alabama, and the Alabama College for Women. WAPI has a power of 5,000 watts. It operates on a wavelength of 263 meters or 1,100 kc.

Farthest South

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One Announcer at KGO Is Single

Washington.

Of late KGO has had a number of requests as to the matrimonial status of Howard Miller and Byron Mills, Charles Park and Hjalmar Stromberg, announcers at the station. All of the above admit marriage except Stromberg. Although he is in the six-foot class, may be classed as a good-looking, and is popular, Stromberg still remains single.

WCAV Authorized to Use 10,000 Watts

Philadelphia.

WCAV in this city has been granted permission by the Radio Commission to increase the power from 5,000 to 10,000 watts. It is operated by the Universal Broadcasting Company. The change in power will make this one of the most powerful stations in the East.

The new transmitter will be located at Byberry, Pa., which is just on the edge of the city limits. The old equipment will be retained for emergencies.

It is estimated that the daylight service radius will be 100 miles under the most unfavorable conditions. The frequency of the new station is 1,170 kc., which will be held constant by a crystal oscillator.

A New Book on Tubes Written by Expert Pair

By J. E. ANDERSON

TechnicaL Editor


This is the first edition of a new book on receiving tubes by Mr. Anderson, which fills a definite need. It is particularly valuable to service men, advanced amateurs and students of radio who want to learn the theory of resistance coupled receiving tubes. It is written in plain and concise English. Unessentials have been omitted, the necessary points treated those phases of the subject which are necessary to understand the operation of vacuum tubes.

Mathematics is used, but only enough of it to give the properties of the tubes definite expression. Anyone who has any familiarity with simple algebra will have no difficulty understanding the book.

Many Curves

Typical characteristic curves for all the tubes are used unstintingly to supplement the theory, and those who have no knowledge of mathematics can learn all the properties of tubes from diagrams alone.

The book is up-to-date and includes much material which has been made available during the past few years, which is not found in any other book treating the same subject. It contains discussions of all the principal types of circuits, types of coupling, oscillators, detectors and rectifiers.

The treatment of the subject follows computational lines, and the orthodoxy in every respect. However, the authors have carried this orthodoxy to the point of passing on to the readers, verbatim, some of the traditional fallacies which they thought and experiment have not yet been able to upset.

Brave on Motorboating

One of these is the statement that the time constant of the stopping condenser and the grid leak in resistance coupled circuits should be as small as possible. Analysis and experiment lead to the opposite conclusion.

Another is that in resistance coupled circuits the plate voltage must be increased to compensate for the drop in the coupling resistor. A higher plate voltage should be used in this type of circuit it is not because of any need of compensating the drop in the coupling resistor but to avoid distortion. With respect to the cause of "motor-boating" and the conditions for maximum voltage amplifications in transformer coupled audio circuits the authors have abandoned tradition for correct explanations.

The book can be recommended heartily to all students of vacuum tubes and their uses.

A Thought for the Week

NOT so long ago officials of the musical unions of the country were declaring from the heights of power the highbrowism of the profession and business of making music living through the mechanism of the musical art. Now it's quite different. Radio's raucous appetite for the worse musics has gone to sell more the musicians and composers millions of dollars annually—without most of it going into the usual pocket of the exponents of Bach, Herbert and Beethoven.
ALL STATIONS MUST DISCLOSE BUSINESS DATA

Washington.

Two questionnaires seeking information as to present broadcasting conditions throughout the country with a view of making improvements, the Radio Commission — through the country with a view of making further improvements upon the Commission's legal division, inquires before the reallocation became effective.

The second questionnaire, Form 61, covering licensees' business and legal questions should be filled out and sworn.

April 6, 1929

RADIO WORLD

New WNYC Plant

Ready This Month

The new broadcast plant for WNYC, New York metropolitan station, will be ready for operation about the middle of April.

The new transmitter will be controlled, which will steady the wave, and the transmitted wave will be modulated 100 per cent. It is expected that this will double the response in receivers tuned to the station. The modulation of the present transmitter is about 35 per cent.

There will be a wire control room for the routing of band concert programs from the Mall in Central Park to twenty-five other parks in the metropolitan area, where they will be reproduced through large loudspeakers.

The new studios have been designed to enliven the tonal quality of programs originating in them, because artists performing in the old studios have complained of the "dead" effect produced. Hence the new studios have been designed to have a reverberation period of 20 seconds.

U.S. DELEGATES AT CONFERENCE

The United States is represented at the European Radio Broadcasting Conference by a delegation of five, headed by William D. Terrell, Chief of the Radio Division of the United States Department of Commerce, which was announced at the White House. The conference is being held at Prague, Czechoslovakia.

The other delegates are L. E. White, radio engineer of the American Telephone and Telegraph Company; C. J. Pannill, vice president of the Radio Manufacturing Corporation; Gerald C. Gross, radio engineer of the Federal Radio Commission; and Commander H. P. LeClair, Assistant Attache in Paris.

According to William R. Vallance, Assistant Solicitor of the Department of State, the following countries are represented at the conference: Germany, Austria, Belgium, Denmark, Egypt, Hungary, Ireland, Holland, Italy, Latvia, Norway, Poland, Sweden, Switzerland, Czechoslovakia and Russia.

PEPPING UP VOLUME

Service men often run across sets that are squeaky in reproduction and with volume much below normal. This applies not only to old sets, but also to some new ones. Low voltage is generally the cause of this in AC operated sets. Placing a lower resistance in one or more positions of the voltage divider often clears up the trouble. A Standard Clarostat should be tried across various sections, until the trouble is found and remedied.—J. H. C.

J.C. JENSEN ELECTED

Professor J. C. Jensen, head of the department of physics at Nebraska Wesleyan University, has been elected president of the association of College and University broadcasting stations.

Next Week! See Here!

The recording of sound in two distinct ways, and used in talking movies in two many points of interest to the radio-wise. Vacuum tubes are used and familiar radio principles involved. So be sure to read the article on this subject, by Capt. Peter V. Hinsche, in next week's issue of Radio World, dated April 10th.

On a recent visit to the General Electric Company he was shown many interesting scientific developments coming from an especially prepared surprise, a reproduction from film of a complete hour of music which will be played by the orchestra and in one or two places found that in future programs changes must be made in the seating of certain sections or choirs to get the best results, musically, from the organization.

CIVIL SERVICE

The United States Civil Service Commission announces the following open competitive examination:

AGRICULTURAL WRITER (RADIO)

Applications for agricultural writer radio (radio) must be filed at the United States Civil Service Commission at Washington D. C., not later than April 24. The examination is to fill vacancies in the office of the Secretary, Department of Agriculture, Washington D. C., not later than April 24.

The distance salary is $2,500 a year. Higher-salaried positions are filled through promotion.

Full information as to the requirements of the writer will be given in the notice of examination. Applications must be filed with the United States Civil Service Commission at Washington, D. C., or the Secretary of the United States Civil Service Commission at the post office or custom house in any city.
### Quick Conversion Table, Frequency to Wavelength

In the following table the entire broadcast range of frequencies is given, from the highest (1,500 kc.) to the lowest (550 kc.). The frequencies in kilocycles will be found in the left hand separate column. To the right of the frequency is the equivalent wavelength, that is, the wavelength, and this is carried out to the first decimal place. Now, in consulting the list of stations by call letters, printed on the opposite page, you will find the frequency in kilocycles at extreme right of each single line.

If you prefer to know the carrier by the wavelength designation, you can find this out in a jiffy by locating the frequency in kilocycles below and reading the corresponding wavelength in meters at right on the same line.

Here is the conversion table:

<table>
<thead>
<tr>
<th>Frequency (kc.)</th>
<th>Wavelength (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>395</td>
</tr>
<tr>
<td>1050</td>
<td>370</td>
</tr>
<tr>
<td>1100</td>
<td>342</td>
</tr>
<tr>
<td>1150</td>
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### Literature Wanted

THE names and addresses of readers of RADIO WORLD who desire literature on parts and sets from radio manufacturers and jobbers, dealers and mail order houses are published in RADIO WORLD on request of the reader. The blank at bottom may be used, or a post card containing the information desired may be mailed to the Circulation Department, 145 West 45th Street, New York City.

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<th>State</th>
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<tr>
<td>R. H. Sessions, 307 Molt St., Brunswick, Ga.</td>
<td>Fred T. Johnson, 6 No. Rose Drive, Orlando, Fla.</td>
<td>Hoffmann, 3821 Lewellyn St., Cincinnati, Ohio</td>
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Radio reception is, in some localities, seriously disturbed by interference arising from electrical apparatus in the vicinity. A brief outline of the sources of such interference and the methods usually used in mitigation is given herein, together with references to further information. A reception report is given herein to interference produced by radio apparatus.

The only general remedy for electrical interference is co-operative effort on the part of users of radio and users or owners of the electrical sources of disturbance, to reduce or eliminate the causes of the trouble.

