

Radio Digest

EVERY
WEEK

Illustrated

TEN
CENTS

TRADE-MARK

Vol. III

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CHICAGO, ILL., SATURDAY, OCTOBER 14, 1922

No. 1

AIR TRANSMITS POWER

CHICAGO'S SHOW TO BE TRADE'S LEADER

DISPLAY PLANNED IS ONE
OF NATION'S BEST

Exposition Opens in Huge Coliseum
October 14, to Last Eight
Days

CHICAGO.—The Chicago Radio Show, the first show ever endorsed by the National Radio Chamber of Commerce and the Radio Division of the national electrical manufacturers, now promises to be one of the largest trade expositions ever held in the United States. When the doors of the Coliseum are thrown open to the public on Saturday, October 14, practically every large manufacturer of radio apparatus will be represented in the show, which will continue until Saturday, October 23. It will be open to the public both afternoon and evening for the eight days.

It will be the first time that the manufacturer has taken the opportunity to meet the jobber, dealer and the public all at the same time. Aside from the show features, it will be a great get-together convention for all persons interested in Radio. Dealers and jobbers from all over the middle west will be present and meetings of some of the most important committees of the National Radio Chamber of Commerce will be held at the same time.

Entertainment Arranged

An elaborate entertainment program is arranged. Ed. Wynn, the famous comedian, and his company will put on their show the opening night of the exposition and it will be broadcasted. There will be a society night, a Radio ball, a children's afternoon and other features during the week. While the entire Coliseum will be given over to the exhibits, the Coliseum Annex will be given over to meetings, entertainment, the Radio ball and other features.

The remainder of the exhibition space is being reserved rapidly. The amount of space already taken insures the success of the exposition from the standpoint of both the exhibitor and the spectator. There will be plenty of room for the crowds, as sixty percent of the entire floor of the Coliseum, Chicago's great exposition building, will be used for aisles, preventing over-crowding and giving the exhibitor a chance to talk to his prospective customers.

Much to Interest Public

The public will be entertained well. The exhibits will include the latest Radio apparatus and many exhibits are of improvement. (Continued on page 2)



Wallace F. Vail, president of the United States Radio Corporation, announces the discovery of a method by which electrical power may be transmitted to remote points through the use of Radio. Among the experiments made with the new apparatus was that of lighting an electric lamp by means of air waves. Mr. Vail and Miss Edith Flynn beside part of apparatus. © Keystone

SCIENTISTS' DREAM NEAR REALIZATION

U. S. Radio Corporation Engineers Light Lamp, Ring Bell by Air Waves

Device May Find War Use

Device Complete After Six Months' Experimenting—May Be Carried In Auto

(Special to RADIO DIGEST)

SAN FRANCISCO.—Will the dreams of the scientists come to pass? Will the transmission of power by Radio become the next step in the advancement of this new science? According to an announcement by Wallace F. Vail, President of the United States Radio Corporation of this city, tests have been made of the sending of electric power direct by the means of a Radio transmitter upon which the engineers of the company have been working for the past six months.

"The first experiments of this nature were held after the engineers employed by the corporation noticed that an electric lamp lighted without apparently any reason, while they were doing regular broadcasting," said Mr. Vail.

"The men at once recorded the hook-up of the set that they were using to transmit and commenced an investigation.

Rings Bell, Lights Light

"Later, an electric bell was rung in the city of Berkeley, eight miles away, by means of the same idea. The engineers were able also to light an electric light at a distance of one thousand feet entirely by the transmitted power."

Will the completion of the tests which have been made in the presence of engineers prove that future wars of the world will be next to impossible because the United States will have the secret making it possible to destroy forts, powder mills and other places at a distance of a hundred miles or more?

(Continued on page 3)

Oyster, Radio Seasons, Opened at Same Time

Transmission Is Good in All "R"
Months of Year

WASHINGTON.—Oysters are now in season—and so is Radio. Curiously, the two seasons coincide; if there is an "R" in the month, Radio transmission is good. The Radio season opened officially on September 1st, and is now in full blast. The Radio season may be said to begin in September and close in April in the United States, according to W. D. Torroll, the Chief Radio Inspector. During this period the best results are obtainable; static, the summer imp of interference, ceases his activity in the fall. Vacations are over and the enthusiasts begin listening in for the distant stations, some of which they have not heard since the beginning of summer. The amateurs are already shaping their plans for further trans-oceanic tests.

NEW ENGLAND BOASTS FOUR MORE STATIONS

Hardware and Department Stores
Get Commercial Licenses

BOSTON, MASS.—New England has four new limited commercial broadcasting stations. The Shepard Stores at Providence, owned by the same concern operating Shepard Stores in Boston, has been assigned the call WEAN; the Putnam Hardware Company at Moulton, Me., in the heart of the potato raising district of Aroostook County, is given the call WLAN; to Col. Edward H. R. Green's new station at Dartmouth, Mass., known as the Round Hills Radio Corporation, is given WMAP; and to the Vermont Farm Machine Company, at Bellows Falls, Vt., goes WLAK.

James H. Rogers, a Maryland inventor, claims that he has received Radio messages from distant stations through the ground by simply burying a wire.

EXPLOIT OPENING OF AUTO TRAIL BY RADIO

COLUMBUS, O.—Broadcasts will be used here to exploit the Old Trail reopening celebration to be held on October 2, 27 and 28 under the auspices of the Columbus Automobile Club. The Entreklin Electric Company broadcast the news of the celebrations and cities along the National Highway between Wheeling, W. Va., and London, Ohio.

TINIEST OF MUSICIANS SING FOR WSY PLANT

BIRMINGHAM, ALA.—WSY, the Alabama Power Company's station, broadcasted this week the music of six of the tiniest and best loved musicians in the world. Two cages of singing canaries known as the "Canary Opera," booked with Keith vaudeville, proved a feature unsurpassed for those who listened in on the "Voice of the Magic City."

AIR TRANSMITS POWER

(Continued from page 1)

Power Wave Cannot Be Insulated

"The value that the invention may have in war time," said Mr. Vail, "may be gained from the fact that engineers have been unable to insulate against this power wave, thus indicating that powder mills, forts and other defenses could be blown up."

The power waves, according to Mr. Vail, are of such a high frequency that instead of going over or around obstacles, as do the waves of Radio telegraph and the Radiophone, they go through all obstructions. It is possible to carry the complete device in the tonneau of a small automobile when it is desired to transport it. The possibilities of this invention in the future as a weapon of defense or one of offense may be imagined somewhat when it is known that the transmitted waves can heat the metallic filament in an incandescent light until the former is melted.

It is said that government authorities at Washington have ordered an investigation with a view of further development and utilization of the invention for government purposes.

RADIO GOLF LATEST IN INDOOR SPORTS

Player Who Can Tune In Most Long Distance Stations Winner—Skill Required

BOSTON, MASS.—G. R. Entwistle tells of a new indoor sport called Radio Golf, which differs much from the much beloved African golf, another well-known indoor sport. The object of Radio golf is to get as large a score as possible, which means in other words to tune in as many long distance stations as possible. This is how it is played:

Select some evening of the week and keep a record of the distant stations heard. Each station has its identifying call letters and can be recorded easily with the aid of a call list and a United States map drawn to scale. Using these the player determines the distance between his station and the various stations heard and puts it down in tabular form, the station in the left hand column and the distance in the right hand column, so the totals can be footed up.

The beauty of Radio golf is that anyone can play. He can make it a "lonesome," a twosome or a foursome, just as he chooses, with neighboring sets competing with him for the best scores. Don't think it doesn't require skill, however, for it does. Skill is needed not only in tuning and adjusting but care is required in seeing that all parts of the receiving set are in fine working order.

TWO TEXAN PLANTS VIE FOR HONOR AS LARGEST

Fans Get Announcements of Rival 750-Watt Stations

SAN ANTONIO, TEX.—Southwest Texas Radio fans are wondering which of the two big stations coming here will be the "largest in the South." The Southern Equipment Company, which has a 750-watt station installed and awaiting a license had claim to the honor in recently broadcast tests, heard in Oklahoma, Colorado, Nebraska, Kansas, Missouri, Iowa, Illinois, Kentucky, Tennessee, Arkansas, Louisiana, Mississippi and the interior of Mexico as far as Mexico City.

On the other hand, Brooks Field, the army balloon training school, which now operates Station DM7, recently made the announcement by Radio that it would have a 750-watt station in operation soon.

CHICAGO RADIO SHOW

(Continued from page 1)

ments made during the summer and to be shown for the first time. There will be novelty exhibits and a score of aerials on the roof of the Coliseum will catch and disseminate all that is being sent out from the broadcasting stations all over the country.

In the large space in the center of the building will be a display of Radio controlled automobiles, torpedoes, a pump that pours out real water and other mechanical devices operated from a small sending station.

U. J. Herrmann, managing director of the show and Manager James F. Kerr visited more than a dozen Radio shows in different parts of the United States before making their final plans for Chicago's show and are going to avoid the mistakes made by the other shows. The Chicago Radio Show will be an annual national affair and holds an exclusive lease on the Coliseum building for this kind of a show and for a long term of years.

Lee De Forest Explains Talking Motion Pictures, Latest Invention

Pioneer in Radio Development Believes That in 'Phonofilm' He Has Made Another Scientific Triumph—Photographed Sounds Make for Perfect Synchronism with Pictures

NEW YORK.—Lee De Forest, inventor of the audion and Radio pioneer who in 1908 predicted the broadcasting which is sweeping the country today and was promptly criticised for it, is thoroughly convinced that he has mastered another scientific triumph—talking motion pictures.

The squawking, scratching, jumping kind unsuccessfully shown some years

apparatus is "very compact and simple, both for attachment to the moving picture camera and to the projector in the theatre."

"The audion amplifier is the underlying device on which all this is built up. For taking and reproducing the voice on the moving picture film, a special light, governed or controlled by the voice, is inserted in the moving picture camera and

PIECE OF TALKING MOVIE FILM



This section of one of Dr. De Forest's first "Phonofilms" shows the inventor himself speaking. Checkerboard markings on inside left margin of picture are record of his photographed voice vibrations. In top picture he is making no sound, in middle and lower photos he has started to talk. Compare the edge markings

ago is not his achievement, but a speaking film which synchronizes the picture and human voice, and which promises to revolutionize the present motion picture industry.

Mr. De Forest talked freely and confidently about his invention when interviewed, and explained its makeup. He told how it could be attached at small cost to the average motion picture projector now installed in the thousands of cinema theatres scattered throughout the country.

Conceives Idea of Talking Movies

Since 1899, when Marconi came to this country and introduced Radio, De Forest, then just out of college, became interested in scientific things and scored many triumphs in the Radio field. Three years ago he conceived the idea that the now silent drama should be synchronized with the voices of the actors and actresses in the picture.

Today he believes his dream has come true. He worked for two years on the experiment in this country and then went to Germany, where cheaper materials and labor prevailed, and put on the finishing touches.

His invention is today "emerging from the laboratory stage to the film studio," and "the technique of a new art must now be studied and developed."

Compact and Simple

Based on inventions made several years ago and fully protected by basic patents and applications Mr. De Forest says the

connected to the audion amplifier, which in turn is connected to the sound catching device, similar to a microphone.

"A very narrow strip of the film—1-16 inch wide—is devoted to the photographic recording of the voice waves through this special light. In reproduction a reverse arrangement is attached to the moving picture projector, whereby a fine, but intense, beam of light passing through this narrow track on the film, registers on a narrow strip of the film when the picture is taken.

Audion Amplifier Magnifies Sound

"It remains then for the audion amplifier to magnify this weak telephonic current several hundred thousand times without distortion, and a new type of sound converter or loud speaker to throw the reproduced sound out into the theatre from behind or beside the screen.

"An entirely new technique from the usual silent drama remains to be developed. Ordinarily the film picture of today would not be greatly benefited by the addition of the voices of the actors. In certain passages, 'close-ups,' where weighty words are spoken, where now the audience seeks to read from the motion of the actor's lips the message, usually unsuccessfully, the addition of the voice may be made very effective.

"Incidentally, music, adequately played in the studio by a good orchestra, will replace the usually inadequate attempts in the smaller theatres by piano and one or two stringed instruments.

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Looking Ahead

The seventh of the series by H. M. Towne will appear next week. Mr. Towne for a number of years has been employed in the laboratories of the General Electric Company.

Panel Units for Your Receiving Sets. Details of panel construction will continue. This popular feature has been requested by many readers and will be written by Thomas W. Benson.

Broadcasting Directory. Gets better and larger each week. The only convenient reference to aid you in finding a station heard.

"How to Make Department." Many kinks every week are interchanged here.

Radio Illustrated. The picture page is the best of its kind.

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RADIO BROADCASTS HAVE COME TO STAY

H. P. DAVIS, ORIGINATOR OF SERVICE, TELLS WHY

Westinghouse Official, in Interview, Declares Programs Have Become Public Necessity

"You have asked me, 'why should Radiophone broadcasting be continued?' I cannot find any answer to that question as it seems so perfectly obvious to me that Radiophone broadcasting has come to stay. Instead of answering I would ask:

"Who wants Radio broadcasting stopped?"

"What causes anyone to want broadcasting stopped?"

"Is the present broadcasting service unsatisfactory?"

"If it is unsatisfactory, this should not be a cause for discontinuing it, but rather a reason for greater effort at improvement." It was evident at once from his reply that Mr. H. P. Davis, vice-president of the Westinghouse Electric & Manufacturing Company, had been surprised to think that anyone should ask such a question. And little wonder, for the man who was responsible for organizing the first Radiophone broadcasting station in the world—this pioneer station being KDKA at East Pittsburgh, Pennsylvania—and the installing of three other stations (KYW at Chicago, Ill., WJZ at Newark, N. J., and WBZ at Springfield, Mass.) has been closely in touch with Radio for the past two and a half years and has evidently detected no demand from the public for cessation of Radiophone broadcasting activities.

Speaks of Phenomenal Interest

Mr. Davis called to the interviewer's attention the wonderful and phenomenal spread of popular interest in Radiophone broadcasting, and stated that he believed that this interest was not waning, but was increasing.

"You have asked me why Radiophone broadcasting should be continued," said Mr. Davis. "Perhaps I can answer your question best by saying that I can tell you many reasons why Radiophone broadcasting should not be stopped."

The interviewer assured Mr. Davis that there was no real objection to the Radiophone, and so far as he knew there was no reason why it should not be continued. This was in answer to Mr. Davis's first question in reply.

"Broadcasting," he continued, "has become a public necessity and is rapidly lining itself up with other utilities such as the telephone, telegraph, electric light, moving pictures, etc., and just as these activities were crude in their beginnings, but later refined to present-day conditions, so, in the same way, will Radiophone broadcasting be developed and will cover and make available to all within hearing range, all worth-while activities of general interest to the public."

Who Will Pay for Programs

When Mr. Davis was asked if present conditions under which Radiophone broadcasting was done, wherein a free service was given would be continued, he stated in reply that a service of this character offered such benefits to mankind in general that ways would be found for its continuance.

"Why," he said, "consider the effect of discontinuing operations at our four stations! We believe that the combined audience of our four broadcasting stations is at least a million every night in the week. It may be more. This estimate is based on an approximation of the number of Radio receivers which have been sold in the territories covered by these stations. What would be the result if all broadcasting stations stopped suddenly, with or without warning, entertaining and informing this vast audience?"

"The effect upon this audience would be about the same as would occur if we took away some one or more of the utilities already referred to, such as the electric

(Continued on page 4)

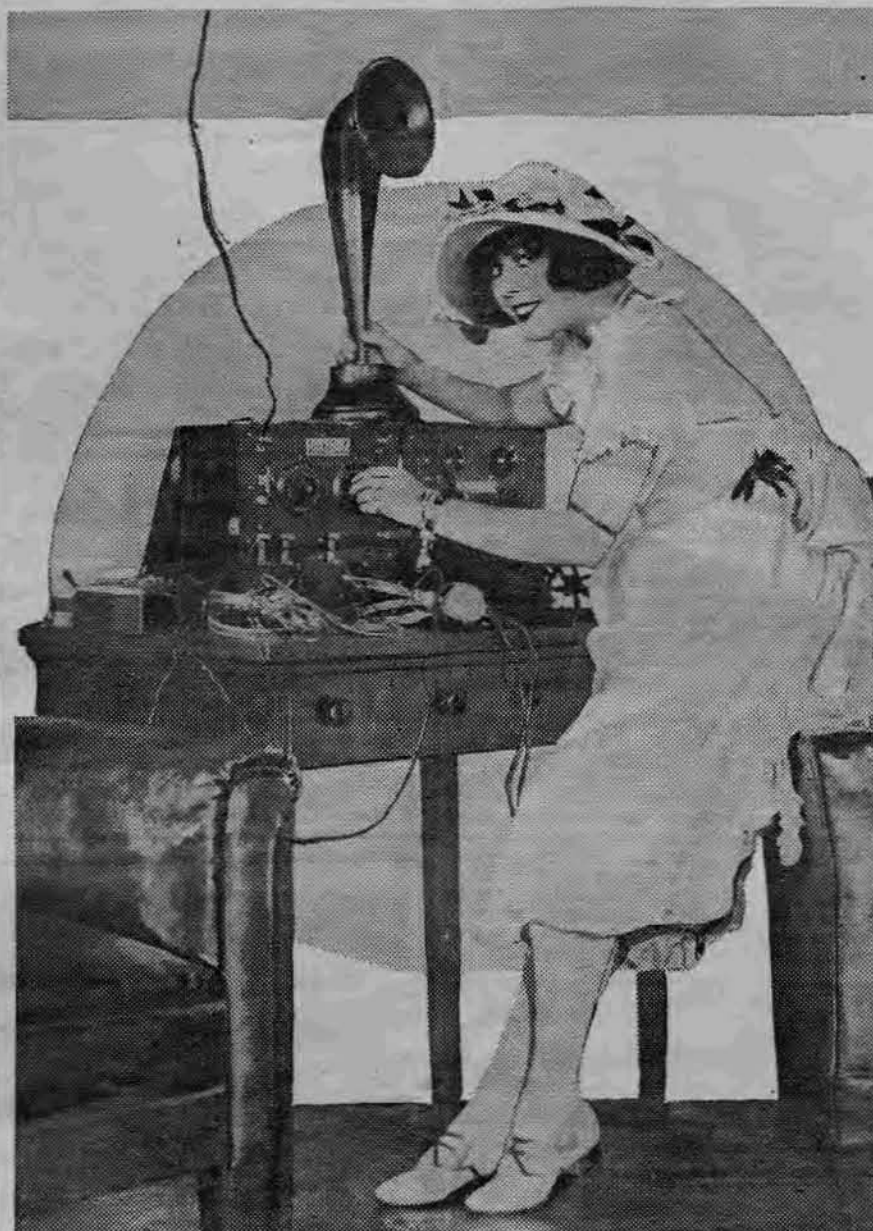
USE BROADCASTS AND FIND ARMY DESERTER

CHICAGO.—Radio was used for the first time recently in tracing army deserters when William C. Mays, a full blooded Indian, was arrested here by Police Sergt. Richard Mackey. Mays deserted from the flying field at Langley, Va., and news of his flight was broadcasted by Radio. The message was picked up at the government bureau here.