Much of the work in mitigation of electrical interference results in improvement in the operation of the electrical devices or supply lines and is thus a double gain.

Remedy Exists

There are, however, some electrical devices which, even when in perfect working order, cause disturbances which result in interference with radio reception. In many cases it is possible to provide filters, shields, chokes, etc., either at the sources of disturbance or at the receiving set, which do much to relieve the difficulties.

Part of the disturbance from the electrical devices is practically inevitable and must be regarded, like atmospheric disturbances, as part of the inherent limitation of radio reception. In other words, the limitation upon radio reception is not only the distance and the power of the transmitting stations and the sensitivity of the receiving set, but also the omnipresent background of slight electrical disturbances which drown out signals below a certain intensity.

Why Locals Are Better

This background of electrical disturbances is the underlying reason why reception from local stations is inherently superior to reception from distant stations.

Power-line Induction.—A frequent cause of interference is the presence of alternating-current power wires near the antenna or receiving set. Low-frequency voltages (usually 60 cycles) are induced and the resultant current flowing in the receiving circuit causes a "humming" sound in the telephone receivers. The low pitch of the hum will usually identify this source of interference. A method of eliminating or at least reducing the magnitude of this interference is to place the antenna as far as possible from the wire lines and at right angles to them.

When the interference cannot be eliminated by such means, the proper choice of a receiving set may help. An inductively-coupled (two-circuit) receiving set is less susceptible to such interference than a single-circuit set.

The use of one or more stages of radio-frequency amplification should also help to filter out the audio-frequency interference.

It has been suggested that audio-frequency interference might be shunted around a receiving set having a series antena condenser and a shunt choke between the antenna and ground terminals of the set a high resistance, which will offer lower impedance to the audio frequency than will the receiving set itself.

Electrical Machine Noises

Sparking Apparatus.—Sparks are produced in the normal operation of many types of electrical apparatus (such as motors, doorbells, buzzers, gasoline engines, X-ray apparatus, violet-ray machines, some forms of battery chargers, rural telephone rings, heating pads and thermostats.

Sparks are also sometimes produced at defective insulators, transformers, etc., of electric wire lines. Sparks usually give rise to electrical noises which travel along the electric power wires and by them are radiated out and are then picked up by radio receiving sets. The noise thus produced in a radio set may come from a disturbance which has traveled many miles along the electric power wires.

One remedy for such types of interference is to eliminate the spark.

This is possible if the spark is an electrical leak and not necessary to the operation of the device in which it occurs.

Radiation Reduction

Many very useful electrical machines, however, require for their operation the making and breaking of electrical circuits while they are carrying current and whenever this happens a spark is produced.

It is impossible to eliminate these machines so that it is necessary to make the spark of such nature or so arrange the circuits that the radio-frequency current is reduced or prevented from radiating.

To prevent the radio frequency current produced by a spark from getting on to the lines connecting the sparking apparatus some form of a filter circuit is necessary. A condenser (1 microfarad, more or less) connected across the sparking points will usually considerate amount of the radio frequency current, or, a condenser connected from each side of the line to ground will serve the same purpose. When any connections are made to the power line, in order to avoid fire and personal injury, only apparatus that is carefully tested as to voltage and current-carrying capacity should be used and the power company should be consulted before making the installation.

Additions to the power source should be made only by qualified persons.

Choke Coils Help

A choke coil in each side of the line in addition to the condensers connected to ground forms a simple filter circuit which should prevent frequencies in the broadcast range from getting on the line. A high inductance (choke coil) or high resistance connected in each side of the line changes the characteristics of the circuit so as to reduce the amount of power radiated.

If such a filter circuit is not effective or is impractical, the apparatus may be made more shielded, the power wires may be surrounded by solid metal sheet or wire screen which is thoroughly grounded. The screen should completely surround the apparatus.

This may be difficult. For example, in shielding the ignition system of a gasoline engine the spark coils and all wires and other parts of the system must be enclosed in metal shields and these must be very well grounded.

Sources Spotted

Location of Source of Interferences.—The first thing to do in tracing the source of trouble is to make sure that it is not in the receiving set itself. Next thing is to open the electric switch at the house meter. If the interfering noise is still heard in the radio set, the source is then known to be outside the house. It is then desirable to report the situation to the electric power company.

Many of the companies have apparatus for the purpose of following up complaints of this kind. Usually a receiving set with a coil antenna is used to determine the direction from which the interfering noise comes, and this outfit is taken from place to place until the source is found.

Often Up Against It

The location of such sources is often a very difficult and baffling undertaking. It sometimes requires that the power be cut off of parts of the line, in order to trace down the part of the line where the trouble arises.

The trouble sometimes comes from a spark discharge over an insulator to ground, or between a pair of wires, or it may be that the wire is touching some object such as a tree, pole, guy wire, etc. Such a spark discharge is a loss of power to the operating company and a potential...
Electrical Interference

Recommended—Remedy Exists
Bells, Heating Pads, Sparking Commutators, and Even Induced
on Electric Wires—Hum from
two Baffling Annoyances Not
Remediable

Bureau of Standards

source of serious trouble, and for these reasons the company is probably more
interested in finding and eliminating this type of trouble than the radio listener.

Large leaks and sparks may be observed at night, especially in wet weather.
However, sparks which are too small to be readily noticed may cause serious
interference to radio reception.

Sprkng Brushes

Commutators.—Where direct-current motors are in operation near a radio receiving
set, interference is sometimes caused, especially when the brushes on the
motor are sparking badly.

This sparking can be reduced as much as possible by cleaning the commutator and proper setting of the brushes.

The remaining interference is sometimes overcome by placing two condensers (about 2 microfarads each) in series
across the power supply line and connecting their midpoint to a good ground sys-
tem. This is substantially as outlined above under “Sparking Apparatus.”

Bell Ringers.—Another source of inter-
ference is the ringing machine used in
rural telephone exchanges.

Telephone engineers can reduce or eliminate interference by placing, in the case of one
precipitator, a filter depending
on a combination of inductance and capacity, and in the case of another, rectifiers
where electrically operated means
are used.

Precipitators Troublesome

Precipitators.—Many cases of radio
interference have been caused by electrical
precipitators which are used to prevent
smoke and noxious fumes or material
from leaving the chimney.

The precipitator operates by establishing
a highly charged electric field inside
the chimney of such a nature and direc-
tion that particles going up the chimney are charged and driven against the walls
where they stick.

The precipitator produces interference for the reason that the high voltage used in their operation is obtained from a rectifier
which produces sparks and generates radi-
catron that can spark when alternating currents as well as the direct current which the precipitators need.

Will Radiate

If the precipitator is so designed and
arranged that the distance between the rectifier and the chimney is only a few
feet or if the entire apparatus including all leads is so placed that a metal building
there is usually no trouble. But if the
rectifier is separated from the chimney
the wires which join them forms a good
area which will radiate and cause inter-
ference for 20 miles or more. Inter-
ference from these precipitators can be
eliminated by placing a grounded wire
screen entirely around these wires and
connecting it to the shielding around the
rectifier.

Mr. Proskauer answered that by the proper
system of filter condensers, except
the possibility of one or two ex-
tremes and isolated cases, all extraneous noises not interfering reception on elec-
trically operated receivers may be en-
tirely eliminated or diminished to the ex-
tent where one can say that the program once
more becomes a delight.

The types of filter which should be
used, and which is most effective for re-
ducing the disturbance of man-made static
or electrically operated machine-made inter-
ference, he said, is that utilizing choke coils and condensers, wired and connected
in such a way that the disturbance will be
filtered out either at the source of the interference or, as in the case of one
commercially made unit, by application of the
filter directly at the set.

Mr. Proskauer brought out that other
filtering devices which eliminate or dimin-
ish the extraneous noises are intended for
use at the source of interference, but the
Si-Len-Ser was designed to work directly
at the set, chiefly because of economy and
convenience. It may be used at the source,
however, in extremely bad cases of interference.

Mr. Proskauer attributed the chief
causes of interference with good recep-
tion to all oil burners and electric refrig-

eration where electrically operated means
are used. These, a filter depending
upon a combination of inductance and ca-
cacity should be used. This filter is crit-
ical both to its potential and load. The ca-
pacitive type of filter is applicable to
most types of electrical apparatus, but the
capacity he found to be desired. Mr. Proskauer
may be addressed at 114 Worth Street,
N. Y. City.—J. H. C.

What Do Talkies Mean to Radio?

What have the talking movies to do with
radio?

Well, with the radio-frequency side of
radio they have nothing to do. But with
the audio frequency side they have a lot to
do, because the same audio that we are
familiar with is used in the talking
movies.

Another interesting point is that pho-
to-electric cells, kino-lamps, and ampli-
fying tubes generally, are used in abun-
dance, and in familiar ways. Besides, phys-
ics in various phases enters the discus-
sion, and our own radio is a branch of
physics.

Particularly there are two ways of rec-
dording sound on films, and what these
methods are, and how they are accom-
plished, will be revealed by Capt. Peter
V. O’Rourke in next week’s issue of
Rano World, dated April 13th. His illus-
trated article also will tell of the wax
record method, and you will learn which
companies use which.

Owners of theatres, large and small—
movie theatres, vaudeville theatres, any
place where there’s a roof under which a
public movie may be shown—will be interested in Capt. O’Rourke’s article,
for the quality of reproduction of sound
and will be compared.

Bernard’s Power Pack

In line with other audio, Herman
Bernard’s one-stage of fine transformer
coupled audio, in a B supply that is en-
tirely AC operated, and which will af-
ford filament voltages for 247 or AC
screen grid tubes in a receiver proper,
should prove highly interesting. The out-
put tube is a single 245, the new power
tube that does not hum, although di-
rectly heated by AC. An exceptionally
fine B supply, power amplifier and fila-
ment supply—and, remember, AC! The
last tube gets 250 volts on the plate and
works into a dynamic speaker, for which
this particular output circuit is especial-
ly intended. See the details in next
week’s issue of Rano World, dated April
13th.

Lacault’s Article

The second part, and final text, of R.
E. Lacault’s article on the 6-tube part of
the RE29, his last and best circuit, will
be published in the April 15th issue. Al-
though the 6-tube receiver text will be
completed then, detailed constructional
drawings will be published subsequently.
Keep in touch from week to week with
this amazing circuit, designed by the man
who designed the Ultralyne, the great-
est DX circuit of its time.
Lacault’s Last and Best

Ultradyne Modulation Used
Extreme Sensitivity—Band Pass Frequency—Super High Fidelity
Scientifically Avoided—“Utter Satisfaction,” Lacault
First Presentation of Famous System

By R. F. Lacault

LIST OF PARTS

C1, C2—Two Hammarlund .005 mfd.
Midline tuning condensers
C3, C4, C5, C6, C9, C10—Six Sangamo .0005 mfd. fixed condensers
C6, C7—Two Acme Parvolt 5 mfd. fixed condensers
C11—One .001 mfd. Sangamo fixed condenser
L1—One Lacault B1 antenna coupler, with base
L2—One Lacault B2 oscillator coil, with base
L3—One Lacault F2 intermediate frequency transformer with base

It was necessary to devise a circuit which would be selective and at the same time take advantage of the high amplification possibilities of the screen grid tube. And it was also necessary to coordinate all the parts so that the circuit would be stable in all the three frequency levels. All these conditions have been met in a way which has led to optimum overall results.

Fewer Tubes Used

A casual glance at the circuit diagram might lead to the conclusion that the receiver cannot be very sensitive due to use of only six tubes. This conclusion is based on the notion that the sensitivity of a receiver is proportional to the number of tubes used. Many factors other than tubes enter into the question of sensitivity. One of these is the stability of the circuit, another is the volume-handling capacity of the tubes. No gain in the sensitivity is achieved by adding tubes when the adding makes it necessary to introduce stabilizing devices which take away whatever extra amplification the additional tubes should give.

While the circuit diagram shows only six tubes, the receiver actually contains eight, for the second audio is a push-pull stage, built into the power supply device which has been designed to go with the receiver. It has been stated many times that a...
Screen Grid Receiver of Ex Filter included at Intermedi erodyne's Usual Troubles Details Worked Out to My wrote, just before he died; Designer's Masterpiece. Lacault

Super-Heterodyne cannot be used successfully with an antenna, and that a coil aerial must be used. That statement was made when the Super-Heterodyne was first introduced, when little was known about details of the circuit, and it has been handed down as a tradition. The idea has been disproved many times. Antennas are coming into use more and more all the time for this type circuit.

Hence an antenna is used in this circuit because it is more effective, eliminates the necessity of another tube, is much more convenient to use once it has been installed, and it is less conspicuous in the home.

The antenna coil L1 and the oscillator coil L2 are of special design and are provided with plugs so that other sizes of coils may be inserted into the circuit to cover other wavelength ranges. These coils are tuned with 0005 mfd. Hammarlund Midline condensers (C1 and C2). Note that the roots of both these condensers are grounded to the shield so that there will be no body capacity.

While this is usual for the antenna condenser C1 it is not for the oscillator condenser. One of the chief difficulties with Super-Heterodynes is eliminated by this simple connection.

Screen Grid Tube Modulator

The first tube V1 is a screen grid tube, but it is not used as such. The plate and the screen grid have been connected together to form an enlarged plate. This connection gave high modulation efficiency.

The method of coupling the modulator tube and the oscillator should be noted carefully. There is no pick-up coil. The composite plate of the screen grid tube is connected directly to the grid of the oscillator tube. Since this grid returns to ground, there is no polarizing voltage on the plate of the modulator. But there is a high alternating voltage on this plate, the resonant radio frequency voltage across the tuned circuit controlling the oscillator frequency. This voltage is alternately positive and negative. It is the positive loops of this voltage which are modulated by the signal impressed on the grid of the first tube.

One reason for using a high intermediate frequency is to insure a low impedance to the signal frequency in the oscillator circuit. But there are more important reasons which will be discussed later. (See next week's issue of Radio World — Editor.)

R2 is a 4-ohm ballast resistor which not only limits the filament current to the oscillator tube but also furnishes that tube a grid bias of one volt.

Intermediate Amplifier

The intermediate amplifier consists of two screen grid tubes and four tuned circuits. The first of the intermediate transformers L3 is doubly tuned. That is, the primary is tuned with C3 and the secondary with C4.

The modulator grid is kept negative with respect to the filament by means of the 25-ohm resistor R1. Since the resistance of the filament is also 25 ohms, the battery voltage is divided equally between the resistance R1 and the tube. That is, when the battery voltage is 6 volts the bias on the tube is 3 volts. This is the optimum bias for detection with this type of tube and connection.

High Detecting Efficiency Attained

High detecting efficiency requires that the load impedance on the tube be of the detected frequency and low impedance for the signal frequency. Both of these conditions are met in the first tube. The tuned circuit, consisting of the primary of L3 and condenser C3, is a parallel tuned circuit for the intermediate frequency, and its impedance or resistance is extremely high. The condition for low impedance at the signal frequency would not be met were not the signal frequency always much different from both the intermediate frequency and the oscillator frequency. Currents of the signal frequency pass through C3 with practically no impedance. Likewise they pass through either C2 or the secondary of L2. If the higher frequency setting of the oscillator is used, the signal frequency is lower and hence passes through the coil. If the lower oscillator frequency is used the signal frequency is higher and passes through the condenser C2.

This coil is constructed so that it is a band pass filter having a suitably wide transmission band. The double tuning assures thorough filtering as well as a high step-up of the intermediate frequency voltage.

The coupling coils L4 and L5 are identical in construction and tuning, the secondary of each being tuned. The primaries are wound to match the plate impedance of the screen tubes and to utilize the amplification of the tubes to the fullest extent.

Carefully Constructed

All the three coupling devices (L3, L4 and L5) have been constructed to rigid specifications as dictated by careful laboratory experiments. They provide a highly selective intermediate filter without cutting off side-bands, and at the same time step up the amplification tremendously in the transmission band.

Tapped resistors R3 and R4 are used in the filament circuits of the screen grid tubes to limit the current and to provide a suitable grid voltage. The total value of each of these resistors is 25 ohms and the tap is placed 15 ohms from the filaments.

[Part II of this article, to be published next week, issue of April 13th, will contain certain intimate information on construction and operation of the 6-tube design. There will follow articles on the B supply and power amplifier.]
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FIG. 739
DESIGN FOR A 4-TUBE ALL-ELECTRIC AC RECEIVER, WHEREIN A SCREEN
GRID TUBE, TWO 227 TUBES AND A 4T1A POWER TUBE ARE USED.
THE ANTENNA IS CONDUCTIVELY COUPLED FOR STABILITY, BUT
THE TWO TUNED CIRCUITS SHOULD BE TUNED INDEPENDENTLY.
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TEenna CIRCUIT.

IN CALCULATING the grid bias re-
sistor for a screen grid tube should only
the plate current be used or should both
the plate current and the screen grid cur-
rent be used?

(1)—Fig. 739 shows such a circuit.
(2)—What should the grid bias be on
the 622 and AC screen grid tube?
(3)—If I insert a milliammeter in the
lead to the cathode, will the meter read
the plate current?

HOWARD RICHARDSON,
Toledo, Ohio.
(1)—The total current flowing in the
cathode lead should be used, that is, the
sum of the plate current and the screen
grid current.
(2)—The bias should be 1.5 volts for
both tubes.
(3)—The milliammeter will read the
sum of the plate and the screen grid cur-
rents. It is this which should be used in
computing the grid bias resistor. But
the current should be measured when the
grid bias is 1.5 volts. A dry cell may be
used to obtain the bias while the mea-
surement is made.