10 DISABLED SOLDIERS GIVE MUSIC PROGRAM

BOSTON, MASS.—Ten disabled veterans furnished a concert recently at WNAC, the Shepard station of this city. The veterans are students at the New England Conservatory of Music and are taking instruction under direction of the United States vocational bureau. The numbers included clarinet, violin, saxophone, piano and trumpet, and baritone and tenor solos.

DANCING, RADIO, ANN'S FAVORITES



Ann Pennington, star Follies dancer, is a Radio bug—she says so—and next to dancing she likes Radio better than anything. She has installed a set in her home and put up an aerial—all alone so they say. Radio dance music, she claims, helps her keep in practice. © K. & H.

Ohio Women's Club Salaams to Broadcast's Popularity

COLUMBUS, O.—The Radio craze has secured such a hold on the people in this city that the women have even gone so far as to include the subject in their club programs. Recently, at a meeting of the Glen Echo Child Welfare league, the subject of the day was "Radio" and the roll call was responded to by Radiograms. R. C. Bohannon, of the Erner & Hopkins Electric company, gave an instructive talk on the origin and development of the science.

Phones Irritate Shrapnel; Removed So Vet Can Listen

CINCINNATI, O.—Judge Robert S. Marx, of this city, former commander of the Disabled Veterans of the World War, this week underwent a successful operation for the removal from his neck of a jagged piece of shrapnel, a souvenir of the great war, which had constantly interfered with the use of his Radiophone. The magnets in the phones of his set caused sufficient movement of the metal to irritate the tissue around it, dangerously near the mastoid glands in his neck.

SIX-IN-ONE AUDION IS GERMAN'S IDEA

PROF. BERNHARDT EXPERIMENTS WITH TUBE

Has Common Filament Surrounded by Six Grid-Plate Combinations Mounted Hexagonally

NEW YORK.—Professor Bernhardt, well known among professional Radio circles in Germany, has been experimenting with a vacuum tube which has six grids and six plates.

This peculiar vacuum tube is really the outcome of experiments carried on with several elements placed within one evacuated container, and lighted with but one filament. It has, then, really six separate elements, united in one vacuum tube, with but one filament to supply the electron flow.

The construction of the tube is interesting. The filament is placed in the center of the tube, hanging vertically. All around it are placed the six grids in the form of a hexagon, and directly in back of these are the plates.

This tube, therefore, operates as six separate tubes, as the grid and plate elements function separately. It would then be possible to connect this tube in an amplifying circuit, and get an amplification equivalent to six stages!

ALASKA'S FIRST PLANT, WLAY, GIVEN LICENSE

Twelve Other Stations Given Permits During Week

CHICAGO.—Thirteen regular broadcasting licenses, now known as Class A, were issued by the Department of Commerce during the week ending September 30. Among them is the first broadcasting station in Alaska, WLAY, the station of the Northern Commercial Company, located at Fairbanks, nearly in the center of that territory. The Alaskan plant will broadcast a program of entertainment for the benefit of the citizens within a radius of about 500 miles.

The list of licenses for the week follows:

- WLAV, Electric Shop, Inc., Pensacola, Fla.;
- WNAF, Enid Radio Distributing Co., Enid, Okla.;
- WOAA, Dr. Walter Hardy, Ardmore, Okla.;
- WLAZ, Hutton & Jones Electric Co., Warren, Ohio.;
- WOAE, Medland College, Fremont, Nebr.;
- WLAY, Northern Commercial Co., of Alaska, Fairbanks, Alaska.;
- WMAK, Norton Laboratories, Loekport, N. Y.;
- WNAD, Oklahoma Radio Eng. Co., Norman, Okla.;
- WNAB, Park City Daily News, Bowling Green, Ky.;
- WMAL, Trenton Hardware Co., Trenton, N. J.;
- WMAP, Utility Battery Service, Easton, Pa.;
- WLAW, New York Police Dept., New York City.;
- WNAH, Wilkes-Barre Radio Repair Shop, Wilkes-Barre, Pa.

English Plant Claimed As World's Most Unique

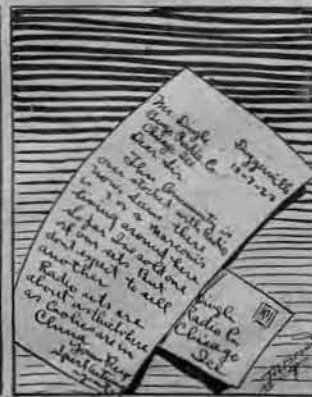
Sixty Wires for Phones Radiate from Receiving Set

LONDON, ENGLAND.—The public Radio station which has been established at Southport, England, is claimed to be one of the most unique in the world. It is built like a small entertainment hall. On the "platform" a large receiving set has been installed, from which 60 distributing wires radiate. These are suspended at well-spaced intervals from the ceiling, and to the end of each is attached a hand phone, suspended within easy reach of the seated patron. Arrangements are made with certain broadcasting stations to send out music between specified hours.

THE ANTENNA BROTHERS

Spir L. and Lew P.

Who Said Rubes?



CATCH 'BANDITS' BY USE OF RADIO CARS

PAPER OF OAKLAND, CAL., HOLDS CONVINCING TEST

"Thieves'" Auto Is Run Down in Hour and 45 Minutes by Equipped Machines

(Special to RADIO DIGEST)

OAKLAND, CALIF.—The Oakland Tribune, Oakland, California, recently held a Radio test which helped to convince two police departments that Radio apparatus should be installed on their cars. The test was carried out under the directions of the Radio department of the Tribune, and attracted wide attention. The U. S. Army and two police departments sent observers.

The test was a "bandit" chase, wherein a fictitious bandit and an accomplice attempted to evade the police. The car driven by the "bandits" was described completely by The Tribune prior to the test, and persons residing in Oakland or any of the surrounding country were requested to notify the Tribune if the car was sighted on the morning of the day of the test.

Reports Come in Half an Hour

The "bandit" car made its getaway at 9 o'clock in the morning. Half an hour later a fleet of cars, each equipped with receiving apparatus, distributed themselves over the vicinity at various points, as would be done in case several police departments were co-operating in a bandit hunt.

Half an hour after the "bandit" car left town, phone calls began coming in reporting its whereabouts, the direction in which it was traveling, etc. The calls went directly to the Tribune's Radio broadcasting tower, KLX, which is known over the entire west. Operating at 15 minute intervals, KLX broadcasted the various reports. Both Radiophone and spark were used in the test, the latter being employed to insure the reception of the reports by all of the cars in the chase.

"Bandits" Quickly Captured

Many reports were received, some authentic and some that were conflicting. The test resulted in the capture of the "bandits" one hour and forty-five minutes after the Radio-equipped cars took up the trail, and after the "bandit" car had covered 110 miles of territory, doubling back and side-tracking his pursuers. At the time of the capture on Bay Farm Island, a few miles from the starting point, more than half a score of the cars in the chase were closing in on the "outlaws." The car that captured the "desperadoes" was fitted with a three-wire aerial containing a total length of 40 feet of wire.

As soon as the capture was made the news was flashed back by spark to KLX, and KLX in turn notified all the cars in the chase, requesting them to report back. Forty-five minutes later every car had reported back. Each car presented a log of the signals, and every car except one had copied every Radiophone message correctly. So effective was the Radiophone that no effort was made to copy the spark messages, which were merely confirmations of the spoken messages.

As a result of the test, the two police officials have recommended and are negotiating the installation of Radio apparatus on police cars of two departments, Oakland and Berkeley.

COLUMBUS TO BE LINK IN GOVERNMENT CHAIN

New 1,500-Mile 10-K.W. Plant Is for Official Business

COLUMBUS, O.—Columbus, through the United States Army barracks and reserve depot, is soon to become an important link in the chain of Radio communication stations which the government is throwing across the country from Washington to San Francisco. The huge transmission station at the General Reserve Depot was to have been completed by October 1. This station will be the most powerful in this section of the country, having a sending radius of 1,500 miles.

Under present plans, it will be used exclusively for the transmission of government business and will be one of the relay stations from Washington to the Golden Gate. Other stations are at Chicago, Omaha, Cheyenne and Salt Lake City. The transmitting set is of ten kilowatts and is operated through a 1,500-volt generator, in turn fed by a motor whose power is obtained from the reserve depot's own power plant.

RADIO BROADCASTS

(Continued from page 3)

light, or the telephone—and we might go even further and say that it might be the same as stopping the newspapers and magazines, and the cutting off of amusements and communications. The effect probably right now would not be so vital as it will be later, as the service improves and grows—which it is bound to do."

People Would Demand Service

"What would happen if this occurred?" was asked of Mr. Davis.

"You know as well as I do," he said, "that there would be a public clamor that would quickly bring some solution of a state or federal nature. I do not believe, however, that this can happen, as there is enough commercial possibility and goodwill in this business to make it worth while for those companies that can benefit from it, to continue the service."

"What about the Westinghouse Company?"

"I feel that, in answer, I can say for the Westinghouse Company that it will not stop a worth-while service. We realize the great value of the accruing good will to the whole electrical industry, which has come from Radio broadcasting; and we further realize the responsibility we have undertaken, and it is our determination to do our share in the perfecting and developing of this important public service. So you see that there is really no reason why we should stop, as long as there is a service to the public to be fulfilled."

Phantom-Circuit

BUILD YOUR OWN. This marvel of mystery with no aerial, no loop, no ground bridge in music instead of static spheres. We completely base circuits on Magnavox from stations 100 miles distant, audible 15 feet from horn. The simplicity of this set will surprise you. No Radio frequency. Complete instructions including photo of circuit sent you paid for 50c.

VESCO RADIO SHOP, Box 794, Vacaville, Calif.

Carter "HOLD-TITE" Jacks

1 to 5 Springs
Prices 70c to \$1.10

Heavy tapered phosphor-bronze springs; no spacer washers. Write for Bulletin on these Jacks, Carter "TU-WAY" Plugs and other products. CARTER RADIO COMPANY, 299 South State Street, Chicago

Book Reviews

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

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

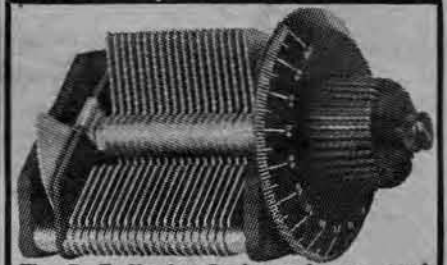
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"IT'S THE BUNK"—WILL ROGERS

MOVIE STAR TALKS TO RADIO AUDIENCE

Ropeless, He Successfully Springs Gags on Thousands of Listeners

"It's the bunk," laconically remarked Will Rogers as he went on ropeless recently before the invisible audience listening in on station WWJ, owned by the News of Detroit, Michigan.

"I don't think you can hear. If it isn't the bunk let me know whether you hear me."

"Much to my surprise," said Rogers to the writer as he was sitting in his dressing-room at the New Amsterdam theatre in New York, between the acts of the Ziegfeld Follies in which he is appearing as of old, "I received post cards and letters from all over the middle west. One in particular was from a couple down in the Arkansas hills, located fifty miles from a railroad and twenty miles from any town, who had listened in that evening and heard my gags and wrote they were very much pleased with my air act.

His Gags Show Improvement

"I also heard from a couple of old school chums of mine whom I had not seen for years. They said they were delighted with my stuff and it had improved since we use to be on guard duty at Boonville, Missouri.

"The whole thing was new to me," commented Rogers as he rubbed the grease paint on thicker and began looking for his Giant baseball uniform in which he was to appear in the next act.

"I never cared for electricity," he continued. "Always been afraid to mon-

key with the wires. This broadcasting thing was new to me.

Henry Fords Hears Him

"The thing that interested me at Detroit was the fact that Henry Ford was listening in on my act that night. You know when I am in Detroit I always spend a day with Henry, and on this trip, the day after I was on the program, I went out to visit him. He said that he had heard me very plainly on a set that he had built himself. He had it rigged up in an old cabin on his estate at Dearborn near Detroit. Edsell, his boy, had a ready-made set at his home, but Henry stuck to the one he made himself for a few dollars.

"We got to talking about the effects of Radio on the attendance at the theaters and Ford said that theatrical interests were wrong in taking the attitude that stars broadcasting over the Radio would hurt the show business. 'It will bring them in instead of keeping them away,' Henry commented.

Ford Hints He May Make Sets

"There's a lot of profit in these wireless sets. We can build them for twenty-five dollars and make money. I may go into the manufacturing of Radio sets," Rogers quoted Ford as saying.

"My movie experience helped me there," said the famous monologue-philosopher-comedian in answer to the question. "Did you get Radio fright when you appeared before the microphone in Detroit?"

"You know in motion picture work we have no audience except the camera men and the director. On this account I didn't miss the people out front so much when I was broadcasting.

"No, I don't believe Radio will take the place of the spoken stage any more than the movies did. Most artists who have made records for the phonograph people have found that the records have helped attendance. I believe the same is true of the wireless. It will help the drama rather than hurt it."

"Did you miss your rope when you were broadcasting?" the interviewer inquired as Rogers grabbed his baseball cap preparatory to joining two stalwart players, garbed in New York Giants' suits, who were to appear with him in the next act in a screaming take-off on baseball in the "Bull Pen."

"No, I can't say I did. You know that rope is a handy thing on the stage. If one of my gags don't go I do a trick with the lariat and get a hand for that. If I didn't have the rope there wouldn't be anything else to do when a joke didn't go over but to stand there and start the next one. That rope is handy on the stage, but I didn't miss it when I was talking over the wireless."

With this final comment on his experience in the mystic realm of Radio broadcasting the stalwart western stage humorist shook hands and with a flying leap made a dash up the stairway for the next act in the new edition of the Follies.



Will Rogers, screen and stage favorite, tried his hand at Radio speechmaking. It was NOT the bunk!

FIRST PLANT GIVES AFRICANS A SCARE

NATIVES SUSPECT WITCHCRAFT OF APPARATUS

News of White Men's All-Seeing "Magic Eye" Spreads Rapidly to Villages

LONDON, ENGLAND.—The coming of the first Radio plant to Central Africa and its effect on the superstitious natives is related by S. F. Joelson, author of "The Tanganyika Territory," in an interview.

"It was during the East African campaign that there first arrived in Nyassaland heavy motor-lorries fitted with Radio installations and one mounting a powerful searchlight," said Mr. Joelson.

"Quickly the purpose of these new instruments became known to the inquisitive blacks, who promptly sent throughout the town of Zomba and the surrounding villages the news that their white masters had brought into the land a magic eye that could see everywhere, even on the darkest night, and a powerful machine that could speak without a mouth and hear without ears. Yea, even from lands far distant were the words heard.

Radio Classed as Witchcraft

"To the superstitious savage the advent of these evidences of European witchcraft—for as such they were rated—was by no means welcome. Did it not mean that their secret whisperings and their hidden doings would be disclosed to the all-knowing white man?"

"If messages from other white men far away could be received, was it not certain that the listening machine could overhear conversations in the family huts? If the eye could pierce the darkness afar off, could it not more easily see into the black man's nearby village and there watch what happened?"

Blacks Quaked With Fear

"For days the Nyassaland township was in a state of constant fear. Terror lighted the heart of the man whose advances had not always been loyal; the head-man whose words had not been true. Was he had been told again and English used their magic

powers only to learn about their enemies did the natives throw off their frightened constraint and resume their wonted careless manner of life. The explanation was to them so natural. Of course, the doings of friends would not be subject to the black arts of sorcery.

"To the faint hearted the presence of a pair of aerials was a powerful argument for patriotism.

"Thus did Radio make its way to Central Africa."

De Forest Brings Out New Receiver

Three-Tube Outfit Gets Results of Apparatus with Six Tubes—Has Loop Aerial

NEW YORK.—After many weeks of silence regarding their much-rumored new receiving set, the De Forest Radio Tel. & Tel. Co. has at last released the details regarding this new apparatus.

In a cabinet measuring 10 inches by 10 inches by 8 inches the De Forest engineers have embodied a two-circuit tuner, three stages of Radio frequency amplification, detector and two stages of audio frequency amplification. Due to a recently patented circuit to which De Forest has sole rights for manufacture, only three tubes are necessary to give the results usually necessitating six tubes.

Loop Plug Controls Tuner

Provision is made for the use either of a loop aerial or of an outside aerial and ground. The base of the loop is a phone plug which is inserted, through a hole in the cover of the set, into a two-circuit jack beneath. When the loop is withdrawn and the outside aerial is in use, the condenser is connected across the secondary of the variocoupler. When the loop is inserted, the condenser is across the loop and variocoupler is automatically disconnected.

Connections, with the exception of aerial and ground, are made to binding posts mounted on a shelf about midway of the panel vertically, and inside, the wires to batteries being brought out through eye-letted holes in the rear of the cabinet. The set is extremely simple to operate as there are no ticklers or variometers to adjust. With the loop in use, all tuning is done with the condenser. Filaments are all controlled with but a single rheostat and once this and the potentiometer are adjusted, the tuning requires the manipulation of but a single knob.

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for full information. We want enterprising dealers. We will show you how to build a profitable permanent business quickly.

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Chicago Radio Show
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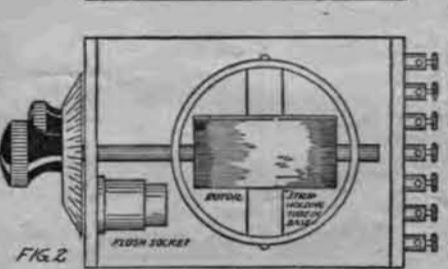
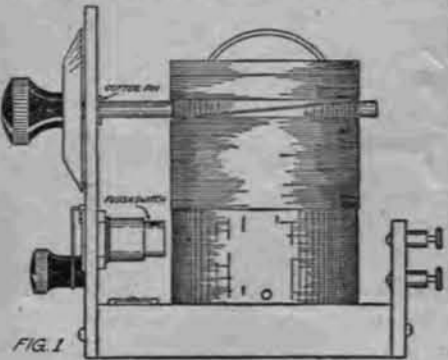
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How to Make Uniset Panel Receiver

By Thomas W. Benson

HAVING always championed the unit idea of building Radio sets, the writer has watched with interest the various attempts in this line. The DeForest sets were among the first to adopt the idea, but carried it to an extreme. The principle of mounting each instrument



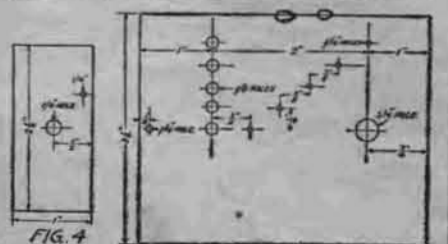
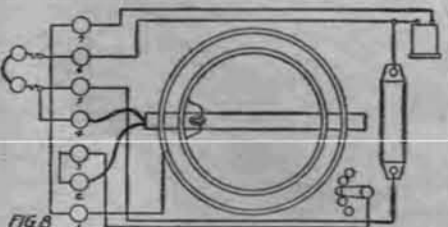
on a separate panel was good, but when the panels are spread over a large area with the attendant long leads for connections the apparatus will not function well on short waves. The DeForest Company found this to their sorrow, and the panel apparatus did much to cast honeycomb coils into disrepute as short wave tuners. Their "Inter Panel" sets were a step forward and carried the unit idea to perfection. To combine apparatus that normally must be used together into a unit and the use of the proper units to build the desired set is the logical goal of the unit principle.

Advantages of Scheme

The writer has designed, built and tested a series of units that not only embody this principle but go further. They have been simplified to the point where anyone equipped only with a few hand tools and a kitchen table can build them at a cost that puts real Radio apparatus within the reach of everyone. The sets can be handled by the inexperienced. Old folks and children have no trouble in tuning the simpler arrangements, although a little care is needed when several stages of amplification and regeneration are used. They will also appeal to the experimenter as terminals are brought out in such a fashion that almost any pet or new circuit can be experimented with.

Crystal Tuner Unit

The first unit in the series is a crystal tuner complete in itself and good for a range of 15 to 25 miles, depending upon size of the aerial and power of the transmitter. This set is a complete unit, can be used alone, and forms the nucleus around which can be built a long distance receiver. One can start to construct this set with full assurance that it will not be necessary to dismantle it later, but simply add other units as found desirable and in-



crease the range and loudness of the signals.

The tuner is of the single-circuit type, employing inductance for tuning only, a switch giving rough adjustment, while a variometer effect is used to provide fine tuning. This arrangement gives very good results, can be built readily and at the cost of a variable condenser, a transformer and a special detector apparatus. An idea of the appearance of the apparatus can be obtained from Figures 1 and 2, which show

the side and top views of the set respectively.

Construction of a Crystal Tuner

The base is made from white pine or poplar measuring 4 by 5 inches and 3/4-inch thick. This board should be cut true and carefully smoothed up with sandpaper. It is then given two coats of thin shellac. It pays to take a little care with the seemingly unimportant parts of the set, for one must remember they are to be used with other units to make a large outfit that should be a source of pride rather than a reason for excuses in its construction.

Bakelite or Formica Panel Used

The panel is to be made from bakelite or formica. This will cost more than fiber but looks better, is more efficient and adds little to the over-all cost of the set. A piece 4 by 6 inches, 3/8-inch thick, is used. The layout for drilling the panel is shown in Figure 3. The best procedure is to mark off the position of the holes on a piece of paper and paste it on the panel, then with a small center punch mark the panel through the paper and drill.

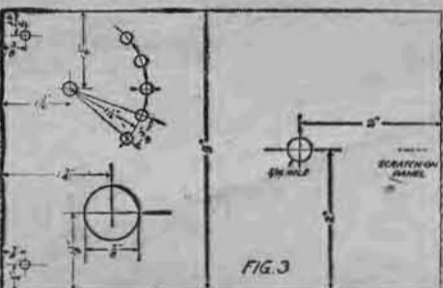
The writer has found it good practice to first drill all the holes with the smallest size drill used.

In this case 9/64-inch drill, which is the size hole usually used for contacts, would be used, then larger drills should be used where necessary. This procedure will save many bad mistakes.

Where the size of hole is not given, it will depend upon the size contacts to be used or the make of switch employed. A 3/8-inch hole is required to mount the detector. Where a drill of this size is not available, drill a series of small holes inside of a 3/8-inch circle, break out the center, and smooth up the edges with a file.

Main Inductance Panels

The terminal panel may well come next. This also is cut from 3/8-inch formica or bakelite and drilled as shown in Figure 5. Hole sizes are not given here, as they will depend upon the binding posts to be used. The two lower holes are for attaching to



the base and may be 9/64- or 5/16-inch in diameter.

Next we have the tube on which is wound the main inductance. Let us for convenience call this the stator. This is a fiber tube 3 1/4 inches in outside diameter, 1/4-inch wall and 4 inches long. If so desired it is only necessary to drill holes to fasten the ends of the winding and to pass the rod carrying the rotor. A much neater job results when the leads from the winding is brought down inside the tube and come out through the lower row of holes. The latter method requires the drilling of the holes shown in the illustration. After drilling, all rough edges should be removed from the holes and the tube should be given a thin coat of shellac.

The leads from the winding should first be put in place. Cut five pieces of No. 18 fixture wire 8 inches long. Bare one end of each of these wires for 1/2-inch and tin the wire with solder. Now take one lead and push the bared end through the right hand hole of the row of 1/4-inch holes near the bottom of the stator. Pass the wire up through the tube and out the 1/8-inch hole directly above it. Bend the bared end down on the outside of the tube and pull the wire inside the tube taut, making it fit snug against the inside. The same procedure is followed with the other four wires in the remaining hole. The above is rather difficult to explain, but an examination of the tube when drilled will make the process easy. When finished there will be five bared ends equally spaced down the side of the tube with the ends protruding from the lower row of holes.

Winding the Coils

We are now ready for the winding. There will be required about two ounces of No. 26 S. C. C. wire. Fasten one end of the wire in a hole drilled 1/4-inch from the top of the stator on the side opposite the holes for the taps and start to wind the wire in place. When about seven turns are on it will be necessary to jump the space where the rod for the rotor passes through and continue winding. If instructions have been followed the fifteenth turn will reach the point where the first leads come through the wall of the tube. Without cutting the wire, bare about 3/8-inch of it and wind it around the tap head and continue winding.

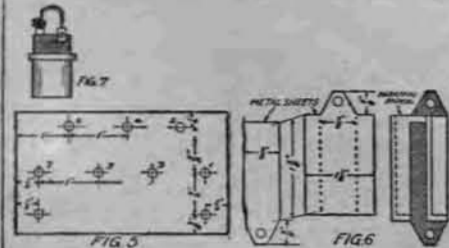
The twelfth turn of the second section should reach the next tap lead where it should also be bared and wrapped around

the lead. The remaining three sections will consist of twelve turns each. The end of the winding being wrapped around the last tap lead. The taps should now be carefully soldered, taking care not to use too much soldering flux or get it on the windings. This completes the stator.

The rotor may now be made as shown in Figure 4. It consists of a 1-inch length of fiber tubing, 2 1/2 inches in diameter with an 1/2-inch wall. Holes in the center are drilled for the pivot rod and two small holes for the ends of the winding. The rotor is wound with 15 turns of No. 26 S. C. C. magnet wire, winding very tight to prevent the wire working loose.

Assembling Rotor and Stator

The rotor and stator may now be assembled. The pivot rod is really a 5/16-inch piece of brass tubing 1/4-inch outside diameter. A small hole is drilled through



the rod 1/8-inch from one end for the cotter pin shown back of the panel in Figure 1. One inch from the other end a V-slot is filed in the tube for the wires to enter. Start the end with the slot through the holes in the stator, hold the rotor in place and push the tube through. The exact position of the rotor on the pivot can be determined when the set is assembled.

The contact points on the panel should be put in place and the switch lever mounted. The detector receptacle consists of a flush bayonet joint double contact socket as used on automobiles. This is slipped into the 3/8-inch hole and locked in place with the nut provided. Now attach the panel to one end of the base with two round head nickle wood screws 1 inch long.

Mounting Strip for Stator

The mounting strip for the stator as shown in Figure 2 is cut from wood 1/2-

inch square and trimmed long enough to fit inside the tube. This is fastened to the base by means of a wood screw in such a position that the stator will be 1/2-inch from the rear edge of the base. The stator can be slipped over this cleat and the rotor slid along the pivot till it is in the center of the stator. The stator can be slipped up or down on the cleat so the pivot tube will be parallel to the base and turn freely in the hole in the panel then fastened there by driving small brass pins through the stator into the cleat as shown in the side view of the instrument. The cotter pin and washer should fit snug against the back of the panel.

The dial can then be slipped onto the end of the pivot tube and clamped in place with the set screw. To set the dial, place the rotor horizontal, turn the dial so either the 100 or 0 mark is even with the scratch on the panel and fasten. Two flexible leads are pushed through the V-slot in the pivot tube and out through the end. These leads are soldered to the ends of the rotor winding.

The taps from the stator are cut to the proper length and soldered to the contact points on the panel.

Fixed Condenser Construction

Details of construction of a fixed condenser for this set are given in Figure 6. Two sheets of thin copper or brass are cut to the sizes shown, a sheet of paraffin paper or oiled linen placed between them, and the sides of the wider piece folded over the narrower. Leads can be soldered to the ends of the sheets entering when the condenser is connected into the set.

The seven binding posts can be placed on the terminal panel which is mounted on the rear of the base by means of two wood screws. The wiring of the set can be completed as shown in Figure 8, using No. 18 fixture wire or No. 14 bare copper wire with spaghetti tubing. The former makes a very satisfactory job if a little care is taken in bending the wire and cutting it carefully to the proper length. A little time spent at this point will be well repaid in the appearance of the set. It will be noted that the detector and condenser are not connected to the tuning apparatus inside the set so jumpers must be used on the outside. This allows for the use of different circuits as will be seen

(Continued on Page 9)

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Radiophone Broadcasting Stations

Corrected Every Week.

HOW TO USE THE NEW DIRECTORY

THE BROADCASTING station directory changed greatly last issue. Every public service broadcasting station is to be found now, not only in the location index, but in the schedule list below. The latter, however is divided, one-half appearing this week, and the other half to appear next week. It is believed the improvement will be greeted as welcome by many readers.

The station schedules, given below, are listed alphabetically by call letters. Following the call is given the city and state, the wave length (PROVIDING a wave length other than 360 meters is used), the miles range of the station, the owner of the station, the schedule of operating hours, and the kind of time used.

The state, city and call list given following the station schedule list appears with the first half of the schedule list each week and is merely an index. One wishing to find the calls of the stations in his vicinity, will find this index useful.

Two successive issues of RADIO DIGEST will give one the most complete and accurate list of broadcasting stations obtainable.

Station Schedules

(NOTE.—The second half of the schedule list appears below. The first half appeared last week.)

- WDAY, Fargo, N. D. 485 also. 100 mi. Fargo Radio Service Co. Daily ex Sun. 12:15 pm, weather; 7-7:30, news, music. Mon, Wed, Fri, 9-10 pm, concert, etc. Sun. 12:15 pm, weather. Central.
- WDM, Washington, D. C. 50 mi. Church of the Covenant. Sun. 10:30 am, church service; 3 pm, lecture; 7:30, church service. Eastern.
- WDT, New York, N. Y. Ship Owners Radio Service.
- WDV, Omaha, Neb. John O. Yeiser, Jr.
- WDY, Roselle Park, N. J. Radio Corp. of America.
- WIZ, Tuscola, Ill. 70 mi. James L. Bush. Daily ex Sun, every half hr. 8:30 am-12:15, Chicago Board of Trade quotations. Tues, Fri, 7-8 pm, concert, entertainment. Central.
- WEAA, Flint, Mich. Fallin & Lathrop.
- WEAB, Fort Dodge, Ia. 250 mi. Standard Radio Equip. Co. Daily ex Sun. 7:30-8:30 pm, music. Sun. 10-15 am, church service, 3-3:30 pm, music. Central.
- WEAC, Terre Haute, Ind. Baines Elec. Service Co.
- WEAD, Atwood, Kan. 485 also. 150 mi. N. W. Kansas Radio Supply Co. Daily ex Sun. 11-11:30 am, markets, music; 12:15, markets; 1:45 pm, markets; an half hour 3:15 to 5:45, news reports. Tues, Wed, Thurs, Sat, 7:30-9 pm, concert. Central.
- WEAF, Blacksburg, Va. Polytechnic Inst.
- WEAF, New York, N. Y. Western Elec. Co.
- WEAG, Edgewood, R. I. Nichols-Hindline-Bassett Lab.
- WEAH, Wichita, Kan. 485 also. 500 mi. Lander Radio Co. Daily ex Sun. 7:30-8:30 pm, markets at 8:30 am, 9:40, 10:45, 11:45, 12:30 pm, 3:15, Wed, Sat, 8-9 pm, concert. Sat, markets at 8:40 am, 9:40, 10:40, 11:40. Sun. 8-9 pm every third week, concert. Central.
- WEAL, Itasca, N. Y. Cornell Univ.
- WEAL, Vermillion, S. D. Univ. of S. D.
- WEAK, St. Joseph, Mo. 100 mi. J. B. Abernoble. Daily, 12-1 pm, St. Joseph live stock markets; 7:30-8:45, concert. Central.
- WEAM, North Plainfield, N. J. 75 mi. Borough of N. Plainfield. Daily, 7:30-8 pm, music, police news, etc. Eastern.
- WEAN, Providence, R. I. 100 mi. Shepard Company. Daily ex Sun. 8-5 pm, music; 6-8, bedtime stories, sports, weather, music. Mon, Wed, 8-10 pm, concert. Eastern.
- WEAO, Columbus, Ohio. Ohio State Univ.
- WEAP, Mobile, Ala. 485 also. 50 mi. Mobile Radio Co. Daily, 4-5 pm, 7-8:55, Central.
- WEAQ, Berlin, N. H. Y. M. C. A.
- WEAR, Baltimore, Md. Balt. American & News Pub. Co.
- WEAS, Washington, D. C. 100 mi. The Hecht Co. Daily ex Sun. 8-9 pm, music, retail news. Wed, 7-8 pm, concert. Fri, 7:30-8:30 pm, concert. Eastern.
- WEAT, Tampa, Fla. John J. Fogarty.
- WEAU, Sioux City, Ia. 150 mi. Davidson Bros. Co. Daily ex Sun, 9 am, opening markets, weather, sports, news. Central.
- WEAV, Rushville, Nebr. 200 mi. Sheridan Elec. Service Co. Wed, Fri, Sun, 8-9 pm, concert, news, etc. Mountain.
- WEAW, Anderson, Ind. Arrow Radio Lab.
- WEAX, Little Rock, Ark. T. J. M. Daily.
- WEAY, Houston, Tex. Will Horwitz, Jr.
- WEAZ, Waterloo, Ia. 100 mi. A. C. Sweetman. Mon, Thurs, Sat, 7-8 pm, news, concert, lecture. Central.
- WEB, St. Louis, Mo. Benwood Co.
- WEH, Tulsa, Okla. (300 S. Main St., Eldorado, Kans.) Mutual Refining Co.
- WEV, Houston, Tex. Hurburt-Still Elec. Co.
- WEW, St. Louis, Mo. 485 only. 100 mi. St. Louis University. Daily ex Sun. 10 am, weather, opening grain and live stock markets; 2 pm, closing of markets. Sat, 2 pm program at 1 pm. Central.
- WEY, Wichita, Kan. 485 also. 500 mi. Cosradio Co. (Wichita Beacon) Daily ex Sun. hourly, 8:40 am-12:40 pm, stock markets. Daily, 10:45 am and 4:30 pm, weather; 8-10 pm, sports, concert, lecture; 10:45 weather. Sun. 8:10 pm, church service, concert. Central.
- WFAA, Dallas, Tex. 400 and 485 only. 250 mi. News Cotton Journal. Daily ex Sun. 10:15-10:45 am, weather, cotton region bulletin; 12:30-1 pm, music, talk; 2-2:30, markets, news, sports; 3:30-3:45 pm, markets, news; 6:45-7, sports; 8-8:30, concert. Sun, 2:30-3 pm, chapel; 6:30-6:45, sports; 9:30-10, concert. Central.
- WFAB, Syracuse, N. Y. Carl E. Wines.
- WFAD, Burlington, Wis. 100 mi. Superior Radio Co. Daily, 7:30-9 pm, Central.
- WFAG, Salina, Kan. 100 mi. Watson Weldon Motor Supply Co. Daily ex Sun. 8:45 am, 9:45, 10:45, 11:45, 1:15 pm, markets; 4, news. Tues, Thurs, Fri, 8 pm, concert. Sun, 11 am, church service; 8 pm, concert. Central.
- WFAH, Poughkeepsie, N. Y. 200 mi. H. C. Spradley. Daily ex Sun. 10-10:30 am, 11:20-11:35, 1:30-2 pm, 4-4:15. Tues, Thurs, Sat, 8:15 pm, feature program. Eastern.
- WFAG, Waterford, N. Y. 340 only. 300 mi. Radio Engineering Lab. Wed, Sat, 7:45-10 pm, concert. Sun, 2-4 pm, church service. Eastern.
- WFAI, Asheville, N. C. Elec. Supply Co.
- WFAJ, Asheville, N. C. Hi-Grade Wireless Instrument