WILL YOU PLEASE publish a circuit
diagram of a four tube AC receiver using
one screen grid tube, two —27s and one
—71A.

(1)—Fig. 739 shows such a circuit.
(2)—R1, 600 ohms; R3, 1,750 ohms; R4,
2,000 ohms; R5, 2,000 ohms; R6, 1,000
ohms; C1, 0.001 mfd.; C2, 1 mfd.; C3,
4 mfd.; C4, 0.01 mfd.; C5, 12 mfd.; C6,
0.01 mfd.; C7, .01 mfd.; C8, 0.0005 mfd.
(3)—The plate voltage should be 135,
screen grid voltage 75, filament voltage
25, and grid voltage 1.5 volts.

I BUILT the four tube screen grid
Diamond just exactly as you described
it, except that I used a bakelite subpanel
and tuning coils, condensers and audio
transformers from an old set. The circuit
does not work. I only get a local
station very faintly. I have checked the
wiring many times and I am sure that
it is all right. What can I do to get the
set going?

CHARLES JACOBSON,
Newark, N. J.
Don't trust a visual test of the wiring.
You cannot possibly see that all the cir-
cuits are continuous by looking at the
wiring. Test all grid, plate and screen
grid circuits with a meter or a head-set
wiring. Make sure that all the tubes get the proper voltages. Also make
sure that the screen grid tube is func-
tional. This tube is best tested in
the old circuit?

TOWNSEND KING,
Fort Dodge, Iowa.
(1)—See the article on page 16, March
issue of RADIO WORLD.
(2)—You will get more volume out of
two good audio frequency transformers.
Would it be worth while to install
one screen grid tube?
(3)—How will the selectivity and sen-
sitivity of the circuit be compared with
the old circuit?

I AM PLANNING to rebuild my five-
tube radio receiver to get greater sen-
sitivity. It is now operated with two good audio frequency transformers.
Would it be worth while to install

WALTER GREER,
Racine, Wis.
(1)—Boost the total voltage on the
plate and grid to 300 volts. Change the
filament voltage from 6.3 volts to 7.5 volts and
use an 800-ohm grid bias resistor in place of
the 1,000 ohm unit.
(2)—You will get more volume out of
the new tubes because they have a higher
amplification factor and approximately the
same mutual conductance.

I WISH to wind some coils for .0005
mfd. condensers on 2-inch tubing, using
No. 20 D.S.C. wire. Please give the turns
required.

RUDOLPH JOHNSON,
Fort Dodge, Iowa.
(1)—See the article on page 16, March
issue of Radio World.
(2)—As many as the secondary.
(3)—Any fine insulated magnet wire.

WHAT IS an inductive trimmer? How
is it made?

SAUL KATZ,
Milwaukee, Wis.
(1)—An inductive trimmer is a small
coil in series with the main tuning coil
so mounted that the coil can be varied.
It may have from one to ten turns depending
on the type of receiver. The turns, however,
is to compensate for differences in cir-
cuits tuned by the same control.
(2)—It is possible but it is not simple.
(3)—See an article on page 16 in the
December 22 issue of Radio World for a
detailed explanation.
FROM the viewpoint of engineering merit, the new AC screen grid tube, soon to be announced by RCA and Marshall, is possibly the best development in 25 years. The tube, small enough to be utilized as good as the 226 and 227 type AC tubes which are today used as radio frequency amplifiers in almost every modern receiver.

Just what does this mean, not in amplifications, selectivity factors, and stability, but in terms of home enjoyment and convenience? Briefly, this means that the screen-grid tubes, followed by a power detector and two good audio output stages, will give a sensitivity of 10 microvolts per meter—an engineering definition of what is generally considered a far greater sensitivity in a radio set than can be used in most homes, due to static and other interference ordinarily never heard on less sensitive sets.

"Antennaless" Set Next

Translated into non-technical language, the superiority factor of the new AC screen grid tube means that sets can be built commercially requiring no outside antenna or ground connections, and operated entirely from self-contained screen antennas fastened into the wooden cabinets housing set and loudspeaker. If well designed, will receive more distant stations, with less interference, than sets using an equal number of less sensitive tubes, although the usual outside antenna installation is used with the less sensitive tubes. The lessened interference of the screen grid set means far greater receiver tone quality.

From the viewpoint of convenience alone, screen grid tube superiority means the installation of an antenna or ground installation bother in all but a very few percentage of installations. The great stride this development has made was realized immediately when it is shown that ever since wireless became a practical reality there has been no greater demand for a word of this article was written, so that the RCA set-manufacturing enterprise to locate in the modern Clearing Industrial District, nine miles from the heart of the Chicago "loop." The Silver-Marshall plant, however, is the last of the radio factory yet to locate at Clearing, being in itself bigger than its two predecessors put together. The last plant in modernoney-

Selectivity Considered

By rule of thumb, if amplification is doubled, absolutely selectivity must go up four times (selectivity must go up as the square of amplification if a satisfactory practical receiver is to be obtained). Briefly, this means that the selectivity factor of nearly eight times greater than can be gotten from a 226 or 227 type tube, holding the selectivity apparently to anyone tuning the amplifier to the same value.

The screen grid amplifier is completely stable, insensitive to oscillation when troubles, and yet requires no neutralizing or stabilizing adjustments.

NEW SILVER-MARSHALL FACTORY NEAR CHICAGO AIRPORT

The new radio receiver factory of Silver-Marshall, Inc., a largest American manufacturer of radio parts and kits, is now well under way in the Clearing Industrial District of Chicago—within the "Whirr" of the Chicago Municipal Airport, according to McMurdo Silver, president of the corporation. The plant will be the third radio manufacturing enterprise to locate in the modern Clearing Industrial District, nine miles from the heart of the Chicago "loop." The Silver-Marshall plant, however, is the last of the radio factory yet to locate at Clearing, being in itself bigger than its two predecessors put together. The last plant in modernoney-

Airing Now a Possibility

This dream, with the almost complete elimination of dealer and consumer installation problems that it brings, is now a possibility. Speaking technically for a moment, the eight-time superiority of the new AC screen grid tube means that for a given selectivity of a stage of radio frequency amplification can be made to give nearly eight times more selectivity with one of the new tubes than it will require for a 226 or 227 type tube, without oscillation, and that the screen grid tube does away with neutralizing adjustments, permitting new tubes to fit a given set without having to buy a new set. The demonstration of the screen grid tube gives greater-Stable RF amplifier than any other known tubes.

Unfortunately, however, the selectivity factor of eight for the new type tube cannot be fully realized, and all that can be realized in practice cannot go into amplification. As amplification is increased, with absolute selectivity held constant, apparent selectivity, that is selectivity divided by the selectivity factor, falls off much more rapidly.

The AC Diamond, a 4-tube design, is sensitive over the entire broadcast band. You will get fine reception. Also please be assured that you will positively get rid of squeals. The only reason why so much space has been devoted to the squeal problem is that it is still the biggest problem in radio receiver design. The circuit for a receiver designed with the elimination of a receiver tube without undue loss of amplification. The success of the receiver, or of any other receiver, depends largely on its stability, and there may be certain that the measures outlined March 23d and 30th assure you of a stable set.

If you stick to the parts as specified you will have no trouble from motorboating, even though this is a fine quality (171A) tube, but self-oscillation of a receiver tube, like a transformer coupled. You may hear a stuttering sound, but it will be due to self-oscillation of a radio frequency detector, and you are useable sound, that is, the tube will be an acceptable product. The AC 171A at the same plate voltage, despite the presence of the hum frequency, will produce excellent tone quality.

If you are using a dynamic speaker and you hear a hum you may feel certain that the hum is produced by an oscillation of the speaker itself. The hum will disappear. Such a capacity—about 9 mfd., or so, which may be an electrolytic condenser—is often essential in DC types of dynamics that are used at a distance from the receiver itself, since the length of the cord offers a suitable impedance across which the alternating current must find a path around the hum, and then sounds like motorboating, but is wholly unlike it electrically, since motorboating is low-frequency oscillation only. Correct the RF oscillatory condition and the supposed motorboating will disappear.

The receiver will hum ever so slightly. There is little hum produced by the operation of the 227 tubes and the AC 222 tube, especially when the mid-tap of the 2.5 volt hum is still present. The last line, if a 245, contributes no hum, since it is designed to be as hum free as a directly heated AC tube can be, because of low voltage across the filament and high current. The last tube, of course, if the new 245, has 180 volts on the plate, and greater undistorted maximum power than the RCA at the same plate voltage, despite lesser bias.

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Some Inside Facts on the New AC Diamond

[The construction of the AC Diamond was described in the March 23d and 30th issues. The circuit used is one AC screen grid tube, two 227 tubes and one 112A or 171A (power tube.) Next week, issue of April 5th, constructed plans will be published in an illustrated form.]