- WFAN, Hutchinson, Minn. 485 also. 500 mi. Hutchinson Elec. Service Co. Daily ex Sun, 1 pm, markets etc. Central.
- WFAP, Peoria, Ill. 200 mi. Brown's Business College. Daily ex Sun, 10:30 am, weather; 12-12:15 pm, music; 1:45-1:55, markets; 4:30-4:50, business lecture; 7:45-7:55, sports, news, concert. Sun, 11 am, church service. Central.
- WFAQ, Cameron, Mo. Cameron Radio Co. and Mo. Wesleyan College.
- WFAR, Sanford, Me. Hall & Stubbs.
- WFAS, Fort Wayne, Ind. United Radio Corp.
- WFAT, Sioux Falls, S. D. 300 mi. Arzus Leader. Daily ex Sun, 7:30-8 pm, sports, concert. Tues, Thurs, special concert, 8-9 pm. Sun, 7:30-8 pm, concert. Central.
- WFAU, Boston, Mass. Edwin C. Lewis.
- WFAV, Lincoln, Nebr. 485 also. 300 mi. Univ. of Nebr. Daily ex Sun, 10-10 am, weather, markets. Sat, 9-10 pm, concert. Central.
- WFAW, Madison, Wis. Daily Metropolis.
- WFAZ, Banghampton, N. Y. 50 mi. A. L. Kent. No fixed schedule.
- WFAZ, Independence, Kans. Daniels Radio Supply Co.
- WFAZ, Charleston, S. C. S. C. Radio Shop.
- WFI, Philadelphia, Penn. 350 mi. Strawbridge & Clothier. Daily ex Sun, 1:16 pm, news; 3:30-4:30, concert; 7-8 pm, sports. Fri, 8-9 pm, radio talk. Wed, Fri, Sat, 7:30-8:30 pm, concert. Fri, Sat, (alternate weeks) 7:30 pm, concert at 8:30 pm. Sun, 4 pm, church service. Eastern.
- WFO, Dayton, O. 485 also. 300 mi. Riike-Kumler Co. Daily ex Sun, 9-9:30 am, concert, news; 11-12 and 4-5 pm, concert, news, markets, weather. Mon, Wed, Fri, 7-8 pm, concert, lecture. Sun, 11-12 am, church service. Central.
- WGAB, Houston, Tex. 485 and 600 also. 250 mi. ORV Radio Co. Daily ex Sun, 8:30-9:30 am, police, news; 12:30-1:30 pm, music, readings; 4-5, sports, news. Mon, Wed, Fri, 8 pm on, concert. Eastern.
- WGAC, Brooklyn, N. Y. Rhythm Radio Stores Co.
- WGAD, Encarnada, Porto Rico. 200 mi. Spanish-American School of Radio Telegraphy. Irregular, 7:30-11:30 pm, entertainment. 60th Meridian.
- WGAH, Tulsa, Okla. Goller Radio Service.
- WGAH, New Haven, Conn. New Haven Elec. Co.
- WGAJ, Shenandoah, Ia. W. H. Gass.
- WGAK, Mason, Ga. Mason Elec. Co.
- WGAN, Lancaster, Pa. 85 mi. Lancaster Elec. Supply & Construction Co. Mon, Wed, Fri, 7-8 pm, concert, lecture. Sun, 3-3:30 pm, church service. Eastern.
- WGAM, Orangeburg, S. C. 150 mi. Orangeburg Radio Equipment Co. Daily ex Sun, 10 am, markets, weather; 11:30-11:45 am, markets, weather, news, baseball; 4, music, lecture; 10, time, weather, entertainment. Sun, 11 am, church service; 11:55, time; 10 pm, time, weather, music. Eastern.
- WGAP, Pensacola, Fla. Cecil E. Lloyd.
- WGAQ, Shreveport, La. 500 mi. Glenwood Radio Corp. Daily ex Sun, 7:45-9 pm, news, sports, music. Sun, 11 am, sermon. Central.
- WGAR, Fort Smith, Ark. 485 also. Southwest American. Daily ex Sun, 12:15-1 pm, music, news; 8 pm, news, concert. Sun, 2-5 pm, concert. Central.
- WGAS, Chicago, Ill. 800 mi. Ray-D-I Co. Organization, Inc. Daily ex Sun, 9-9:20 am, 11:15-11:30, 11:55-12, 12:15-12:30 pm, 1:30-1:45, 2:45-3, 4-4:15, 4:30-4:45, 5-5 pm. Fri, 10-11 pm, Central.
- WGAT, Lincoln, Nebr. 100 mi. Am. Lerion, Dept. of Nebr. Mon, Wed, 9 pm, announcements. Fri, 9-10 pm, patriotic program, concert. Sun, 3-5 pm, sermon. Central.
- WGAU, Wooster, O. Marcus G. Limb.
- WGAV, Savannah, Ga. B-O Radio Co.
- WGAW, Dayton, O. Dayton, O. Radio Club.
- WGAX, Washington, D. C. O. Radio Elec. Co.
- WGAY, Madison, Wis. 100 mi. North Western Radio Co. Daily ex Sun, 9-10 am, financial news; 11:30, news, opening markets; 4 pm, news, closing markets. Mon, Wed, Thurs, Sat, 7:30-8:30 pm, concert. Sun, 12:30-12 am, sermon. Central.
- WGAZ, South Bend, Ind. 100 mi. South Bend Tribune. Daily ex Sun, 8-9:30 am, home hints, menus; 2-3 pm, news, music; 7-8, news, music. Central.
- WGB, Des Moines, Ia. Register & Tribune.
- WGI, Medford Hillsdale, Mass. 485 also. 500 mi. Am. Radio & Research Corp. Daily ex Sun, 2:55 pm, music; 3, news; 7:30, sports, news; 7:45 pm, police reports. 9-10 Tues and Thurs, 7:30 and 7:45 pm, programs at 7:45 and 7:55 pm, respectively. Sun, 8 pm, church service; 8:45 am, sacred concert. Special features week nights, 7:30-9 pm. Eastern.
- WGL, Philadelphia, Pa. 2,000 mi. Thos. F. J. Howlett. Tues, Thurs, Sat, 7:45-11:30 pm, concert. Eastern.
- WGB, Buffalo, N. Y. 485 also. 200 mi. Federal Telep. & Teleg. Co. Daily ex Sat and Sun, 12m, 5:30 pm, markets, weather; 8, sports, news, bedtime story; 8:15, concert. Eastern.
- WGU, Chicago, Ill. The Fair.
- WGV, New Orleans, La. Interstate Elec. Co.
- WGY, Schenectady, N. Y. 400 and 485 only. 1,500 mi. Gen. Elec. Co. Daily ex Sat and Sun, 11:55-12 am, time signals; 12:30 pm, stock markets; 12:40, music; 12:45, weather; 2-2:30, music, features for women; 6:08, produce markets; 6:16, stock markets; 6:20, late news; 7:45-8:45, concert. Fri, in addition, 6:30 pm, child story; 7:40, health talk; 10:30-11:30, musical program. Sat, 12:30, stock markets. Eastern.
- WHA, Tucson, Wis. 485 also. 600 mi. Univ. of Wis. Daily ex Sun, 12:30-1 pm, weather, markets. Tues, Thurs, Fri, Sat, 12-1 pm, weather, markets, time. Tues, 8-9 pm, concert. Fri, 8-9:15 pm, news, concert. Sat, 1-1:30 pm, instruction. Central.
- WHAA, Iowa City, Ia. 150 mi. State Univ. of Ia. Daily ex Sun, 7:30 pm, news, music. Sun, 10:45-12 am, church service. Central.
- WHAB, Galveston, Tex. 485 also. 500 mi. C. W. Thompson Co. Daily ex Sun, 9:30 am, police news; 9:45, weather; 10, markets; 12 m, markets; 3 pm, markets; 5, weather, police news, general news. Mon, Wed, Fri, 8 pm, entertainment. Sun, 10 am, church service. Central.
- WHAC, Waterloo, Ia. 150 mi. Cole Bros. Elec. Co. Daily ex Sun, 6:15 pm, news, sports. Mon, Wed, Fri, 9:30 pm, concert. Central.
- WHAD, Milwaukee, Wis. Marquette Univ.
- WHAE, Sioux City, Ia. 300 mi. Automotive Elec. Service Co. Daily ex Sun, 12:30-5:30 pm on half hour news. Thurs, 8:30 pm, concert. Central.
- WHAF, Pittsburgh, Pa. Radio Elec. Co.
- WHAG, Cincinnati, O. 100 mi. Univ. of Cincinnati. No regular schedule.
- WHAH, Joplin, Mo. John T. Griffin.
- WHAJ, Davenport, Ia. 30 mi. Radio Equip. & Mfg. Co. Daily ex Sat and Sun, 2:30-3 pm, 4:30-5:30, 10-11, Sat, 10-11 am, 2-2:30 pm, 5-5:30, 11-11:30, Central.
- WHAL, Bluefield, W. Va. 200 mi. Daily Telegraph. Daily, 5-5:30 pm, sports. Mon, Thurs, 7:45-9 pm, concert, lecture. Sun, 11 am, 7:30 pm, church service. Eastern.
- WHAK, Clarksburg, W. Va. Roberts Hardware Co.
- WHAL, Lansing, Mich. 190 mi. Phillips, Jefferys & Derby. Daily ex Sun, 8-9 am, 10:30-11:45, 1-2 pm, 6-8:30. Eastern.
- WHAM, Rochester, N. Y. Univ. of Rochester.
- WHAN, Wichita, Kans. Southwestern Radio Co.
- WHAO, Savannah, Ga. Frederic A. Hill.
- WHAP, Decatur, Ill. Dewey L. Otta.
- WHAQ, Washington, D. C. 100 mi. Semmes Motor Co. Mon, 7-8 pm, lecture on automobile upkeep. Eastern.
- WHAR, Atlantic City, N. J. Paramount Radio & Elec. Co.
- WHAS, Louisville, Ky. Courier-Journal & Louisville Times.
- WHAT, Yale, Okla. Yale Democrat (Yale Telephone Co.)
- WHAU, Corinth, Mass. Corinth Radio Supply Co.
- WHAZ, Huntington, Mo. 100 mi. Wilmington Elec. Spec. Co. Inc. Mon, Wed, Fri, 12-1 pm, music; 6, music; 6:30, music; 7, news, sports; 7:30, concert. Eastern.
- WHAW, Tampa, Fla. 50 mi. Pierce Elec. Co. Daily, 12-1 pm, weather, music; 4-5 and 8-10, music, entertainment. Eastern.
- WHAX, Holyoke, Mass. Holyoke Street By Co.
- WHAY, Huntington, Ind. Huntington Press.
- WHAZ, Troy, N. Y. Rensselaer Polytechnic Inst.
- WHB, Kansas City, Mo. 485 also. 1,000 mi. Swemey Auto & Tractor School. Daily, 10 am, 3 pm, 6, weather. Daily ex Sun, 2 pm, ladies' hour; 7, beds time stories. Tues, Thurs, Sun, 8-10 pm, concert. Central.

- WHD, Morgantown, W. Va. 100 mi. W. Va. University. Daily, 4-6, 7-7:30, news etc. Eastern.
- WHK, Cleveland, O. 300 mi. The Radiovox Co. (Warren R. Cox). Daily ex Sun, 8:30-9:30 am, 1:30-2 pm, 4-4:30, 6-6:30. Tues, Thurs, Sun, 8-9:30 pm. Eastern.
- WHN, Ridgewood, N. Y. Times Printing & Pub. Co.
- WHU, Toledo, O. Wm. B. Duck Co.
- WHW, East Lansing, Mich. 485 only. 150 mi. Stuart Wm. Seelye. Daily ex Sun, 11:30 am and 12:30 pm, weather and markets. Eastern.
- WIAA, Waupaca, Wis. Waupaca Civic & Commerce Assn.
- WIAB, Rockford, Ill. Joslyn Automobile Co.
- WIAC, Galveston, Tex. 485 also. 100 mi. Galveston Tribune. Tues, Thurs, Sat, 7 pm on, bedtime story, evening prayer, concert. Central.
- WIAD, Ocean City, N. J. 200 mi. Ocean City Yacht Club. Fri, Sat, Sun, 8-12 pm. Eastern.
- WIAE, Vinton, Ia. 75 mi. Zimmerman Radio Co. Tues, Thurs, Sat, 9 pm, music, news. Wed, 8 pm, band concert. Sun, 2:30 pm, music. Central.
- WIAF, New Orleans, La. 300 mi. Nola Radio Co. Sun, 10-11 am, music, lecture. Central.
- WIAG, Birmingham, Ala. Mathews Elec. Supply Co.
- WIAH, Newton, Iowa. Continental Radio & Mfg. Co.
- WIAL, Springfield, Mo. Heer Store Co.
- WIAP, Neenah, Wis. Fox River Valley Radio Supply Co.
- WIAK, Omaha, Nebr. 485 also. 500 mi. Journal-Stockman Co. Daily ex Sun, 7:45 am, markets; 9:10, markets; 10:15, weather, markets; 12, markets; 1:50 pm, weather, markets; 3:50, markets. Central.
- WIAM, Allentown, Pa. 100 mi. Chronicle-News. Schedule irregular.
- WIAO, Milwaukee, Wis. School of Engineering of Milwaukee. (News.)
- WIAP, Springfield, Mass. Radio Development Corp.
- WIAQ, Marion, Ind. Chronicle Pub. Co.
- WIAR, Paducah, Ky. 150 mi. J. A. Rudy & Sons. Sun, 11-12, 11-12 am, music, news.
- WIAS, Lincoln, Nebr. 485 also. 300 mi. W. N. Eastern. Music; 4-5 pm, same and sports; 7:30-9, concert, lecture, etc. Sun, 11-12 am, church service. Central.
- WIAT, Burlington, Ia. 400 mi. Hawk-Eye Home Elec. Co. Tues, Thurs, 8-9 pm, concert. Central.
- WIAT, Tarkio, Mo. Leon T. Noel.
- WIAU, Le Mars, Ia. Am. Trust & Savings Bank.
- WIAY, Birmingham, Ala. N. Y. Radio Lab.
- WIAW, Saginaw, Mich. Saginaw Radio & Elec. Co.
- WIAZ, Lincoln, Nebr. Capitol Radio Co.
- WIAX, Washington, D. C. Woodward & Lothrop.
- WIAZ, Miami, Fla. Flieger St. Elec. Supply Sales Co.
- WIK, McKeesport, Pa. 500 mi. R. & L. Elec. Co. Daily ex Sun, 6:30-7 pm, Tues, Thurs, 9:30-10:30 am, 1:30-2:30 pm, Sat, 6:30-7 pm. Eastern.
- WIL, Washington, D. C. Continental Elec. Supply Co.
- WIP, Philadelphia, Pa. Gimbel Brgs. Co.
- WIZ, Cincinnati, O. Cino Radio Mfg. Co.
- WIAB, Lincoln, Nebr. Am. Radio Co.
- WJAC, University Place, Nebr. 485 also. 150 mi. Nebr. Wesleyan Univ. Daily ex Sat and Sun, 12 m, weather; 1 pm, markets; 10:45 pm, weather. Tues, Thurs, 9-9:30 pm, concert. Central.
- WIAD, Waco, Tex. 485 also. 500 mi. Jackson's Radio Engng. Lab. Daily ex Sun, 12:30-1 pm, markets, news, music; 3:30-4, news, music; 6-6:15, sports; 8:45-9:45, concert. News. Sun, 11-12 am, church service; 3:30-4 pm, music; 6-6:15, sports; 8:45-9:45, concert. Central.
- WJAE, San Antonio, Tex. 500 mi. Texas Radio Syndicate (Evening News). Mon, Thurs, Fri, Sat, 7:30-8:30 pm, music. Tues, 9:30-10:30 pm, music. Central.
- WJAF, Norfolk, Neb. Daily News.
- WJAH, Rockford, Ill. Central Park Amusement Co.
- WJAI, Dayton, O. Y. M. C. A.
- WJAK, Stockdale, O. 485 also. 300 mi. White Radio Lab. Daily ex Tues., Fri., Sun, 10:30-11:05 am, music, aces, Fri, 6-7 pm, music. Wed, Sat, 8-9 pm, concert. Sun, 2-2:45 pm, chapel. Central.
- WJAL, Portland, Me. Victor Radio Corp.
- WJAM, Cedar Rapids, Ia. 100 mi. Evening Gazette. Daily, 7-8 pm, musical program. Central.
- WJAN, Peoria, Ill. 300 mi. Peoria Star and Peoria Radio Sales Co. Daily ex Sun, 11:30 am, markets, weather; 1:30 pm, closing markets, agriograms, bond news; 6:15, sports. Tues, Thurs, Sat, 5:15-9:45 pm, concert. Central.
- WJAP, Topeka, Kans. Capper Publications.
- WJAQ, Duluth, Minn. 200 mi. Kelly Duluth Co. Daily ex Sun, 8-9:30 pm, concert. Sun, 11-12 am, pipe organ; 12:30-12:45 pm, church service. Central.
- WJAR, Providence, R. I. The Outlet Co.
- WJAS, Pittsburgh, Pa. Pittsburgh Radio Supply House.
- WJAT, Marshall, Mo. 100 mi. Kelly-Vaeter Jewelry Co. Daily ex Sun, 1:15-1:45 pm, 2:35-6, music. Central.
- WJCB, Cleveland, O. Union Trust Co.
- WJAZ, Chicago, Ill. Chicago Radio Lab.
- WJD, Granville, O. 100 mi. Dennison University. Daily, 5-6 pm, concert, lecture. Central.
- WJH, Washington, D. C. 250 mi. White & Boyer Co. Tues, 7:30-10 pm, concert, address, lecture. Eastern.
- WJW, Toledo, O. 300 mi. Service Radio Equipment Co. Daily ex Sun, 3-4 pm, concert. Mon, Wed, Fri, 7:30-9 pm, concert, lecture, etc. Sun, 7:30-9 pm, church service, concert. Eastern.
- WJT, Erie, Penna. 1,000 mi. Elec. Equipment Co. Daily ex Sun, 7:30 pm, sports, markets, weather, police reports. Mon, Wed, Fri, 8, bedtime stories; 8:15, concert, lecture. Sun, 7:45 pm, church service. Eastern, daylight saving.
- WJX, New York, N. Y. De Forest Radio Telephone & Telegraph Co.
- WJZ, Newark, N. J. 1,500 mi. Westinghouse Elec. & Mfg. Co. Daily ex Sun, 15 minutes hourly from 9 am to 6 pm; 12-12:30 pm, 7-10:15 pm. Miscellaneous program of highly varied nature. Sun, 3-10:15 pm, music. Eastern.
- WKAA, Cedar Rapids, Ia. 485 also. 350 mi. H. F. Parr (Republican Times). Daily ex Sun, 6-7 pm, concert. Thurs, 10:15 pm on, concert. Sun, 4:30-5:30 pm, sacred program. Central.
- WKAD, Lincoln, Neb. Star Pub. Co.
- WKAE, Providence, R. I. Charles Looff.
- WKAF, Wichita Falls, Tex. W. S. Radio Supply Co.
- WKAG, Louisville, Ky. Edwin T. Bruce.
- WKAH, West Palm Beach, Fla. Planet Radio Co.
- WKAJ, Fargo, N. D. 150 mi. Fargo Plumbing and Heating Co. Daily ex Sun, 5-6 pm, music, news, sports. Sun, 8-9 pm, concert. Central.
- WKAK, Okemah, Okla. Oklahoma County News.
- WKAJ, Orange, Tex. Gray & Gray.
- WKAM, Hastings, Neb. Daily Tribune.
- WKAN, Montgomery, Ala. 30 mi. Alabama Radio Mfg. Co. Daily ex Sun, 3:30 pm, music; 8:30 pm on, sports, music, news. Central.
- WKAP, Grandson, R. I. Flint, Dutce, Wilcox.
- WKAQ, San Juan, Porto Rico. Radio Corp. of Porto Rico.
- WKAR, East Lansing, Mich. Mich. Agri. College.
- WKAS, Springfield, Mo. L. E. Lins Music Co.
- WKAT, Frankfort, Ind. Morning Times.
- WKAV, Laconia, N. H. Laconia Radio Club.
- WKAW, Beloit, Wis. 50 mi. L. M. Turner. Program not established.
- WKAX, Bridgeport, Conn. 75 mi. Wm. A. Macfarlane.
- WKAY, Gainesville, Ga. Brenau College.
- WKAZ, Wilkes-Barre, Pa. Landau's Music & Jewelry Co. Unlimited time. No regular hours.
- WKC, Baltimore, Md. 500 mi. Jos. M. Zamolshi Co. Tues, Thurs, Sat, 7:30-9:30 pm. Eastern, daylight saving.
- WKN, Memphis, Tenn. Richman-Crosby Co.
- WKY, Oklahoma City, Okla. 485 also. 500 mi. Oklahoma Radio Shop. (Daily Oklahoman.) Daily, 12 m, weather; 7-7:30 pm, sports, specialans; 8:30-9:30, concert; 9, weather, news. Sun, 3:30-4:30 pm, concert. Central.
- WLAB, Carrollton, Mo. George F. Grossman.
- WLAC, Raleigh, N. C. N. C. State College.
- WLAD, Hastings, Nebr. 150 mi. Arvanette Radio Supply Co. Program not established.
- WLAF, Lincoln, Neb. Johnson Radio Co.
- WLAG, Minneapolis, Minn. Cutting & Washington Radio Co.
- WLAA, Syracuse, N. Y. Samuel Woodworth.
- WLAY, Waco, Tex. 485 also. 2,000 mi. Waco Elec. Supply Co. Daily ex Sun, 8:30 am, 10:30, 2:30 pm, 7:45, markets, music, sports, news. Sun, 3 pm, church service. Central.
- WLAK, Bellows Falls, Vt. Vermont Farm Machine Co.
- WLAL, Tulsa Radio Co. Tulsa, Okla.

- WLAM, Springfield, O. 30 mi. Morrow Radio Co. No regular schedule.
- WLAN, Houlton, Me. Putnam Hdwe. Co.
- WLAP, Scranton, Pa. Anthracite Radio Corp.
- WLAW, Louisville, Ky. W. V. Jordan.
- WLAQ, Kalamazoo, Mich. A. E. Shilling.
- WLAR, Marshalltown, Ia. Mielick Music Co.
- WLAT, Burlington, Ia. Chas. G. Bosch Co.
- WLAV, Pensacola, Fla. Elec. Shop, Inc.
- WLAW, New York, N. Y. New York Police Dept.
- WLAX, Fairbanks, Alaska. Northern Commercial Co.
- WLAZ, Warren, O. Hutton & Jones Elec. Co.
- WLB, Minneapolis, Minn. Univ. of Minn. 100 mi. Daily ex Sun, 12-12:30 pm, 7:30-7:50. Central.
- WLK, Indianapolis, Ind. 300 mi. F. F. Hamilton. (Indianapolis News.) Daily ex Sun, 11-11:30 am, music, weather; 12-12:30 pm, music; 2-2:30, music; 3:3-3:30, music; 5, sports; 10, weather. Tues, Thurs, Sun, 8:30-10 pm, Special, Sun, 2-4 pm, church services; 10, weather. Central.
- WLW, Cincinnati, O. 2,000 mi. Crosley Mfg. Co. Daily ex Sun, 10-11 am, music, weather; 1-2 pm, music, bond report; 2:30-3:30 pm, music, closing stock quotations. Tues, Thurs, Fri, 8 pm on, music, lecture; news etc. Central.
- WMA, Anderson, Ind. 25 mi. Arrow Radio Lab. Mon, Wed, Fri, 7:30-8:30 pm, concert, news, etc. Central.
- WMAZ, Oklahoma City, Okla. Radio Supply Co.
- WMAZ, Casanova, N. Y. F. Edward Page.
- WMAF, Dartmouth, Mass. Round Hills Radio Corp.
- WMAD, Lincoln, Neb. General Supply Co.
- WMAJ, Kansas City, Mo. Radio Telegram Co.
- WMAK, Lockport, N. Y. Norton Labs.
- WMAL, Trenton, N. J. Trenton Hdwe. Co.
- WMAA, Beaumont, Tex. Beaumont Radio Equipment Co.
- WMAP, Easton, Pa. Utility Battery Service.
- WMB, Auburn, Me. Auburn Elec. Co.
- WMG, New Haven, Conn. Columbia Radio Co. Mon, Wed, Fri, Sat, 8:30-9:45 pm, concert, address etc. Eastern.
- WMM, Cincinnati, O. 485 also. 1,000 mi. Precision Equipment Co. Daily ex Sun, 11 am and 4 pm, weather, markets. Mon, Wed, Sat, 8:15-10, concert, lecture, vaudeville. Central.
- WMU, Washington, D. C. 100 mi. Doubleday-Hill Elec. Co. Daily, 4:30 pm, concert, sports. Thurs, 8:30, concert. Eastern.
- WNB, Bowling Green, Ky. Park City Daily News.
- WNAD, Norman, Okla. Okla. Radio Eng. Co.
- WNAE, Boston, Mass. Shepard Stores.
- WNAH, Bismarck, Mo. Atkinson County Mail.
- WNAF, Eldon, Okla. Eldon Radio Distributing Co.
- WNAH, Wilkes-Barre, Pa. Wilkes-Barre Radio Repair Shop.
- WNAL, Omaha, Neb. R. J. Rockwell.
- WNY, Albany, N. Y. 60 mi. Shotton Radio Mfg. Co. Mon, Wed, Sat, 8-9:30 pm, music, entertainment. Eastern, daylight saving.
- WNO, Jersey City, N. J. Wireless Telephone Co of Hudson Co., N. J.
- WOOA, Ardmore, Okla. Dr. Walter Hardy.
- WOOE, Fremont, Nebr. Medland College.
- WOOI, San Antonio, Tex. 1,000 mi. 485 also. Southern Equipment Co. (Evening News). Daily ex Sun, 10:30 am, 11:15 pm, 3-8, markets, crops, weather. Sun, 7-8:30 pm, music. Wed, 7:30-8:30 pm, concert. Central.
- WOC, Davenport, Ia. 485 also. 500 mi. Palmer School of Chiropractic. Daily ex Sun, 12-12:15 pm, markets, weather, concert; 3:30-4, lecture; 5:45-6 and 7-8, concert. Sat, 8-8:15, business review. Sun, 9-10 am and 5:30-6 pm, sacred concert. Central.
- WOE, Akron, O. 50 mi. Buckeye Radio Service Co. Mon, Wed, Fri, 7-8:15 pm, concert, news, lecture. Sun, 10-12 am, church service. Eastern.
- WOH, Indianapolis, Ind. 1,000 mi. Hatfield Elec. Co. (Indianapolis Star.) Daily ex Sun, 10-11 am, music; 10:15 pm, musical markets; 1-2 pm, music; 1:20, markets; 4-5 pm, music; 4:15, police news; 4:50, sports. Mon, Wed, Sat, 8:30-10 pm, Concert. Central.
- WOI, Ames, Ia. 300 mi. Iowa State College. Daily, 9:30 am, 12:40 pm, weather. Central.
- WOK, Pine Bluff, Ark. 1,000 mi. Arkansas Light and Power Co. Daily, 7:30 pm, sports, markets, weather, news. Tues, Fri, 8-9:30 pm, concert. Sun, 11 am and 7-15 pm, church service. Central.
- WOO, Philadelphia, Pa. John Wanamaker.
- WOQ, Kansas City, Mo. 485 also. 800 mi. Western Radio Co. Daily ex Sun, every half hour 6:30-1:15 pm, markets; 11:30 am, 2 pm, 7:30, markets, weather, road conditions; 7:45-9, concert, vaudeville. Sun, 7:30-9, church service. Central.
- WOR, Newark, N. J. 400 only. 150 mi. L. Bamberger & Co. Daily ex Sun, 20 minutes on half hour from 10:30 am to 6:30 pm, miscellaneous. Eastern, daylight saving.
- WOS, Jefferson City, Mo. Mo. State Marketing Bureau.
- WOV, Omaha, Neb. Metropolitan Utilities Dist.
- WOZ, Richmond, Ind. 485 only. 300 mi. Richmond Paladium. Daily ex Sun, 12-12:15 pm, markets; 4-5, concert, news, markets; 6:30 pm, concert, news, weather, lecture. Central.
- WPA, Fort Worth, Tex. 485 also. 500 mi. Fort Worth Record. Daily ex Sun, 11:30 am, 2:30-3 pm, 6-6:15, 7:15-7:30, 8-9:30, Sun, 8-9:30 pm, 6:30, Central.
- WPE, Kansas City, Mo. 485 only. Central Radio Co. Mon, Fri, Sun, 7:45 pm, concert. Sun, 8:15 pm, sermonette. Daily, afternoon, sports, scores. Central.
- WPG, New Lebanon, O. R.R. No. 2. Nushawg Poultry Farm.
- WPI, Clearfield, Pa. Elec. Supply Co.
- WPL, Philadelphia, Pa. 30 mi. St. Joseph's College. Daily ex Sun, 8:30 pm, 8:30, sports, news. Sun, 10:45-12 noon, 7:45-8:30 pm, church service. Eastern.
- WPL, Zanesville, O. Fergus Elec. Co.
- WPM, Washington, D. C. 200 mi. Thos. J. Williams, Inc. (Washington Daily News.) Daily ex Sun, 12:30 pm, news. Mon, 8 pm, concert. Eastern.
- WPO, Memphis, Tenn. 700 mi. United Equipment Co. (News-Seminar.) Daily, 4-9 pm, concert, news. Central.
- WQX, Chicago, Ill. Riverside Park. Walter A. Kuehl.
- WRK, Hamilton, O. 1,000 mi. Doron Bros. Elec. Co. Mon, Wed, Sat, 8:30-10:30 pm, concert, news. Fri, 7:30-9:30, concert. Sun, 10:45 am and 7:30 pm, church service. Central.
- WRL, Schenectady, N. Y. 800 mi. Union College. Sun, 7:30 pm, sacred concert, speeches, etc. Irregular miscellaneous weekday program. Eastern.
- WRM, Urbana, Ill. 410 also. 200 mi. Univ. of Ill. Thurs, 8:30-8:55 pm, 9:05 on, news, concert, lecture. Special concerts irregular. Central.
- WRP, Camden, N. J. 200 mi. Federal Inst. of Radio Teleg. Daily ex Sat and Sun, 10-10:45 pm, instruction. Eastern.
- WRR, Dallas, Tex. 485 also. 200 mi. City of Dallas. Daily ex Sun, 12-12:30 pm, weather; 3-3:30, sports, markets, news; 7:15, police news; 8:30-9, music. Sun, 11 am, church service; 7-8 pm, police news, church service. Central.
- WRW, Tarrytown, N. Y. 1,500 mi. Tarrytown Radio Research Lab. Tues, Thurs, Sat, 10:05 pm, Sun, 10:30 am, 2 pm, 10:05, Eastern.
- WSB, Atlanta, Ga. 485 also. 1,000 mi. Atlanta Journal. Daily ex Sun, 12-1 pm, concert, for industrial employees; 2:30, weather, markets; 4-4:30, theater concert; 4:30, markets; 5-6, concert; markets, music, bedtime stories; 7-8, concert, etc.; 10:15-11:15, music. Sun, 11 am, 5 pm, church service. Central.
- WSL, Utica, N. Y. J. & M. Elec. Co.
- WSP, Norfolk, Va. 100 mi. Shipowners Radio Service Inc. Mon, Wed, Sat, 8:15-9:30 pm, concert. Eastern.
- WSV, Little Rock, Ark. L. M. Hunter & G. L. Carrington.
- WSX, Erie, Pa. 75 mi. Erie Radio Co. Tues, Thurs, Sat, 10-10:55 pm, news, concert, lecture. Sun, 12:15-1

ELEVEN CLASS "B" PLANTS ON THE AIR

WELL-KNOWN STATIONS TO USE 400-METER WAVE

Famous Broadcasters Meet Strict Government Requirements—Dare Not Use "Canned" Music

CHICAGO.—During the week ended September 30th, the Department of Commerce licensed 11 broadcasting stations in the new Class "B." This is the first issuance of the new licenses to the super-broadcasters and celebrates the licensing of the first broadcasters a year ago. All of the stations licensed under the new regulations are old ones which have been licensed as limited commercial stations for public service broadcasting for some time. They comprise large stations which have qualified with the rigid requirements of the Department, and are now entitled to use the special 400-meter wave length assigned exclusively to these stations. Only high-class entertainment will be carried. Mechanical music is forbidden. The stations which remain in Class A, over 500 in number, are permitted to broadcast "canned" music if they so desire.

New Class B Stations

Among the B Stations are the well-known calls of Westinghouse, General Electric, Western Electric, the A. T. & T. Co., Bamburgers, and such papers as the Detroit News, St. Louis Post Dispatch and Dallas News.

The first Class B list follows:

WFAA, A. H. Belo & Co., Dallas, Texas; WBAY, American Telephone & Telegraph Co., New York; WOR, Bamberger, L. & C., Newark, N. J.; WWJ, Evening News Ass'n, Detroit News, Detroit, Mich.; WGY, General Electric Co., Schenectady, N. Y.; KSD, Pulitzer Publishing Co., St. Louis, Mo.; WHAZ, Rensselaer Polytechnic Institute, Troy, N. Y.; WOO, John Wanamaker, Philadelphia, Pa.; WEA, Western Electric Co., New York; KYW, Westinghouse Electric & Mfg. Co., Chicago; WCX, Detroit Free Press, Detroit, Mich.

P. M. Smith Leaves Dubilier

NEW YORK.—Preston M. Smith has resigned his position as sales manager for the Dubilier Condenser and Radio Corporation. Mr. Smith, however, intends to devote his attention and efforts to Radio.

DE FOREST EXPLAINS

(Continued from page 2)

"In the realm of music, scenes from opera and operetta, the phonofilm has a large future, a wide field of usefulness in acquainting millions with the best of music, which most people would never hear but for this and that other new medium, the Radio broadcast."

De Forest has made use of his audion, which is known to the Radio world as the triode tube. With tubes similar to those used in Radio connected in with power amplifiers, such as are connected to Radio receiving sets, the vibrations are amplified to such an extent that they can be thrown out to an audience without distortion.

Later, perhaps, Dr. De Forest's invention will be the means of sending out the voice from the opera or the theatre, while in thousands of motion picture houses all over the country the audience will be witnessing the same play, hearing the actors themselves purely through Radio means.

TO MAKE UNISSETS

(Continued from page 7)

as other units are described. All connections should be soldered using a non-corrosive flux.

Kind of Detector to Use

There is being marketed a detector at a reasonable price that can be plugged into the socket. The detectors come in two styles, an adjustable detector and one that has a fixed adjustment. Or the builder may use any pet detector by simply connecting it to a short length of flexible cord fitted with a bayonet joint attachment plug, plugging it into the socket. The writer prefers this arrangement for fine adjustments of the detector are not liable to be disturbed while tuning the set.

For use in the panel a fixed detector is advisable. In Figure 7 is shown a method of making such a detector from an attachment plug. A small piece of galena or iron pyrites is attached to one terminal of the plug by means of wire wrapped around it. A catwisker mounted in the other terminal is bent to touch the crystal. The detector is adjusted in the usual manner and while a message is being received a drop of sealing wax should be put around the catwisker sealing it in place.

A cap can then be screwed on the plug and poured full of sealing wax or paraffin making a detector not subject to jars or vibration. Several of these detectors can be made up and when one goes bad from static or other causes simply plug in another.

It will be noted from the wiring diagram that the terminals are numbered. It might

be well to keep handy a sketch showing the internal wiring of the set with relation to the terminals for convenience in changing connections. It will also be noted that in the diagram the phones are connected across the condenser. When their use across the detector is desired they should be connected to posts No. 6 and No. 7.

Aerial for the Set

As to the aerial to be used with this set. A single wire 100 ft. long placed 12 feet above a two-story roof has brought in loud signals from stations near while sets 20 miles away were heard clearly. Directions for tuning are hardly necessary. With an aerial of the above size, Radiophone music comes in on the first and second point of the switch, the maximum wave length of the set being a little over 600 meters. After adjusting the detector or being sure of a good fixed adjustment detector, place the switch on the first tap and slowly turn the dial till the signals are at maximum. If nothing is heard repeat, using the second contact on the switch. It will be found that there is a generous overlap on this set, that is, any signal can be heard on two taps by properly adjusting the dial.

Every attempt has been made to describe the construction of this set as clearly as possible, but should there be any points not entirely clear the writer will be glad to furnish additional information on receipt of a stamped envelope, c/o RADIO DIGEST.

The army has perfected a method by which the fastest sent Radio telegraph or telephone message can be caught on wax cylinders and reproduced at lower speed on dictaphone machines, making the message very easy to read and decode if necessary.

AIRPLANE RADIOPHONE FLYING MEET FEATURE

Broadcast Programs and Radio Stunts Amuse Spectators

KOKOMO, IND.—Radio proved a very interesting feature of Kokomo's Second Annual Aviation Meet held at the Fagley Aviation Field here recently under the auspices of the 137th Observation Squadron.

A ground station using a Signal Corps SCR-68 combined Radiophone transmitter and receiver, furnished a variety of entertainment and demonstrations for the spectators, ranging from Radio concerts to the directing by Radio of airplanes flying overhead.

Receiving stations, equipped with loud speakers, were placed at a number of different points on the field.

Over the Signal Corps SCR-68 set located at the field's station, orders to pilots and officers of the squadron were broadcast to both airplanes in flight and other ground stations for delivery. Various other items, including football and baseball scores, market reports, and news items, as well as the official announcements of the various events of the meet, were broadcast for the benefit of the visitors. Nearby amateurs also picked up these signals.

Two planes of the squadron were equipped with the standard signal corps' airplane sets, which are operated by small air-driven generators mounted on the landing gear of the planes. These planes gave demonstrations of plane-to-ground communication.

There's a Radiola for every purse

The public has made radio what it is today and the public will dictate what radio will become tomorrow.

In the meantime, the Radio Corporation of America is doing what it can to protect the public—



This symbol of quality is your protection

By systematically developing Radiolas, which are so simple, so easily manipulated, that no technical knowledge is required to make the most of them.

By research that not merely improves apparatus, but will stabilize the quality of broadcast transmission.

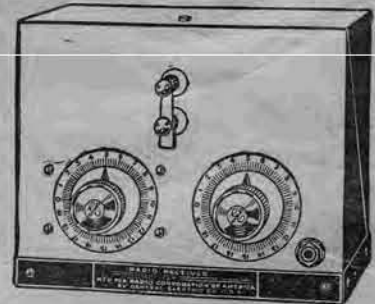
By appointing only responsible distributors who have the same sense of obligation to the public.

The Radio Corporation of America manufactures Radiolas to suit every purse. Prices range from \$18 to \$350. RCA dealers will frankly advise you in making a selection.

Radiola Receiver Model AR-1300 Price \$50

A complete Crystal Receiver which can also be adapted to Vacuum Tube Operation.

Receives Broadcasted Concerts up to distances of from 25 to 40 miles.



Before purchasing any Radio Set, be sure to buy the book "Radio Enters the Home" at your dealer—Price 35c or write direct to

Radio Corporation of America

233 Broadway New York City

10 So. La Salle St. Chicago, Ill.

CROSLEY

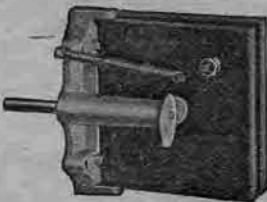
Better—Cost Less

A New Condenser



THE Crosley Book-type Variable Condenser is a radical improvement on the old-style multiple-plate condenser. No plates to warp, uses less space, has less internal resistance than any other type on the market and practically no body capacity effect. Yet, it is of such simple construction that it cannot get out of order.