The AC Diamond, a 4-tube design, is sensitive over the entire broadcast band. You will get fine reception. Also please be assured that you will positively get rid of squeals. The only reason why so much space has been devoted to the squeal problem is that it is still the biggest problem in radio receiver design. The circuit for a receiver designed with the elimination of a receiver tube without undue loss of amplification. The success of the receiver, or of any other receiver, depends largely on its stability, and there may be certain that the measures outlined March 23d and 30th assure you of a stable set.

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The Moore-Daniels Receiver is, in a great many respects, similar to the battery model described in the March 23rd and 30th issues. In the vacant spaces at the left end of the board are placed the additional parts necessary to transform the 110-volt AC lighting current to the low filament voltages and to rectify the AC for plate and bias supply needed to operate the tubes. These parts consist of a power transformer, rectifier tube and socket, filter choke and condenser assembly, and voltage dividing resistor. The balance of the layout is identical with the earlier model, and a reference to last week's issue, dated March 30th, will give complete instructions for the placement and assembly of the parts.

Attention is called particularly to the tubes used. In the first radio frequency stage the new AC screen grid tube is used. Similar in heater design to the 227, the AC screen grid tube's characteristics otherwise are strongly reminiscent of the 222. A plate voltage of 180 is specified for the AC screen grid tube, with a screen grid voltage of 75 (G post of socket). The control grid (cap) is biased to a trifle more than 3 volts negative, resulting in a very low input conductance with consequent low decrement in the input circuit, so that the selectivity of the first tuned stage is increased.

245 as Last Audio

The last audio stage also employs a tube which has just been released, the 245, designed especially for AC operation. Large amounts of power are necessary. It approaches very closely the 210, in ability to handle large amounts of power, and its greater lower plate impedance approaches much more closely to the characteristics of the inductive load impedance ordinarily employed in output circuits, so that the bass notes are brought down the channel just in front of the audio frequency amplifier, where they will be found to terminate conveniently to the voltage dividing resistor and filter block.

Electrad Resistor as Divider

The Electrad Truvolt 10,000-ohm resistor used as a voltage divider is provided with two adjustable sliding taps. These should be carefully spaced so that they are exactly the same distance apart and from the end terminals. Under load, with all the tubes in the receiver and operating properly, this arrangement will give exactly 300 volts for the B and C of the 245, 180 volts for the plate of the AC screen grid tubes and for the first audio 227, 75 volts for the screen grid of the SG tube, and the plates of the second RF tube and detector.

Simple Diagrams

On the pictorial wiring diagram, in order to simplify it and not confuse the builder by a multiplicity of lines, the AC filament wires are not shown, as is also the case with the 110-volt wiring.

It will be noted that two of the terminals on the transformer are labeled "A", and also two terminals on each of the five-prong tube sockets are marked "A" on the pictorial. This indicates that these are the connections for the filaments of these tubes. One lead from the transformer terminal labelled "A" should be run to one of the corresponding leads on each socket, and a connection made from the remaining "A" lead on the transformer to the remaining "A" leads on the sockets. The same procedure should be followed with the "B" markings.

The filament leads should be twisted tightly together and kept well isolated from all other leads.

As in the battery model, described previously, all other low potential wires should be carefully tied into a cable extending down the channel just in front of the audio frequency amplifier, where they will be found to terminate conveniently to the voltage dividing resistor and filter block.

Great DX-Getter Uses Two Taps

By E. Bunting

April 6, 1929

14

RADIO WORLD
April 6, 1929

RADIO WORLD

Daniels AC5

New Tubes in Expert Design

Moore

...of appreciable value, so the 75 volts applied to the plate of the detector is effectively only about 45 volts at the plate, and the 180 volts apparently reaching the audio stage amounts to only 135 at the plate, for which the bias is entirely adequate.

**Line Voltage Compensation**

To compensate for varying line voltages in various localities, the Silver Marshall 335-U transformer is provided with two input voltage taps. At the left-hand side of the transformer there are two terminals at the rear, then a single terminal which in the drawing is labelled "tap." In the event of the line voltage being known to be under 110 volts, use the extreme left terminal, but unless you know it is below 110 volts, use the "tap" terminal.

The small center-tapped resistances by which the electrical center of the filament windings is obtained are not critical either for exact position of the center-point or as to value. Anywhere from 20 to 50 ohms will be found satisfactory, and the position of the center-tap may be 10% or 15% off without audible hum being produced. The All-Electric Moore-Daniels model operates in exactly the same way as the battery-operated model. The completely wired set is tested differently, however.

After the set is wired, connect the 110-volt leads to the electric light socket with a 100-watt or larger lamp in series with one of the leads. If the lamp lights at all, after an initial flash, it should be well below full brilliance.

**Sign of a Short**

If it lights up brightly, there is a short circuit in the wiring somewhere, which should be checked up immediately. If that is unnecessary or after it has been corrected, leave the series lamp and insert the 280 rectifier tube in its socket. The series lamp should glow a trifle more brightly, and the filament of the 280 should attain a barely perceptible red glow. In daylight, the glow of the filament may not show.

Now remove the series lamp. The 280 should grow a trifle brighter, and the Electrad divider should warm up somewhat. Now turn off the current. Insert the tubes in the set proper. Turn on the juice again. The heaters should take from ten to twenty seconds to attain their full heat, after which the set may be checked through and tested in exactly the same way as the battery operated model already described.

By careful study and comparison of the schematic and pictorial wiring diagrams before starting, the builder should so familiarize himself with the identity of each wire and instrument that when he starts to put them together he will be able to do so with skill.

Before commencing to build the set, we strongly recommend that the reader consult his copies of RADIO WORLD dated March 23rd and March 30th, and read what James H. Carroll and the writer have already said about the characteristics of this truly extraordinary receiver. You will find selectively fine, tone excellent, DX plentiful.

The usual procedure in tuning a distant station is to turn up the regeneration until the set just oscillates, then rotate the dials slowly in the vicinity of the desired station until its squeal is heard. At this point we diverge to say that you can set this set squeal all you please without fear of annoying other listeners—the shield grid tube and its associated circuits make radiation nil, or too feeble to be of any annoyance to neighbors.

After the squeal is heard, vary the left-hand dial until it is loudest, and then slide it gently out of oscillation. The antenna variometer can be readjusted for maximum volume (you'll only need that for stations three or four thousand miles away) and the requisite selectivity can be attained in the same way.

One very desirable arrangement which is not shown in the diagrams because it is not absolutely essential is the attachment of two Hammarlund Equalizers across the sections of the two left-hand condensers. These can be varied when installed until a weak signal reaches maximum strength after which they should be let alone.

[The construction of a three-stage balanced amplifier and power pack will be described next by the designers of the Moore-Daniels receivers. This amplifier has sufficient gain to produce good volume even from very weak signals. It employs two of the new 245 tubes in the last stage and has sufficient power to operate several dynamic speaker units, if desired. This amplifier was designed primarily as a deluxe amplifier and power supply for the Moore-Daniels receiver, but will serve equally well with other receivers or as a phonograph amplifier.—Editor.]
Radio World University

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QUESTION and Answer Department conducted by RADIO WORLD staff of experts, for University members only.

Please give the turns of the various condensers. It is not absolutely necessary to use the very same type of condensers, so long as their capacities are about the same. If already a subscriber, send $.10 for renewal from close of present subscription, and send me my secret number indicating membership.

WALLACE KIRK, Brooklyn, N. Y.

FIG. 739

DESIGN FOR A 4-TUBE ALL-ELECTRIC AC RECEIVER, WHEREIN A SCREEN GRID TUBE, TWO 227 TUBES AND A 11A POWER TUBE ARE USED. THE ANTENNA IS CONDUCTIVELY COUPLED, FOR TUBE WINDUP, BUT THE TWO TUNED CIRCUITS SHOULD BE TUNED INDEPENDENTLY. GATING IS NOT PRACTICABLE WITH THE CONDUCTIVELY TUNED ANTENNA CIRCUIT.

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(1)—The total current reading in the cathode lead should be used, that is, the sum of the plate current and the screen grid current. (2)—The bias should be 1.5 volts for both tubes. (3)—The milliammeter will read the sum of the plate and the screen grid currents. It is this which should be used in computing the grid bias resistor. But the current should be measured when the grid bias is 1.5 volts. A dry cell may be used to obtain the bias while the measurement is made.

WILL YOU PLEASE publish a circuit diagram of a four tube AC receiver using only screen grid tube, two -25S and one -71A? (2)—Also please give the grid bias resistors and the capacities of the by-pass condensers. (3)—What should the voltages on the AC screen grid tube be? WALLACE KIRK, Brooklyn, N. Y.