By using Crosley Condensers, louder signals are obtained and accurate tuning made easier. Each instrument passes a one-thousand volt breakdown test and



.0008 Mf. capacity test before leaving the factory. Has a minimum capacity of .00006 Mf.

The Crosley Manufacturing Company makes complete Receiving sets from \$20 up and a complete line of Radio Parts. Better—Cost Less.

For sale by Jobbers and Dealers everywhere. If your dealer does not handle Crosley instruments, write us direct.



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Electromagnetic, Not Ether, Waves

Are Ether Waves to Become Obsolete?

PROFESSOR EINSTEIN'S theory of relativity has, to some extent, refuted the idea that light is a wave motion passing through ether. There was no other name found for this invisible medium. One writer says that the Radio waves and light rays are electromagnetic waves; that is, alternating magnetic fields. He goes on to say that there is no such thing as ether, and if in the attempt to be progressive we talk about ether waves and ether telephony, we are behind the times. If this is the case, electromagnetic wave telephony is the proper name for it.

The Radiophone a Blessing

Program Is Completed by Its Use

WITHOUT literature, art, music and the drama life would be very dull. A part of this program has been denied to a large portion of the population in any country. Anything that adds to the enjoyment of the world is a public benefaction of the highest value. Life at its best is a serious proposition for most of us. If literature, art, music and drama are fundamentally necessary, then anything that brings these to most of us is a blessing. What a high office the future holds for Radio, for it brings to the home something which heretofore had been left out of the program.

Better Train Control Needed

Warning of Danger Cannot be Given Automatically

WITH the many problems and hazards to provide for, the railroads find it quite difficult to put their "safety first" slogan into practice. While it seems as if every conceivable device for the safety of their passengers has been applied, yet accidents continue to occur at the most unexpected times and places. A way to remedy these conditions is sought and many engineers are delving into Radio as a possible means to supply the missing link. Predictions are being made now that the next step in railroading is to be Radio routine communication between train and dispatcher.

While we now have the automatic train control to insure that engineers will do with their trains what the signals dictate they must do, yet there is only intermittent communication with those who might warn them of danger or tell them when they should stop.

It is generally understood that the matter of Radio railroading, as it has been popularly termed, is under serious consideration, so that the news of the installation of such a Radio system for regular use should not come as a surprise to anyone.

Broadcasters Should Repeat Calls

Repetition Will Aid Long Distance Reception

WHILE listening in to a concert the other day we were asked the name of the station sending out the selections. As the set was tuned in about the middle of a violin selection we could not answer the question. Several selections followed with at least thirty seconds to two minutes between them. Nothing was heard in this space of time and we could not definitely tell what station we were hearing. We have just received a letter from a reader asking us to reprint the editorial we published some time ago requesting all broadcasting stations to repeat their calls between selections. A large number of broadcasters are still careless in this regard. Here is the editorial which appeared in the July 1st issue of RADIO DIGEST:

"Not everybody owning a receiving set is able to pick up the message when it starts, therefore he does not know who is speaking, singing or from what station the song or message is being broadcast. And again at the close, the station may have faded out.

"It is best for those doing the broadcasting at the station to repeat their call and owner's name slowly and distinctly at every break in their programs so that amateurs hearing them from long distances will be able to know the station and who they are hearing.

"A number of letters in this regard have been received by RADIO DIGEST complaining about the trouble. Perhaps it would be wise to repeat the call in the same manner as in sending a telegram, as "K for King, Y for Yale and W for Western," for KYW. The latter is particularly necessary for calls containing a number of letters with similar sounds, as WBDE."

Condensed

By DIELECTRIC

When you stop to think of it the amateurs have a pretty tough time trying to work in their code messages. In spite of the fact that they have a low wave length assigned to them, their messages often conflict with broadcasting stations and to do so subjects them to a bit of conversation with the federal inspectors—not always of a kindly nature. The poor fellow who is sending on his 200 meters easily prevents reception by his next door neighbor of some program he has carefully tuned in. This is hard to overcome. A heartless acquaintance of mine suggests that these "hams" ought to sleep in the daytime (none of them work, of course!), get up at midnight and do their sparking from then on until 6 a. m. Well, it should be carefully borne in mind that these selfsame amateurs have contributed to the science of Radio many things for which mere "listeners in" should be duly grateful. As I have remarked before in these columns, McElroy is not my middle name. Nor do I own a transmitting set. Yet for those who send in code on 200 meters some means should be taken to safeguard their continuance.

Hotels and amusement houses will no doubt become the headquarters for testing out new devices for improving the means of enjoyment by their patrons. For instance, in a hotel where there is a loud speaker considerably placed in the dining room to give joy to those paying for six dozen eggs, and actually receiving three on a platter, a light breakfast here would be least of all tempting should the said speaker bring in the morning market report, quoting eggs at the lowest price in years. But, if every table had in addition, headsets, an extra receiving set and a polite waiter then it would be possible to tip yourself into hearing something a little more pleasing. No one can foretell what may happen when the "phonofilm" gets on the market. That is where the amusement houses come in.

Any of your friends lecturers or musical artists? I mean the super-regenerative class that have to travel a great deal to appear before great audiences. It frequently happens that their bookings take them to towns not very far apart, in which case the horror of train travel becomes stepped up somewhat. It wouldn't surprise me in the least to learn that plans were afoot whereby such notables would broadcast from a central city, capable of covering considerable surrounding area, and have their speeches or songs carried to many audiences simultaneously by Radio. These listeners would be seated in auditoriums where they had paid an admission fee to hear the artist through a loud speaker. Some others would benefit without paying, but we'll tune out that idea before they detect it.

The East will soon learn of that Western Conference Intercollegiate Radio Association and try out the same thing. Most of the schools have evinced an active interest in the subject, and some of them being well equipped for experimenting and even broadcasting with powerful transmitting apparatus. The idea will no doubt spread, once its possibilities have been grasped. Consider what it would mean to the various college chess clubs to be able to play their intercollegiate games without being away from a single football match. Or to the half-back, laid up with a sprained ankle, what could possibly compensate him so much as a Radio message from Galena College telling of his team's winning. A college boy might even borrow a "pony" by Radio, providing the others would allow him the time. By all means stir up the schools to get into the game, for a little "jamming" and less cramming would perhaps help some through.

Now watch for the price of headsets to go soaring skywards. Every man who can boast of but a few hairs covering his insulated cranium will be eagerly seeking the nearest store dealing in Radio goods, in order to secure a specific cure for baldness. The news was flashed out into the hydrogen ions quite recently to the entire baldheaded world that to secure a luxuriant growth of hair one had simply to become interested in Radio, purchase a set and don the headgear. In some fashion the electrical waves would accomplish this miracle. You couldn't call wavy hair so produced the Marcel! No, more likely it would come over the head of Hertzian. Any time that father is missing (in case you use only a loud speaker) he will probably be found with his head jammed into the horn.

It seems that Canada is interested in establishing a Radio system for the use of her forest rangers. Considering the terrible devastation from fire which these men make their business to check, it would seem as though no trouble or expense was too great in devising some method to make Radio's use practicable. So far, the main difficulty lies in the recharging of batteries; transporting them through the forest being no easy undertaking. I sincerely hope some way will be found to get receiving sets to these men in order that some of their loneliness may be mitigated. The work they do is of vast importance to all of us and the pleasure of listening to music and various other things when not busy should be theirs.

What are fogs to the modern sea-going Englishman? Since the British Admiralty has placed a Radio cable in the English Channel ships can speed straight for their haven without getting off the course. I believe this scheme of directing a ship by means of Radio paraphernalia and a cable, stretched upon the bottom of a body of water, originated with this country. The fact is the U. S. can lay claim to a great many valuable ideas related to Radio.

RADIO INDI-GEST

And All She Heard Was Static

Dad asked little Hester last Sunday to say grace at the breakfast table and she very solemnly bowed her head and said, "Stand by, Good Lord, while we get that which we are going to receive."—Elsie H.

Oh Gosh, Ain't Radio Wonderful?

Come, for the night is falling,
And my set is tuned so fine
It will pick up a peal of thunder
Or the red ant's plaintive whine.



Come! And sit close beside me.
My head-phone's built for two.
It will be a night of rare delight—
With the world's wild sounds—and you!

The Rhymes Were Howling Successes

"Tonal poems" is the way one romantic writer describes program numbers.

Then He Took Up Radio

"Can you explain Radio to me?"
"To be sure. Take heterodyne action. Suppose that the frequency of oscillations in the receiving antenna is



100,000 cycles per second when that circuit is in resonance with passing electro-magnetic waves, it would require a generator of undamped waves possessing a frequency of 101,000 cycles per second to be heard."
"I understand perfectly now."—Louisville Courier-Journal.

An Electric Massage, All Right

"Face massage" was the subject of a talk in one of the recent programs. One might say that was the beginning of a new wrinkle.

Hot Stuff! The Iron Smooths Out the Waves

Nothing is safe from the Radio enthusiast. First, he monopolizes the clothes line, then the bed springs, next the lighting circuit and now he has invaded the fields of home comforts in his search for efficiency for his receiving set. The last attempt is to use the heating element from the electric iron. Is there any other apparatus about the house made of wires?

You Forgot Coal Bills

Dear Indi—Look on you calendar. See? Oysters and Radio come into their own during the same season. Every month containing an "R" in its spelling is the



berries for both the bivalve mollusk eaters and the wave length changers. What ho! Let us greet both notables into the season park.—Snake Eyes.

Where Have I Heard That Stuff Before

Say, Indi—I turned in the ole Radio set to the station (KGU) the other day sending bedtime stories at 1:30 a. m. What are you do, kid me? Or is that why the grass there look so wideawake?—O. M. Bu

Use of the Radio Receiving Set in the Home

Part VI—Amplification

By H. M. Towne

THE NEED for amplification may arise from two different sources. First, the energy received by the antenna may be too feeble to operate the detector tube satisfactorily, and, second, the volume of sound from the telephone receivers as produced by the output of the detector tube may be insufficient for audibility. The first source calls for Radio frequency amplification, while the second and more common source calls for audio frequency amplification. As the names imply, Radio frequency amplification is the process of amplifying the received energy at Radio frequency; that is, before the energy is

rectified by a detector to audio or speech frequencies; and audio frequency amplification is the process of amplifying the received energy after it has been rectified to audio or speech frequencies. We will at present discuss the audio amplification which in the majority of cases will fulfill requirements for desired audibility.

Audio Frequency Amplification

Amplification calls for the use of a vacuum tube which is nearly identical with the detector tube. The amplifying tubes on the market have an exact resemblance to the detector tubes, both having the three elements of practically the same physical dimensions, and both using the same socket.

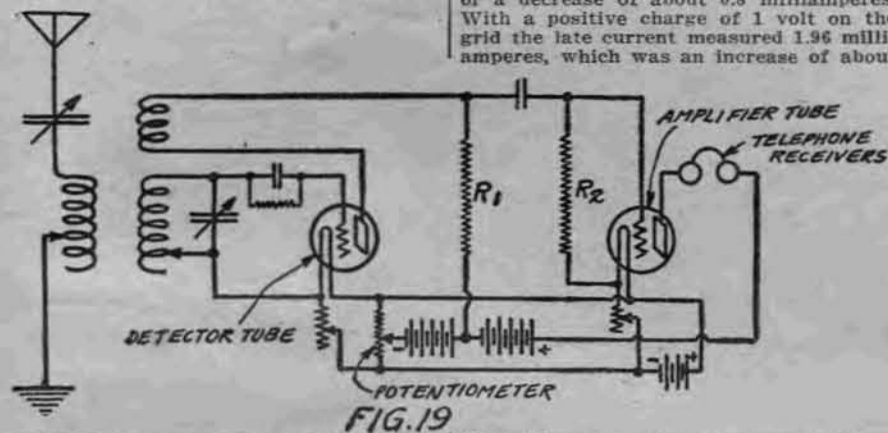


FIG. 19

portion of the characteristic curve. **Increase Must Equal Decrease**

By this we mean that a given positive charge on the grid will cause an increase in plate current which will be equal to the decrease in plate current that would be effected by a corresponding negative charge on the grid.

To put it in figures, a UV-201 amplifying tube, with zero charge on grid, will pass a normal current from plate to filament measuring 1.2 milliamperes (1 milliampere = 1/1000 of 1 ampere). With a one-volt negative charge on the grid the plate current measured 0.46 milliamperes, or a decrease of about 0.8 milliamperes. With a positive charge of 1 volt on the grid the plate current measured 1.96 milliamperes, which was an increase of about

0.8 milliampere above the normal value. This condition in the amplifier tube insures that the amplifying action does not modify the shape of the oscillation; that is, the current changes in the output or plate circuit will follow exactly the shape of the oscillations impressed on the grid or input circuit.

Methods of Coupling Amplifiers

In audio frequency amplification it is necessary to feed the output of the detector tube to the input of the amplifier tube. The output of the amplifier may be connected to the telephone receivers or it may be fed to the input of still another amplifying tube. In coupling the output of one vacuum tube to the input of another we can use various methods. These may include resistance coupling, react-

ance coupling, or choke coil coupling. This type of coupling will give greater amplification than the resistance type due to the fact that the impedance of the choke coil is equal to the resistance replaced.

what higher than is required for other couplings. From 23 1/2 to 35 volts on the detector plate and 80 to 100 volts on the plates of the amplifying tubes, where more

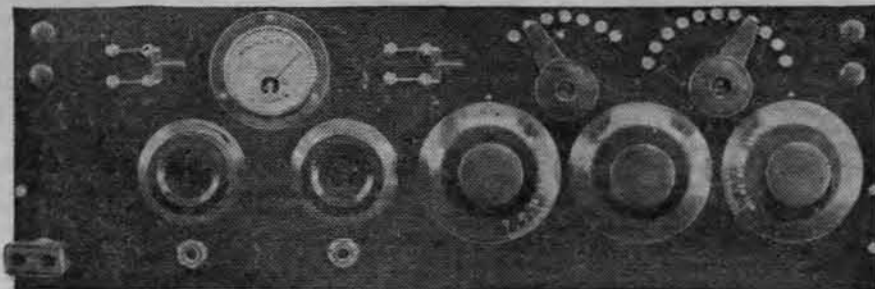


Figure 22

detector tube causes a change of the plate current from the B battery through the resistance R_1 . The current through the resistance R_1 causes a voltage drop across R_1 which will be equal to the current times the resistance ($E = I \times R$). This

impedance equal to the resistance replaced. This type of coupling will give greater amplification than the resistance type due to the fact that the impedance of the choke coil is equal to the resistance replaced.

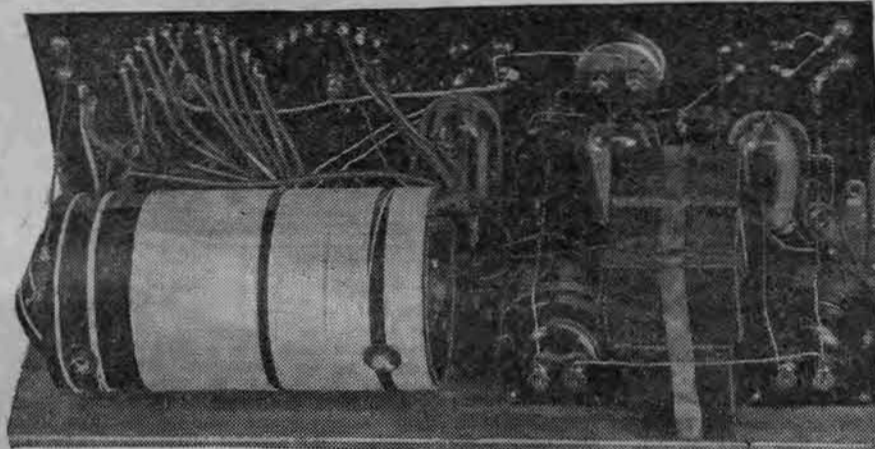


Figure 23

voltage across R_1 is impressed on the grid of the amplifier tube through the coupling condenser C . The plate potential using a resistance coupled amplifier must be some-

ance or choke coil coupling, condenser coupling or transformer coupling. Resistance coupling gives the least amplification but preserves better quality in the reproduction. The transformer enables the greatest amplification, but it is liable to cause more or less distortion of the original received signal.

Resistance Coupling to Detector

Figure 19 shows the method of coupling an amplifier tube to a detector by means of resistance and condenser. In this the plate resistance R_1 should be equal to or a few times greater than the internal impedance of the vacuum tube from plate to

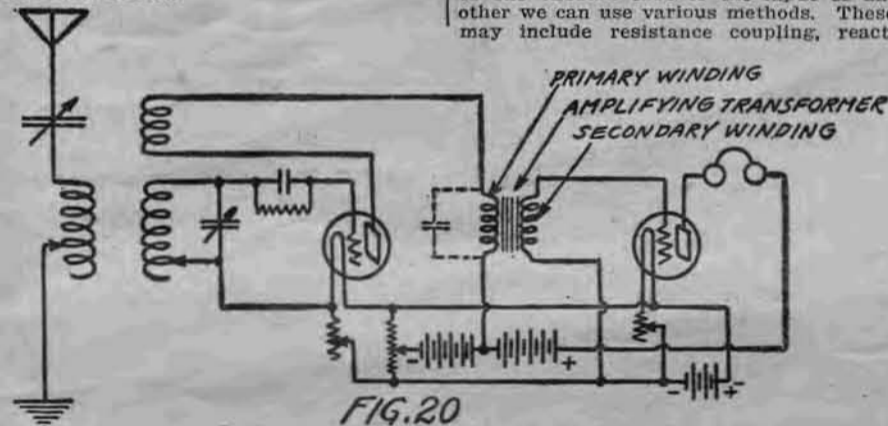


FIG. 20

The most commonly used amplifying vacuum tube is the Radio Corporation's model UV-201. The chief difference between a detector tube and an amplifying tube is in the gas content within the glass bulb. The amplifier tubes have a lower gas content, or, in other words, they are exhausted to a higher degree of vacuum. This difference permits a much higher voltage to be used on the plate

of the amplifier tube without danger of ionization. The average detector tube has a rated voltage of 23 1/2 volts, whereas the tubes are rated at from 40 volts and will actually operate at higher. The essential consideration is that the vacuum on the linear or straight

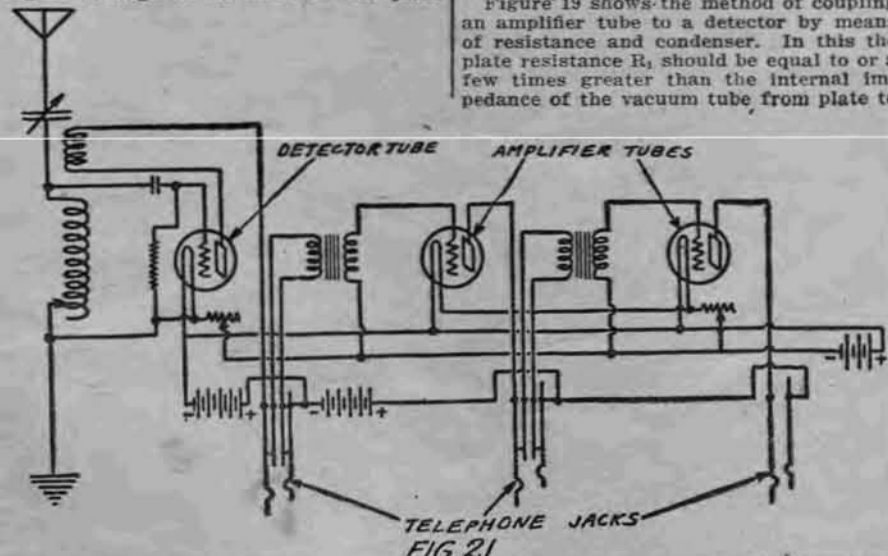


FIG. 21

filament, depending upon the characteristics of the tube. Using a UV-201 amplifier tube about 100,000 to 200,000 ohms gives good results and the coupling condenser C should have a capacity of about .005 mfd. The grid resistance or leak R_2 should be from 2 to 4 megohms. The amplification constant for such an audio amplifier is about 5; that is, the

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Variocoupler Used with Crystal Set

Original Hook-Up with Variocoupler in Circuit

The accompanying illustration shows a hook-up using a variocoupler with a crystal detector set to increase the strength and range. To tune, regulate the variocoupler in accordance with the primary condenser. The hook-up is original

WORKSHOP KINKS? EARN A DOLLAR—

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

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as far as I have been able to determine.—
Bernard Duhrkoop, Portland, Oregon.

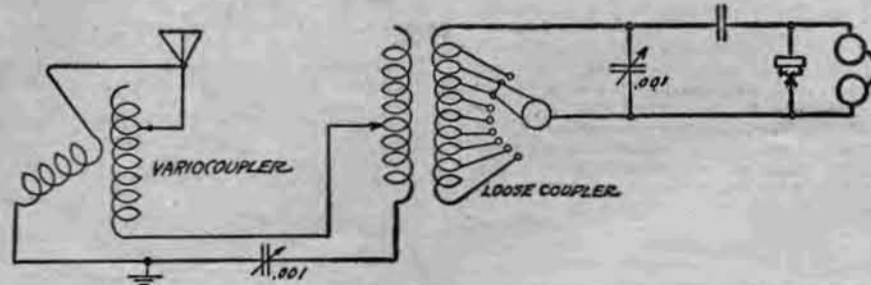
Spring Crystal Holder

The changing of the galena in my crystal set several times a day has been a habit of mine and to loosen one or two screws in the cup to remove the piece is quite a troublesome task. I now use in



place of a cup an ordinary hinged spring paper clip. One of the projections used

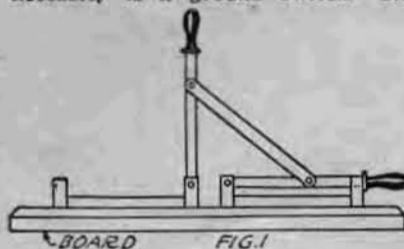
HOOK-UP USED ON CRYSTAL SET



for opening the clip is placed directly in front of the cat whisker. Any size crystal from 1/4 inch to as small as can be handled with a pair of tweezers is held firmly with the use of this clip. Crystals may be changed as readily as the clip can be opened and closed.—Milton Matthews, Omaha, Nebr.

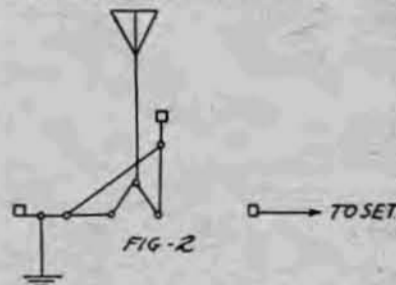
Homemade Ground Switch

One part of a Radio set that is almost a necessity is a ground switch. These



switches may be purchased, but if a person has the time, one can be made easily at home. Sometimes it is possible to procure single pole switches in the junk found in an electrical shop. If these cannot be found in this manner, two inexpensive switches may be purchased and mounted as shown in the illustration. By using the two switches,

one single pole double throw switch can be constructed as in Figure 2; a hole is drilled in the center of each knife and a piece of copper is fastened between them by means of a loose bolt and nut on each



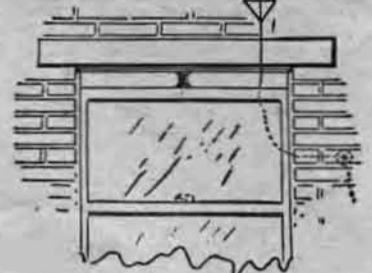
end. The switches should be mounted on a base as shown. The connections are made as shown in Figure 2.—Roland McCallum, Dallas, Tex.

Don't Force Loud Speakers

Don't judge Radio by the sounds that issue from the loud speaking devices in many stores. Investigation proves that most of the trouble is caused by an attempt to squeeze the maximum sound out of the devices. By using judgment in determining the amplification possible, the quality is sure to be improved.

Aerial Lead-in Placed at Top of Window Sash

In many cases apartment house owners will not allow their Radio tenants to disturb in any way or disfigure the property



in which they live. It is almost impossible to run a tube through the side of the house in order to bring in the lead from the aerial.

I solved this problem by nailing an ordinary thread spool to the top framework of my window. The lead-in is easily brought through the narrow opening and connected to the lightning switch.—Saul B. Ades, Louisville, Ky.

Tickler Troubles

If perfect regeneration is not obtained with the tickler, reverse the connections from the tickler, that is, change the connections from the tickler where they unite with plate and transformer or at the coil.

USE OF RADIO SET

(Continued from page 11)

to the fact that the same voltage drop across the choke coil can be had with less energy loss than is had in the resistance. The plate voltage does not need to be as high with the choke coils as with the resistances.

Transformer Coupling

The transformer type of coupling is more generally to be recommended and with a few precautions exercised in the selection of apparatus and in connecting it very good amplification can be had without sacrifice in quality due to distortion. The amplifying transformer must in nearly all cases be purchased, as it is difficult to construct unless one has exceptional facilities. There are numerous amplifying transformers on the market and most of them have cores of laminated iron. As might be expected, the various makes and designs vary widely in their amplifying characteristics.

They all consist of two individual windings, usually on the same leg of the core. These windings are called primary and secondary, and generally designated "P" and "S" on the connection terminals. The primary is next to the core and the secondary is wound over the primary. Both windings are of very fine wire, some designs using as small as .003-inch diameter wire.

The transformer is connected as shown in Figure 20. The primary winding is connected in place of the telephone receivers on the detector set so that the primary is in the plate or output circuit of the detector tube. The secondary winding is connected to the input—that is, grid and filament—of the amplifying tube. The telephone receivers are connected in the plate circuit of the amplifier tube. This constitutes one stage of audio amplification. Additional and successive stages may be added, but for the average broadcast reception two stages of audio amplification are sufficient.

Amplification Action

The amplification action is as follows: A signal on the detector grid causes a change of current from the B battery through the plate circuit, which includes the primary of the amplifying transformer. This change of current through the detector plate circuit is in accordance with the voice frequencies at the transmitting station. The changes of current through the primary cause a voltage across it which will be equal to the current times the primary impedance.

This primary voltage induces a much larger voltage in the secondary, depending upon the winding ratio of turns. The transformer steps up the voltage and the output of the secondary is impressed be-

plate current through the amplifier tube, which is many times the amplitude of the plate current in the detector tube. The actual amplification constant depends upon the transformer ratio and upon the amplifier tube characteristics.

By-Pass Condensers

As shown in dotted lines in the diagram, it is sometimes advantageous to shunt the primary of the first stage transformer with a small fixed condenser of about .002 to .005 mfd. capacity. This only needs to be done when the insertion of the transformer in the plate circuit will interfere with regeneration. A shunt condenser across the primary acts as a by-pass for Radio frequency and regeneration is unaffected. It is advisable to try the

(Continued on Page 14)

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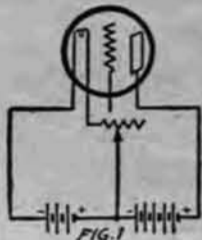
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Simple Instructions for the Beginner

By Harry J. Marx

The Operation of Vacuum Tubes

IN THE development of the series of articles on laboratory tests, it is of the utmost importance that the elementary principles controlling the operation and functions of each piece of apparatus be understood thoroughly. For this reason the description of each test will be preceded by a detailed explanation of these functions. This description may consume but little space. In some cases, however, it will necessitate an article in itself. In



describing the various tests on the operation of vacuum tubes, an entire article will be devoted to this detailed description.

A thorough knowledge of the operation of vacuum tubes cannot be attained without an understanding of the fundamental laws under which it operates. These fundamental laws are based on the electron theory.

The Electron Theory

To those who have taken up the subject of elementary electricity or physics, the following facts are familiar. The smallest unit or divisible part of matter is an atom. The atom simply represents the most diminutive division we can make of any substance. It has been discovered that each atom has certain properties of its own, and the analysis of these properties has been the cause of the formulation of the electron theory. Briefly, the electron theory is based on the assumption that each atom possesses a certain amount of electricity in the form of electrons. Each atom is said to possess an average number of these electrons. In stating "an average number" it is meant that the number is variable. The actual number in any atom or number of atoms may be more or less than the average.

If the quantity is more, then the atom is said to be negatively charged, that is to say—it has more than its normal number and is in a condition where it will readily release some of its surplus electrons. If the quantity is less than normal, then the condition is that of positive charge. In the latter case it will have a tendency to attract free or surplus electrons from any other substance.

If then the actual electron quantity is normal, the condition is neutral, that is, there is no marked tendency for the attraction or repulsion of other electrons. If this is thoroughly understood, the so-called condition of positive and negative charge will present no further difficulties.

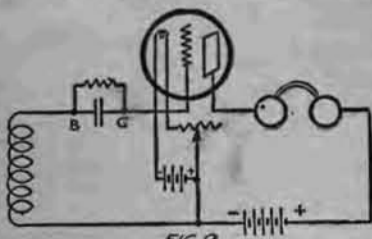
Example of Principle

For example; we may have two bodies, both positively charged, but one more so than the other. In this case there will be a tendency for electrons to flow from the one that has the maximum amount of electrons to that which has minimum, or in other words, the one with the highest positive charge and least amount of electrons will draw electrons from the other body until a balance exists.

In the same way, two negatively charged particles will act similarly. The one having the highest negative charge or greatest number of electrons will lose some of them to the other because of the latter's relatively positive condition. Naturally if we have positively and negatively charged substances in contact there will be a flow of the surplus electrons from the negatively charged substance to that of the positive charged substance until a balance exists between them.

Leakage of Electrons

Any substance, whether positively or negatively charged, will either attract or



electrons if left to stand any length of time. Such change of condition, however, is apt to be a slow process unless under two conditions. If placed in a vacuum, the flow of electrons between any two substances is increased, due to the fact that there is no resistance in the path between them. This, then, permits an easier flow.

It has also been discovered that heat will increase the speed of the motion of the electrons in any substance, and similar to the vaporization of water, the motion may become so great, if sufficient heat is supplied, that the electrons are thrown out in increasing quantities. This "vaporization" will continue until the space surrounding the heated body becomes filled up, or in other words, becomes saturated with these released electrons. If, under these conditions, a positively charged body is brought in the vicinity of this saturated space, the free electrons will be attracted to the body.

The Vacuum Tube

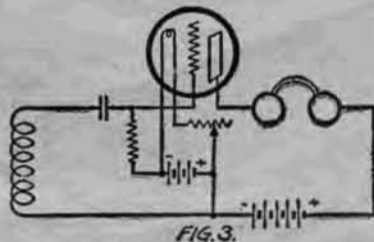
In the vacuum tube advantage is taken of these two conditions. A wire with its two ends projecting is placed inside a glass tube and a plate with a connecting lead coming through the glass is also placed inside. The tube is then evacuated and sealed.

The first condition then under which electrons flow is increased, has been fulfilled, namely, the two substances are placed in a vacuum. The next problem is to apply heat to one so that it will release the electrons freely. This is accomplished by treating the wire as the filament of an electric light. The two free ends are connected to a battery and a rheostat is inserted in series, thus permitting a control of the current pressure, which automatically controls the amount to which the wire is electrically heated. The filament then is heated in a vacuum and is ready to release its electrons.

There will be a flow of electrons to the plate, but this flow will only continue until its capacity for electrons has been filled. After that, there is no attraction for additional electrons. The space in the tube becomes saturated with electrons and results in a condition where the tube is choked and further electron flow is shut off.

External Plate Connection

If, however, the wire from the plate in the tube is connected to the positive side of the A battery which connects to the filament, then as the filament throws off its electrons and the plate accumulates



electrons, they will flow through this external path with the result that the accumulation of electrons on the plate is led right back externally to the filament circuit, thus supplying the filament with more electrons as fast as it exhausts its supply. There is then, a constant flow of current both externally and internally between the plate and filament.

Function of Plate or B Battery

If the plate is positively charged through an outside agency then the former will have an even greater attraction for electrons. A battery is therefore inserted in series, with the positive side toward the plate as shown in Figure 1. This increases the positive charge on the plate in the vacuum tube, and for this reason increases the attraction and accelerates the flow of electrons. This battery may be compared to a pump that speeds up the current flowing through the external circuit from the plate to the filament.

Rectifying Action

The flow of electrons has been explained, but no emphasis has been laid on the fact that this flow of electrons can be only in one direction. Since the filament alone is heated and the plate is always kept positively charged, that is, has a scarcity of electrons, therefore there will be no tendency of the plate to lose any of its electrons to the filament, since the latter is trying to dispose of its own accumulation. There is then a condition that the external circuit can only flow in one direction. The tube is then really a rectifier and will permit current to flow only in one direction.

Two of the characteristics that have been discovered in the action of tubes and which will be taken up in the actual tests are:

1. The electron flow increases with the increase in the temperature of the filament.
2. The electron flow increases with any increase in the positive charged condition of the plate, namely with the increase in the plate battery voltage.

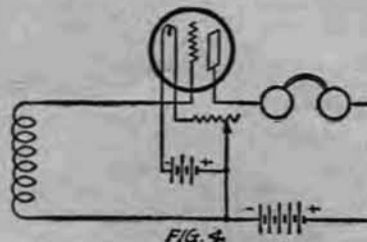
The Grid and Its Function

In order to control more accurately the flow of electrons a third element was added to the tube. This control, called the grid, is of the utmost importance in Radio

reception, and a great part of the success in operation depends on the operator's knowledge of the grid's function.

In the average vacuum tube the grid is a slightly flattened spiral helix which surrounds the filament. The plate in the same manner surrounds the grid. In order to pass from the filament to the plate, the electrons must travel through the interstices of the grid. If either a positive or negative charge is placed on the grid, it will affect the flow of electrons from the filament to the plate.

If the charge is positive, it will increase the attraction of electrons away from the



filament. Since the grid is merely a thin wire and take up but a small amount of space, the speed only of the electrons is increased with the resultant tendency to fly through the grid to the plate. Some of them, however, are caught by the grid and reduce the positive charge.

If the grid is negatively charged, the tendency will be the opposite. It will itself have a tendency to release electrons which will block the flow between the filament and grid. The actual amount of charge will determine the accumulated effect or reaction on the filament to plate circuit.

Methods of Grid Control

The connections to the grid of the tube can be made in a number of different ways and the principles of their operations vary. For this reason a description is given of the different hook-ups and how they affect the operation of the grid. Before describing these methods, some of the conditions which affect the connections must be considered.

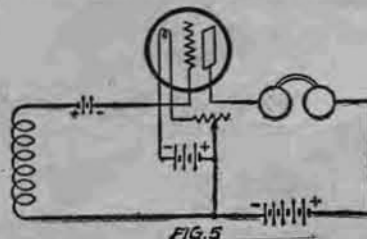
The grid itself may accumulate too great a supply of electrons with the effect of choking and nullifying the tube's operation. Some means must be supplied therefore for taking off this surplus as it accumulates. Another point is the fact that the grid control is so sensitive that it is necessary to avoid too great a reaction which may be sufficient to start an individual flow between the plate and the grid or the filament and the grid.

Condenser and Leak

In Figure 2 a condenser is inserted in series with the grid and a high resistance known as a leak is shunted across the condenser. In describing the action in this circuit the reader must realize that the current flowing in this secondary or grid circuit is an induced alternating current produced as a result of induction from the primary circuit.

This alternating current is quite rapid in its cycles or reversals. Due to this rapidity in reversals, there is no effect through the high resistance grid leak on account of the length of time it would take for any effective current to pass through. The effect, however, on the condenser is the important one.

Let us assume the direction of the current is such that the B side of the condenser is positively charged, or lacks sufficient electrons and therefore has an attraction for more. The result is then that the electrons on the grid side will all pile up or accumulate on the side of the condenser plate marked G. The dielectric or insulation, prevents them from jumping across. Because of this attraction to the one side of the circuit, the grid is left with a scarcity of electrons and therefore has a decidedly positive charge. Naturally the effect will be as explained above. As the grid accumulates any excess electrons, they will trickle through or escape by means of the high resistance grid leak shunted across the condenser. When the current is in



the opposite direction, the B side becomes crowded with electrons with the result that the electrons on the G side are repelled, and the grid becomes negatively charged.

Connections in Figure Three

In the method of connection shown in Figure 3 the action is similar to the Figure 2 method above with the exception

that the high resistance grid leak is connected to the negative side of the filament so that the accumulation is drawn off automatically from the grid circuit by the filament which is constantly absorbing more to replace its losses.

Figure Four Circuit

If no condenser is inserted in the grid circuit, the potential, that is, the positive or negative condition, must be controlled through its connection to the A battery circuit. The two terminals, however, possess too extreme a potential for the grid use and some adjustment in between is necessary.

To accomplish this, a high resistance from 200 to 600 ohms is connected across the terminals of the A battery. A resistance of this type will have only a slight drain on the amperage of the battery. The wire from the grid circuit then connects to a slider that makes contact along this resistance. As the contact approaches either of the two terminals of the battery the grid circuit takes the charge characteristic of that terminal. This instrument is called a potentiometer.

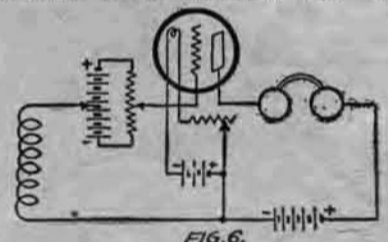
In this way the actual positive or negative condition of the grid is controlled by means of the potentiometer adjustment. This potential is stronger than the incoming current but is subject to fluctuations through the effects of the induced current from the primary circuit whose variations are used by the grid in controlling the plate circuit.