(1)—Fig. 739 shows such a circuit. (2)—R1, 600 ohms; R3, 1,750 ohms; R4, 2,000 ohms; C1, 0.01 mfd.; C8, 1 mfd.; C9, 4 mfd.; C6, 0.01 mfd.; C7, 0.01 mfd.; C5, 0.005 mfd. (3)—The plate voltage should be 135, screen grid voltage 75, filament voltage 2.5, and grid voltage 1.5 volts.

I BUILT the four tube screen grid Diamond just exactly as you described it, except that I used a bakelite subpanel and tuning coils, condensers, and audio transformers from an old set. But the circuit does not work. I only get a local station very faintly. What can I do to get the set going? CHARLES JACOBSON, Newark, N. J.

Don't trust a visual test of the wiring. You cannot possibly see that all the circuits are on or off by looking at the wiring. Test all grid, plate and screen grid circuits with a meter or a head-set and battery. Make sure that all the tubes get the proper voltages. Also make sure that the screen grid tube is functioning. This tube is best tested in another screen grid tube. Test for open and short circuits all through. When wired properly the receiver is remarkable.

IS IT NECESSARY to provide a center-tapped resistor for each of the -71 type tubes in a receiver or will one do for all of them? WALLACE KIRK, Brooklyn, N. Y.

(1)—If one will do, what should be the value of the resistance? (2)—Where should it be placed and to what point in the circuit should the center-tap be connected? LOUIS WATSON, Pensacola, Fla.

(1)—It is not necessary to use more than one resistor for all the tubes on one winding, but there should be one for each 2 volt winding. If the winding is center-tapped, of course the resistor is superfluous. (2)—The value is not critical, but 30 ohms is a good value. (3)—It should be put across the transformer winding anywhere between the terminals on the transformer and the terminals on one of the sockets. The mid-tap should be connected either to the cathode lead or to the plus 45, whichever seems least hum.

I HAVE a receiver now using two -71A tubes in the last stage. If I should like to substitute two -45 type tubes, now that they are available. What changes are necessary in the circuit? (2)—Will I get more volume out of the -45 type tubes than out of the -71A tubes for the same signal voltage input? SUTTON GREEER, Racine, Wis.

(1)—Boost the total voltage on the plate and grid to 300 volts. Change the filament voltage from 5 to 2.5 volts and use an 800-ohm grid bias resistor in place of the 1,000 ohm unit. (2)—You will get more volume out of the new tubes because they have a higher amplification factor and approximately the same mutual conductance.

I AM PLANNING to rebuild my five- tube radio receiver to get greater sensitivity. It is now of the type with two good audio frequency transformers. Would it be worth while to install one screen grid tube? (2)—How will the selectivity and sensitivity of the circuit be compared with the old circuit? TOWNSEND KING, Paterson, N. J.

(1)—The screen grid tube is very much worthwhile while as a radio frequency amplifier. It is now of the type with two good audio frequency transformers. Would it be worth while to install one screen grid tube? (2)—The selectivity will be somewhat lower but the sensitivity much greater.

I WISH to wind some coils for 0005 mfd. condensers on 2-inch tubing, using No. 26 D.S.C. wire. Please give the turns required. (2)—How many turns should be used on the primary when the coil is to follow a screen grid tube? (3)—What wire should be used on the primary? RUDOLPH JOHNSON, Fort Dodge, Iowa.

(1)—See the article on page 16, March 16 issue of Radio World. (2)—As many as on the secondary. (3)—Any fine insulated magnet wire.

WHAT IS an inductive trimmer? How is it made? (2)—Is it possible to gang several condensers and adjust the tuned circuits so that they are all in tune identically at any dial setting? (3)—Please explain how it is done if it is possible. SAUL KATZ, Milwaukee, Wisc.

(1)—An inductive trimmer is a small coil. A series wire is wound on a main tuning coil so mounted that the coil be not in the path of the tube current and in the coil can be varied. It may have from one to ten turns depending on the size of the turns. Its object, of course, is to compensate for differences in circuits tuned by the same control. (2)—Is it possible but it is not simple. (3)—See an article on page 32 in the December 22 issue of Radio World for a detailed explanation.
Some Inside Facts on the New AC Diamond

[The construction of the AC Diamond was described in the March 23d and 30th issues. The circuit uses one AC screen grid tube, two 227 tubes and one 112A or 1124 (power tube). Next week, issue of April 15th, constructed plans will be published in diagrammatic form.]

The AC Diamond, a 4-tube design, is sensitive over the entire broadcast band. You will get fine reception.

Also please be assured that you will positively get rid of squeals. The only reason why so much space has been devoted to the squeal problem is that it is still the biggest problem in radio receiver design—those tubes and condensers that sound like motorboating, but is wholly unlike it electrically, since modulation at radio frequencies producing a beat that sounds like motorboating, but is not present in the audio channel.

The organization thus occupying the largest radio plant on Chicago's south side was founded less than five years ago. Operating in the past only in the radio parts business—where gross sales have fallen off at the rate of about 40% a year since 1925—the company has steadily lifted itself, almost "by its bootstraps," until it is now doing over 10% of the total parts business of the country. While other parts manufacturers have withdrawn from the business or fallen by the wayside, sales and profits of the young company have mounted by leaps and bounds until, early in 1929, it was able to obtain an RCA set-manufacturing license and assume an obligation of minimum guaranteed royalty payments of $100,000 a year. The corporation has been continuously directed by its president and founder, Mr. Silver.

The AC screen grid tube makes the circuit autonomous. The circuit was well tried and tested before a word of this article was written, so.

RADIO WORLD
April 6, 1929

Antennaless' Sets Next!
New AC Screen Grid Tube Makes Circuit Autonomous

By McMurdo Silver

FROM the viewpoint of engineering merit, the new AC screen grid tube, souped up by RCA and Cunningham, is nearly eight times as good as the 226 and 227 type AC tubes which are today used as radio frequency amplifiers in almost every modern receiver.

Just what does this mean, not in amplifications, selectivity factors, and stability, but in terms of home enjoyment and convenience?

Briefly, this means that the screen-grid tubes, followed by a power detector and two good audio stages, will give a sensitivity of 10 microvolts per meter—an enormous improvement over the present tubes, with respect to home enjoyment and participation. Selectivity factors, and stability, due to static and other interference, will be greatly increased. The new tube itself being inherently a much more stable RF amplifier than any other known tubes.

Unfortunately, however, the superiority factor of eight for the new type tube cannot be fully realized, and all that can be realized in practice cannot go into amplification. As amplification is increased, with absolute selectivity held constant, apparent selectivity as observed by an operator falls off much more rapidly.

Selectivity Considered

By rule of thumb, if amplification is doubled, absolutely selectivity must go up four times (selectivity must go up as the square of amplification if a satisfactory practical receiver is to be obtained). Briefly, this means that the superiority factor of eight for the new tube translates into an actual amplification of four times greater than can be gotten from a 226 or 227 type tube, holding the selectivity apparent to anyone tuning the new tube very nearly eight times higher than it will with a 226 or 227 type tube, without oscillation, and that the screen grid tube really removes a great deal of the audio channel, the new tube itself being inherently a much more stable RF amplifier than any other known tubes.

Unfortunately, however, the superiority factor of eight for the new type tube cannot be fully realized, and all that can be realized in practice cannot go into amplification. As amplification is increased, with absolute selectivity held constant, apparent selectivity as observed by an operator falls off much more rapidly.

Selectivity Considered

By rule of thumb, if amplification is doubled, selectivity must go up four times (selectivity must go up as the square of amplification if a satisfactory practical receiver is to be obtained). Briefly, this means that the superiority factor of eight for the new tube translates into an actual amplification of four times greater than can be gotten from a 226 or 227 type tube, holding the selectivity apparent to anyone tuning the amplifier to the same value.

The screen grid amplifier is completely stable, inherently free from oscillation troubles, and yet requires no neutralizing or stabilizing adjustments.

NEW SILVER-MARSHALL FACTORY NEAR CHICAGO AIRPORT

The new radio plant recently of Silver-Marshall, Inc., largest American makers of radio parts and kits, is now well under way in the Clearing Industrial District near the airport of the Chicago Municipal Airport, according to McMurdo Silver, president of the corporation. The plant will be the third radio manufacturing enterprise to locate in the modern Clearing Industrial District, nine miles from the heart of the broadcasting center. There are two Schweizer plant, however, is the largest radio factory yet to locate at Clearing, being in itself bigger than its two predecessors put together. The last word in modern one-story industrial buildings, the new S-M plant, with over 100,000 square feet of floor space, will be in operation May, with a capacity of 1,000 to 2,000 complete radio sets per day, in addition to a greatly augmented line of radio parts, radio power amplifiers—the latter in great demand since the widespread popularity of talking movies.

The organization thus occupying the largest radio plant on Chicago's south side was founded less than five years ago. Operating in the past only in the radio parts business—where gross sales have fallen off at the rate of about 40% a year since 1925—the company has steadily lifted itself, almost "by its bootstraps," until it is now doing over 10% of the total parts business of the country. While other parts manufacturers have withdrawn from the business or fallen by the wayside, sales and profits of the young company have mounted by leaps and bounds until, early in 1929, it was able to obtain an RCA set-manufacturing license and assume an obligation of minimum guaranteed royalty payments of $100,000 a year. The corporation has been continuously directed by its president and founder, Mr. Silver.
Build the Greatest Circuit—RE 29!

The neat and efficient arrangement of parts in R. E. Lacault's RE 29.

Lacault's Last and Best Receiver!

For sheer sensitivity the screen-grid receiver, the RE 29, surpassed any circuit he ever tried, R. E. Lacault said, just before his death. So that this extreme sensitivity could be utilized properly, Mr. Lacault spent many trying months until he developed the circuit to a remarkably high point of selectivity, with utter stability. That done, he knew he had a wonderful receiver, one that his large following, eagerly awaiting a screen grid adaptation of his original modulation system, would build with delight and operate with ecstasy. The RE 29, successor to a long line of successful Lacault receiver designs, is here. His latest outfit, his best circuit, may now be duplicated by constructors!

The receiver consists of six tubes (including first audio) in the table chassis, and two tubes (a push-pull output) in the B supply and power amplifier. Hence the receiver proper uses eight tubes. Two 281 tubes are used as rectifiers. So well are each independent stage and the group of stages designed that abnormally high amplification prevails. Distant stations "roll in" easily with this equipment. The master designer of DX circuits took good care of that!

Build this receiver and the Push-Pull Power Amplifier B supply from the official blueprints. Send for your free copy of the Builders' Information Sheet today!

BLUEPRINTS!

Send for your copy today—NOW.

Mrs. R. E. Lacault, 1381 B-way, N. Y. City (50th ST)

Enclosed please find $1.50 for which please send at once blueprint of the 6-tube RE 29 Receiver.

Enclosed please find $1 additional for blueprint of the Push-Pull Power Amplifier B Supply.

Please send FREE copy of the Builders' Information Sheet on the complete RE 29.

Name

Address

City

State

$100.00 WORTH of Pleasure and Convenience for Only $2.00

IF you have two loudspeakers and want a convenient method of playing both at the same time, on time a time, the Speakerelay gives you that service at the turn of a knob. Simply connect the Speakerelay cord tips to the output (speaker posts) of your receiver, and put the cord tips of one speaker in the first two holes (shown on top in illustration) and the cord tips of the other speaker in the remaining two holes (not shown). Then point the knob to "1" at left to play the speaker whose cords are at left, or point the knob to "2" at right to play the other speaker. Or, to play both together, point the knob at "2".

Instead of using two speakers you may use one speaker and one pair of earphones. This is a great asset when tuning in DX, for with earphones you may readily discern the call letters that might not be so plain on the speaker. Also, any weak station may be tuned in with more accuracy with earphones. We also recommend the speaker may be going all the while!

You can get $100 worth of service out of one of these $2 products.

Cat. No. 121 (illustrated)...

$2.00

If you desire a Speakerelay that enables comparison of four different speakers so any one may be played at a time, but all connected in the casing, then order Cat. No. 1234.

Cat. No. 1234...

$2.50

We stock the Speakerelays in quantity and sell them singly or in multiple lots, on an immediate delivery basis. We also have them on display at our office, so, if convenient, come in and see them.

A five-day money-back guaranty attaches to each purchase of a Speakerelay.

Guaranty Radio Goods Co.
145 West 45th Street
New York City
(A few doors East of Broadway)

WHAT RADIO COMPANIONSHIP DO YOU ENJOY?

Are you meeting weekly the best minds of radio? Do you keep abreast of all the new circuits, the intimate details on perfecting existing sets, and get inside track on sensitivity, discrimination, reception, tonal quality, and how to achieve them? Do you keep fully abreast of the news of radio, technical and non-technical? If not, here is your chance to enjoy the writings of Dr. Lee De Forest, McMurdo Silver, J. E. Anderson, Hernman Ward and a host of other radio engineers who contribute their knowledge to you through the medium of Radio World, the first and only illustrated national radio weekly. SEVEN YEARS OLD!

You can find no magazine that better informs you of the needs of Radio World, which specializes in most intimate revelations of Radio World's famous contributors, and pless the news of radio, from the four quarters of the earth. Short waves? Radio World will tell you all about them. Extremely sensitive broadcast receivers? Their construction and operation are fully discussed with confident regularity. Power screen grid tubes? Large receivers that give a super-abundance of performance out of all comparison to their size? Are you interested in these? Then you're interested in Radio World, any one of the following panel meters:

- 4-4 Voltmeter D.C.
- 0-25 Milliamperes D.C.
- 0-50 Milliamperes D.C.
- 0-100 Milliamperes D.C.

Put a cross in the square next to the meter you order and return this slip with one dollar, when you will send you Radio World by mail each week for ten weeks. Present all subscribers may renew their subscription under 15c per copy...

RADIO WORLD
145 West 45th St., New York City
Published Weekly

HIGH RESISTANCE VOLTMETERS

0-50 V. in portable 1926, full scale. Sensitivity 0.050. Used in conjunction with meter, to determine and insulated (at jet.)

100 $4.50

0-500 5.50

0-1000 7.50

10000 11.50

ELIMINATORS, ETC. Same casing as above. (Cat. No. 347) 1.50

GUARANTY RADIO GOODS CO.
145 W. 45th St., N. Y. City

15c per copy $6 per year
April 6, 1929  RADIO WORLD  19

De Luxe Carrying Case FREE
With Each Jiffy Tester Combination!
This Meter Outfit Makes Thirteen Vital Tests in Only 4½ Minutes!

INSTRUCTION SHEET GIVES FULL DETAILS OF THESE THIRTEEN TESTS

The Jiffy Tester in its Case is a Testing Laboratory All by Itself. Leave the meters in the case. Simply lift out the plug, attaching the four-prong adapter, if testing a four-prong tube. Put plug in socket of receiver to be tested; put tube in Tester socket. The B voltmeter automatically connects to the proper points when its tipped leads are inserted in the two binding posts at rear.

Jiffy Tester Combination, shown one-third size, includes 0-10 voltmeter reading AC or DC (same meter reads both); 0-20, 0-100 milliammeter, with change-over switch; cord and plug with 4-prong adapter; 0-900 high resistance voltmeter. Price $13.50. Complete instruction booklet and de luxe carrying case FREE with each order.

Jiffy Tester a Scientific Trouble Shooter

Here Are the Thirteen Vital Tests!

1. to measure filament voltage, up to 10 volts, of AC and DC tubes.
2. to measure the plate current of any one tube, including any power tube, from less than 1 milliamperes to 160 milliamperes.
3. to measure the plate current of a rectifier or amplifier, up to 160 milliamperes. (Hardly any set draws more.)
4. to measure the B voltage applied to the plate of tube; the voltage across B batteries or B eliminators, up to 300 volts.
5. to determine the condition of a tube, by use of the grid bias switch.
6. to measure any tube's electronic emission.
7. to regulate AC bias, with the aid of a power rheostat, using a 27 tube as scale.

Note All That You Get!
For $13.50 you receive:
(1) One Two-in-One 0 to 10 volt meter for AC and DC. Same meter reads both. Scale especially calibrated at 1/2 to 7/10 volts. This meter reads the AC and DC filament voltage of the tubes properly tested. It reads plate current, which is always DC in a reasonable current, which is always DC in the proper tubes.
(2) One DOUBLE reading DC milliammeter, 0 to 20 and 0 to 100 milliamperes, with change-over switch. This reads grid current, which is always DC in the proper tubes.
(3) One 0-300 volts high resistance voltmeter. No. 346, with tipped 30° zero setting, read 0 to 300 volts on AC and DC.
(4) One 5-prong plug with 30° bend for AC detector tubes, etc., and one 4-prong adapter.
(5) One grid switch to change bias.
(6) One bias switch.
(7) One high sensitivity metal case.
(8) One hand-tipped metal case.
(9) One instruction sheet.
(10) One instruction card.
(11) One de luxe carrying case.

This housed Jiffy Tester, with high resistance voltmeter for measuring B voltages, including those of eliminators, is a service kit of the highest value. The case is furnished in a de luxe finish, with handle. A patented snaplock makes it impossible for the lid to open accidentally. The Tester and high resistance meter fit so snugly in place that they will not jar in transportation. A 5-day money-back guaranty attaches to each sale.

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165 West 45th Street, New York City.

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S-500 high resistance voltmeter in "Jiffy Tester Combination A" is accurate to 1% plus or minus, as that is maximum reading, it is not more than 10 volts off. These clearing packages are to be used only when B voltage meter for measuring B voltages applied to the plate of tube; the voltage across B batteries or B eliminators, up to 300 volts. Price $12.50. Each Jiffy Tester Combination, even with one-third size, include, 0-10 volt meter. Price $5.00.

$14.50

Note—Instruction booklet fully informs you how to make each and every one of these tests in a Jiffy.

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S-500 high resistance voltmeter in "Jiffy Tester Combination A" is accurate to 1% plus or minus, as that is maximum reading, it is not more than 10 volts off. These clearing packages are to be used only when B voltage meter for measuring B voltages applied to the plate of tube; the voltage across B batteries or B eliminators, up to 300 volts. Price $12.50. Each Jiffy Tester Combination, even with one-third size, include, 0-10 volt meter. Price $5.00.

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$14.50

Note—Instruction booklet fully informs you how to make each and every one of these tests in a Jiffy.
Coils Built for Abundant Results!

They Meet the Needs of Battery-Operated or AC Screen Grid Tubes, and General Purpose Tubes of Battery or AC Types.

Fascinating Color Adorns the Bakelite Form as Well as the Wire Insulation

The DIAMOND Pair

AC5 . . . . . $1.50
Model AC5, for .0005 mfd............. $1.50

SGT5 . . . . . $2.75
Tuner to work out of a screen grid tube. The large primary is fixed and is connected in the plate circuit of the screen grid tube. Tunes with .0005 mfd.
Model SGT5, for .0005 mfd............. $2.75

COILS with a purpose, like people with a purpose, succeed best.

For a highly selective four-tube receiver, as great selectivity as you can command on four tubes with ample speaker volume, the two coils, AC5 and SGT5, make an unbeatable combination. Dials will track nicely. Distance will come in easily and loud. Full sensitivity is readily attained.

The AC5 coil is used in the antenna circuit and has a small primary—six turns—while the secondary has 48 turns, a step-up ratio of 1-to-8.

The radio frequency tube is a screen grid which requires a high impedance load on the plate circuit, provided by SGT5 having a 24-turn fixed, untuned primary. The secondary is tuned.

Selectivity is what you need, especially with a high-gain circuit, such as one using a screen grid tube, and this combination of coils not only gives you that but permits retention of ample—even more than ample—volume.

And, remember, the dials track nicely!

The UNIVERSAL Pair

HT5 . . . . . $3.00
Tuner to work out of a screen grid tube, like TP5, only tickler is added. Tunes with .0005. Model HT5, for .0005 mfd............. $3.50

Data on Coils

The coils are wound on blood-orange bakelite, with tuned windings in blue silk insulation, untuned windings in strawberry silk insulation and tickler in Litzendraht, with gold insulation.

The outside diameter is 1/4 inches. The coils are placed on a panel plate. The coils have rotor windings with tickler windings. All coils are wound to the same pitch and horizontal mounting, and hardware to accomplish this.

All tuned windings are center-tapped. All coils are sold on a 10-day money-back guarantee. If you're not delighted with them, for any reason, send them back in five days and get your money back.

RF5 . . . . . $1.50
Excellent selective antenna coil for any circuit, and interstage coil for any battery operated receiver, excepting output of screen grid tube. Tunes with .0005 mfd.
Model RF5, for .0005 mfd............. $1.75

TP5 . . . . . . $3.00
Interstage coupler to work out of a screen grid tube, where the primary in the plate circuit is tuned, the secondary, in the next grid circuit, untuned. Tunes with .0005 mfd.
Model TP5, for .0005 mfd............. $3.50

Enormous amplification, with more than moderate selectivity, is achieved by circuits using these two coils—RF5 and TP5. The primary of the interstage coil, TP5, is on the outside and is tuned. It is center-tapped. The secondary, on the inside, is untuned.
Build the New Diamond
(AC or Battery Model)
The 4-Tube Circuit Supreme!

USE THE OFFICIAL PARTS AS SPECIFIED BY
HERMAN BERNARD,
Designer and Author

The parts listed herewith are exactly the same as those used by Mr. Bernard in his laboratory model.

PARTS FOR THE AC DIAMOND
CA, CG, CT—Three Aerovox 4000 mfd. fixed condensers, molded, $1.25.
CB, CF, CD—Three Aerovox 2000 mfd. fixed condensers, molded, each .75.
CI, CS—Two Aerovox 5,000 mfd. fixed condensers, molded, $1.50.
C3—No. 14424204 Airtron mica, 70 mfd., $1.50.
C1—One Herzog 48630 71 mfd., $1.00.
G1—One Heimann 1010 front sub-chassis.
C2—One Aerovox 225 mfd. mica, .40.
L1—One Lynch 100,000-ohm, 4 1/2 volt variable resistor.
R1—One Electrad 2,000-ohm variable resistor.
R2—One Lynch 2,000-ohm fixed resistor.
R3—One Electrad 5,000-ohm variable resistor.
R4—One Electrad 2,000-ohm resistance stub.
R5—One Lynch 5,000-ohm fixed resistor.

Four Kelly tubes: one 222, two 201A, one 112A or 171A.

R6—One 5,000-ohm 50,000-volt filament transformer.
R7—One 5,000-ohm 50,000-volt filament transformer.
R8—One 5,000-ohm 50,000-volt filament transformer.

Note: The optional condenser, CX, is .006 mfd.

Ten .02-ohm 1/2-watt resistor, $1.00.

Ant., ground, speaker, speaker 4-way plug, cable.

A1—Amperite with mount.
A2—Aerovox .0005 moulded.
C3, C4—Two Aerovox moulded .006 mid.

Front panel and subpanel together.

Front panel: .90.

Four Kelly tubes: one 222, two 227, and one 112A.

GUARANTY RADIO GOODS CO.
145 W. 45th St., N. Y. City.

Send blueprints for the AC DIAMOND
BUILT this 4-tube receiver, using one 222 tube, two 227 and one 112A (or 171A), and enjoy tone quality, selectivity, and ease of control. The official blueprint gives the picture diagram size, both top and bottom views; also schematic diagram and list of parts. You can use your present B eliminator externally, but the same control may be used. There is a $3.50 fee for copies (20 numbers). Mailed for 15c a copy; or subscribe for 6 months (26 numbers) subscription for Radio World, containing Bernard's articles on the construction of this receiver. Name

Send blueprint and four Diamond tubes, $3.00.

Free subscription for 6 months for Radio World. Send blueprint and two AC Diamond issues Public.

SG Diamond

Battery or AC Model (specify which)

The best appearance of the New Diamond of the Air results from using the official aluminum subpanel, 10 x 20 inches, with the four sockets built in, and with self-bracketing front. Hardware and insulating washers supplied with each sub-panel.

Holes are drilled for mounting parts, but as this aluminum drill like bakelite you can drill any holes you want.

Front Panels

The front panels for the battery model or the AC Diamond are of Bakelite, 'laid in', and are drilled with all necessary holes, in exactly the right place, High polish finish.

Complete List of Radio Stations

RADIO WORLD dated March 23rd carried a full and thoroughly up-to-date list of broadcasting stations as they stood at the time of going to press. This list contained the stations in the order of frequency and gave the owner, location, power and time sharers.

Mail for 15c a copy; or subscribe now and start with the March 23rd issue.

Radio World, 145 W. 45th St., N. Y. City.

Bluesprint for the New, Highly Selective

Aluminum Subpanel

for the New, Highly Selective

SG Diamond

Battery or AC Model (specify which)

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Holes are drilled for mounting parts, but as this aluminum drill like bakelite you can drill any holes you want.

Front Panels

The front panels for the battery model or the AC Diamond are of Bakelite, 'laid in', and are drilled with all necessary holes, in exactly the right place, High polish finish.

RADIO WORLD, 145 W. 46th St., N. Y. City.

(Just East of Broadway)

Enclosed please find $3.00 for which please send the aluminum subpanel 10x20" for the new battery model 4-tube SG Diamond of the Air, with sockets built in, and with self-bracketing front and side and rear supports; also send hardware and insulating washers.

Enclosed please find $1.50 for which please send the 7x22" drilled Bakelite front panel for the new SG battery model Diamond.

Enclosed please find $5.50 for both the aluminum subpanel, etc., and the drilled Bakelite front panel of the battery model.

Enclosed please find $5.00 for both the aluminum subpanel, etc., and the drilled Bakelite front panel of the AC model.

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Enclosed please find $1.50 for the 7x22" drilled Bakelite front panel for the new AC Screen Grid Diamond.

Enclosed please find $5.00 for both the aluminium subpanel, etc., and the drilled Bakelite front panel of the battery model.

Enclosed please find $5.50 for both the aluminium subpanel, etc., and the drilled Bakelite front panel of the AC model.

Front Panels

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- **Price:** $7.50 Net
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- **Price, $9.25 Net**
- **Polo Twin Magnet Unit—weight, 3½ lbs., or twice as heavy as ordinary unit. Twin magnets double sensitivity.**
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April 6, 1929

RADIO WORLD

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