How Figure Five Circuit Functions

Another method very similar to that preceding, but in which a potentiometer is not necessary, is shown in Figure 5. In this case a small two to four-volt battery, called a biasing or C battery, is placed in the grid circuit with the negative side towards the grid. This automatically gives the grid a negative charge. This method of connection, however, is not as sensitive and subject to control as the previous one.

Figure Six Explanation

In Figure 6 a method similar to that shown in the preceding circuit is utilized, but by means of a potentiometer a more accurate control is possible. The battery can be of the four-cell type. A tap is taken off between the two center cells and connected to the secondary coil. The



potentiometer is shunted across the battery and the grid is connected to the sliding arm.

By shifting the potentiometer from side to side the effect of the battery will be varied from the distinct positive charge to a negative charge. This method is a little more expensive than the preceding one, but possesses considerable more sensitivity.

The amateur must realize that the electronic flow is creating a continuous current in the plate circuit as long as the filament is lighted, and the effect of the grid is to create fluctuations in the plate circuit by increasing and decreasing its intensity, which corresponds to the fluctuations in amplitude of the incoming Radio frequency currents. This method of superimposing the effects of the incoming current on the plate currents is called modulation. It is quite evident, then, that the effect of only a very weak current through grid action is multiplied many times in the final plate circuit. This, then, illustrates the function of the vacuum tube as an amplifier.

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USE OF RADIO SET

(Continued from page 12)

operation without the condenser and if difficulty is had in getting the detector tube to regenerate the addition of the bypass condenser as shown will usually be found effective.

A lot of transformers on the market amplify much better at some particular audio or voice frequency than they do at other frequencies higher or lower. It is this characteristic that is liable to change the proportion of sound intensifies in the reception of music and the true or original relationship of tones become destroyed.

Transformer Amplifying Ratio

The ratio of the amplifying transformer is quite important, though not so important as the balancing of winding impedance to the impedance of the vacuum tube with which the transformer is to be used. The ratio functions in the voltage amplification and the maximum voltage amplification does not always mean maximum audibility amplification. The characteristic of the vacuum tube amplifier has considerable to do with this and some tubes seem to work better on low ratio transformers, while others give better results with high ratios. Transformers on the market have ratios varying from 3 to 1 to 9 to 1.

Assuming the average transformer and average amplifier tube the energy amplification per stage is about 40. This means that the energy through the head phones on a one-stage amplifier is 40 times that if the phones were connected in the detector plate circuit. The audibility, however, varies as the square root of the energy so that the actual sound amplification constant is the square root of 40, or about 6.3 per stage. Thus a two-stage amplifier will give 6.3x6.3, or 40 times the audibility of the detector tube only. A three-stage amplifier will give 6.3x6.3x6.3, or about 250 times the audibility of the detector tube without amplification.

It is a good plan to exchange the amplifier tubes around in different stages and generally the final output will be better with some particular combination. Audio frequency amplifiers using transformers are generally limited to three stages. More stages are apt to result in tube noises and howling, which is very difficult to eliminate. Even with three stages special precautions have to be taken in mounting the transformers and tubes so that there will be no back coupling from the output to the input of a preceding tube.

Spacings for Transformers

Recommended spacings between transformers of successive stages vary from 1 to 4 inches. This depends largely upon the transformer and whether or not it is shielded by a complete metal casing. The writer has mounted the Radio Corporation's UV-712 transformer 3/8-inch apart between cores with no trouble using three stages. It is important that the terminals of the transformers be connected properly. This is cared for on some transformers by an indication on the terminals.

It makes quite a difference in some transformers which terminal of the secondary is connected to the grid. Generally it should be the terminal connected to the outside layer of secondary winding. This terminal has less capacitance to primary winding than the terminal connected to the inside secondary layer, and it is desirable to avoid any capacitance being associated with the grid of the amplifiers. If trouble is had from howling, the connections of secondaries should be reversed one transformer at a time and results compared.

Single-Circuit Regenerative Receiver

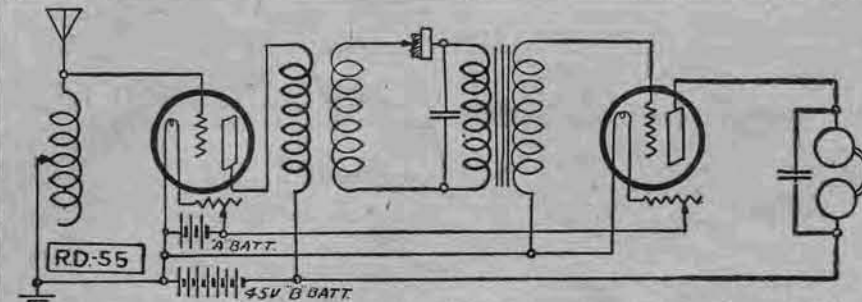
Figure 21 is a diagram of a single-circuit regenerative receiving set using two stages of audio frequency amplification and Figures 22 and 23 are photographs of this combination. Telephone jacks can be inserted between the transformer primary terminals so that the telephone receivers can be plugged in on either the detector, first stage amplifier or second stage amplifier. It should be noted that the amplifier tube rheostat is connected in between the negative side of the A battery and the filament terminal. This results in a slight permanent negative potential on the grid of the amplifying tubes, which is desirable when 40 or more volts are used on their plates. The normal filament voltage is 5 volts, while the storage or A battery delivers 6 volts. This means a 1-volt drop across the filament rheostat resistance. To utilize this one side of the transformer secondary is connected to the battery side of the rheostat, while the other secondary terminal goes to the grid. Thus the volt drop across the rheostat is impressed constantly between the grid and the negative terminal of the filament.

Use of C Battery

If a positive voltage is put on the amplifier grids it will cause a considerable reduction of signal strength. This application of fixed negative potential to the grid of an amplifier tube is called "biasing" the grid, and when higher plate voltages are used the negative bias calls for a much higher voltage, which cannot be obtained across the rheostat. In this case a separate battery of a few small flashlight cells must be used. Such a battery is generally referred to as a C battery.

A separate rheostat for each amplifier tube gives slightly better control for maximum results from each tube without tube noises, but in the average case it is en-

HOOK-UP R.D.-55



This circuit is another one in which a crystal is used for detector for one stage of Radio and one stage of audio frequency amplification. This method used in conjunction with efficient Radio and audio frequency transformers will give very good results. A single-slide tuning coil is used for the primary wave length control. A 43-plate condenser shunted across the coil and slider will considerably improve the tuning qualities of the set. The 45-volt B battery is used for the plate circuit of both tubes.

It is important that the Radio frequency transformer be of the proper design for the wave length range desired. A condenser is indicated across the primary of the audio frequency transformer. For best results, however, this should be a variable 23-plate type. Rheostats are used on the filaments of both tubes. In this hook-up the negatives of both the batteries are connected together. Due to the simplicity of controls this circuit is a simple one to tune.

tirely satisfactory to control all the amplifier tubes with one rheostat. This method keeps them all at about the same adjustment of filament temperature. Care must be taken to leave a rheostat wound with sufficiently large resistance wire to carry the current of the tubes in parallel without overheating. There are numerous rheostats on the market which will carry 3 amperes or more. Always figure about 1 ampere per tube, so that for three tubes in parallel on one rheostat the resistance wire must handle 3 amperes without excess heating. The detector tube, especially in a regenerative set, should have separate filament control, as it requires more critical adjustment than the amplifier tubes.

A voltmeter having 10-volt scale may be mounted on a set as shown in the photograph. This is connected across the filament of the amplifier tubes and should show a 5-volt deflection for correct rheostat adjustment.

(Continued in October 21 issue)

Tungsten in Filaments

The vacuum tube upkeep is the most expensive item in the modern Radio receivers. Tubes are expensive and their life is comparatively short. The latter is more true with the entrance of the general public into Radio.

The life of any tungsten vacuum tube depends upon the life of the tungsten filament. Tungsten has the highest melting point of all metals, 3,250 degrees Centigrade. It can be obtained in the form of fine wire, which may be bent and twisted like any other wire, or it may be as brittle as an eggshell. In vacuum tubes the ductile form is required.

If you look at a brittle tungsten wire through a high-power microscope, you

will see something similar to a wire composed of large blocks. Attempt to bend or vibrate the wire and it will immediately break at the boundary of the adjacent blocks.

Now replace the brittle wire by a ductile wire. It appears that a ductile filament is composed of small grains. What makes tungsten brittle? Take a tungsten filament, heat it up slowly by gradually increasing the current, as done with the ordinary wire-wound rheostat. Bend it—it breaks. You have changed the ductile tungsten filament to fragile and brittle structure.

Contrary to popular belief, the vacuum tube should be flashed to its proper temperature as is done with ordinary incandescent lamps. This is a fundamental principle. Similarly, operating the tube below its proper operating temperature tremendously decreases the life of the tube.

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STATION SCHEDULES

(Continued from page 8)

WWJ, Detroit, Mich. 400 and 485 only. 1,000 mi. Detroit News. Daily ex Sun. 9:30-10:30 am, hints to housewives, concert, weather; 10:55, time signals; 12:05-12:45 pm, concert; 3:30-4:15, markets, weather; 5-6, news, sports. Week of July 10 and every other week, 7-8:30 pm, concert, lecture. Fill in weeks, 8:30-10 pm, concert, lecture. Sun, July 9, wk etc., 9:30 am-2:30 pm, church services and special; 4-6 pm, special. Sun, fill in wk, 2-4 pm, special; 6-10, church services and special. Eastern.

WWL, New Orleans, La. Loyola Univ.

WWT, Buffalo, N. Y. McCarthy Bros. & Ford.

WWX, Washington, D. C. 1,100 only. 600 mi. Post Office Dept. Daily ex Sun. 10 am, weather; 10:30, markets; 5 pm, 7:30, 8, markets; 9:50, weather. Eastern.

WWZ, New York, N. Y. 200 mi. John Wanamaker. Daily ex Sun. 1:40-2 pm, 2:40-3, 3:40-4, 4:40-5, 10:30-12 midnight, concert. Eastern.

WYN, Washington, D. C. 100 mi. Nat'l Radio Inst. Daily, 6:30-7:30 pm, instruction. Eastern.

WYRU, Louisville, Ky. 200 only. 200 mi. Darrell A. Downard. Mon, Wed, 8 pm, police news, concert. Central.

(Note—This completes the station schedule list. The first half, together with the location index, will appear next week.)

Use Rubber Under Battery

The solution in the storage battery is very harmful to carpets and woodwork, so that care should be taken in handling the battery. It should be set on a rubber sheet such as placed on the running board of automobiles.

Radio is used in Vienna to swindle race track gamblers in Paris. By taking advantage of the difference in time, bets are received in Paris after the results of the races are learned.

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Vacuum Tubes



Receiving Set

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When the weather is too cool for outdoor pleasure
And you're worn out after toiling through the day,
Let your evening then be spent at home in leisure,
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ARTISTICALLY decorated in pastel shades and finished with glassine. AERIAL-A vacuum tube receiving set is finished in four color combinations:

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Color Combination.....

Name

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Questions and Answers

Honeycomb Coils

(984) RJ
 1. Will honeycomb coils work well on a wave length of 360 meters?
 2. On which side of the storage battery is the rheostat placed in leading to the filament?
 3. My aerial is fifty feet long, two wires spaced five feet apart and forty feet high, with a lead-in of forty feet. Will this work well using three honeycomb coils and one tube?
 A.—1. Yes, provided you purchase the right coil for this wave length. L 25, L 35 or L 50 for primary; L 35, L 50 or L 75 for secondary, and L 50, L 75 or L 100 for tickler, if used.
 2. Rheostat is connected in series with positive of A battery and filament. Other side of filament goes to negative of A battery and to secondary circuit.
 3. Yes, your aerial is all right. The honeycomb coil combination should be L 25 for primary, L 35 for secondary and L 50 for tickler.

Distance Reception

(984) AJP
 Having read every number of your paper since the first issue and having enjoyed it and profited thereby, I decided to ask your help on a little matter. I have a set employing two stages of amplification and honeycomb coils. There is no difficulty in receiving KYW, but WDAP and distant stations like Detroit, St. Louis, Indianapolis, Schenectady and others do not come in clear. They sound woolly and fuzzy, if you understand what I mean. Will one stage of Radio frequency help that situation? My aerial consists of four wires connected at each end and fifty feet long. The lead is thirty feet. Can you suggest anything that will clear up these tones from the distant places?
 A.—The range of your set is about two hundred miles in summer. One step of Radio frequency will help. Sounds as though you were using too much A battery in an effort to bring in the stations.

Outside Aerial on Super-Regenerator

(877) HGC
 Will you please give me a couple of points on the Armstrong Super-Regenerator as written by F. N. Hollingsworth in the July 29th and 22nd RADIO DIGEST?
 1. How would connection be made to this circuit using an outside aerial instead of loop?
 2. Are the first two tubes detectors or amplifiers, and what two tubes are best to be used? Could first be detector and second an amplifier?
 A.—1. See diagram, page 7, August 12 issue.
 2. All tubes, in either two- or three-tube circuit are amplifier tubes. Detector tube UV-200 might work, but it has to stand 90 volts or better on the plate without paralyzing (blue glow and complex ionization).
 Note.—RADIO DIGEST, August 12th number, contains a very simple explanation of the circuit. In fact, Figure No. 2

in Hollingsworth's article contains a mistake. Figure No. 1 is O. K., but L-4 and L-5 are not inductively coupled. They are at right angles.

Shielding Regenerative Set

(01015) PWAB
 In RADIO DIGEST, Vol. II, No. 6, August 13, 1922, on Page 4, you show a diagram of a short wave receiving set. I have been watching the DIGEST for about one year and this one seems to be the one our club members should try. Would it be asking too much of you to send a detailed drawing showing method of shielding? If any are necessary, we have on hand honeycomb or duolateral coils for different wave lengths and condensers, fixed and variable, Radiotrons U. V. 201 and U. V. 200, and R. C. A. model U. V. 712 and U. V. 1714 transformers. We have no loop aerial. We would like to use the kind of coils mentioned with a single A battery for all tube filaments. Our filament rheostats are of the Bradleystat brand. Please send the drawing showing the different values of the coils, fixed and variable condensers, and tell if coils are inductively mounted. A small bunch of hams will remember you in their dreams.
 A.—We are pleased to note your interest in RADIO DIGEST and to answer your questions briefly as follows:
 The diagram appearing on page four of August 19th issue, which you have selected as suitable to the needs of your club, is in itself quite complete and should not be at all difficult to follow.
 Shielding is not absolutely necessary, although many sensitive regenerative receivers are adversely affected by body capacity. To eliminate this, lining panels with grounded tin foil is found to be very effective. Page four of June 24th issue gives a good description for construction of a loop aerial.
 Briefly, values to be used are as follows:

Condenser on aerial, 43-plate; Condenser on local oscillator, 33-plate; Condenser across the secondary of amplifying transformer, approximately .0005 mfd. Inductances are standard make. Coils are inductively mounted.

Howling

(1017) GBF
 I am enclosing herewith a sketch roughly showing my six-stage amplifier, consisting of 3 stages of Radio frequency, detector, and two stages of A. F. amplification, using all hard A. P. tubes in cascades, 60 to 80 volts on the plate and 6 volts on the filaments. For tuning I use an Amrad short wave tuner having only grid filament connections as the tubes are not designed for regeneration. The Radio frequency transformers are the J-M plug in, 150-475 wave length range type, and audio transformers are of General Radio manufacture.
 1. How can the connections be changed to extinguish lamps when jack plug is

disconnected? All the tubes remain lighted regardless of the plug's position.

2. When stabilizer is moved back from maximum position to edge of wave, reception is faint while increasing stabilizer to increase volume causes a loud howl in most instances. How can this be remedied?
 3. How could I connect extra stages to last amplifier tube with jack connection? How must the circuit be changed on the transformer and where should connections be made thereon?
 4. I have assumed that about 100 volts maximum is safe for these tubes to be varied according to reception conditions. Could more voltage be used on tubes?
 A.—Noting description of your apparatus we take pleasure in answering your questions as follows:
 1. To extinguish lamps at will, use jacks with two extra prongs which will enable you to cut in only the filament desired.
 2. By shielding tubes and transformers you should be able to overcome the howl which follows the manipulation of stabilizer.
 3. To connect extra stages to last tube of amplifier with jack connections place them where the phones now go and run extra leads from batteries to proper place in amplifier.
 4. As high as one hundred and fifty volts can be used safely on your tubes.

Wavemeter Construction

(01014) ACD
 Please give me a simple and efficient method of making a wavemeter at a reasonable cost.
 A.—A wavemeter consists essentially of a series circuit which includes an inductance and a capacity, both of which have known values. Either the inductance or capacity may be of fixed value, while the other may be variable. A hot-wire ammeter, thermo junction, or other suitable device for measuring Radio currents is inserted, either directly into the circuit, or, better, is coupled electromagnetically to it, the coupling being made as loose as will permit of a suitable maximum deflection of the ammeter.
 The construction of wavemeter was described in the September 9 issue of RADIO DIGEST.

Loud-Speaker Voltage

(1025) LFE
 Please advise me if I can use a 12-volt A battery safely on a Magnavox loud speaker. I have tried this for a few min-

utes and find that it is much more satisfactory than 6 volts.

A.—We would not advise using a 12-volt A battery on a loud speaker as suggested. This will cause the field coils to heat if allowed to run for any length of time and might finally burn them out. If you find better results with higher voltage use an 8-volt tap but discontinue same if loud speaker becomes warm at the base.



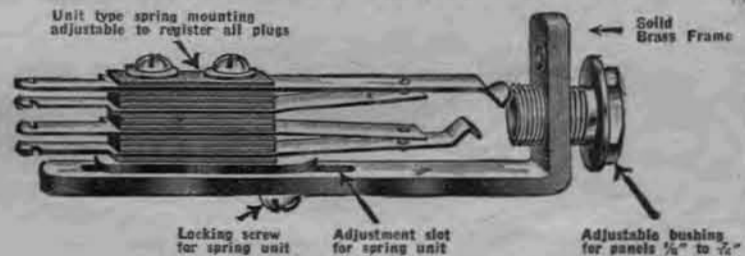
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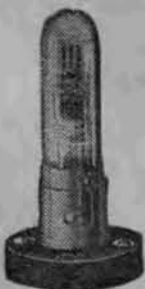
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Patent Applied For

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DEALERS WRITE FOR PROPOSITION

Radio Illustrated

The roof of an office building is just the place for the noonday lunch and the ether waves bring in the music for the finishing touch on the cabaret
© K. & H.

There are many beautiful camping spots along the river shores in Pennsylvania and now the Radiophone brings music to the campers



One of the leading London daily papers has installed a broadcasting station and gives daily concerts. Now whole families take advantage of the entertainment it affords
© Keystone

The Wisconsin National Guard takes a receiving set with a loud speaker along with them to their camp, and it gives entertainment while sitting around the campfire in the evening

