

Radio Digest

EVERY
WEEK

Illustrated

TEN
CENTS

TRADE-MARK

Vol. II

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CHICAGO, ILL., SATURDAY, SEPTEMBER 2, 1922

No. 8

BREAK IN DEATH CELL

SHIP'S DOCTOR AIDS STORK BY AIRPHONE

WAKES IN NIGHT TO SEND ADVICE TO SEA

Joyous Father, Captain of Freighter,
Names New Son After
Physician

NEW YORK.—The advances made in Radio have greatly augmented the work of ship surgeons, and there is hardly a voyage but what the sea doctor is not called upon to prescribe for ailing seamen on passing ships.

Many strange experiences are related by the surgeons of the United States lines' fleet. Among the unusual Radio happenings is one related by Dr. W. S. Ford, surgeon on the steamship President Garfield. Some time ago Dr. Ford was aroused from his slumbers by the Radio operator bearing a message from the captain of a freighter then in mid-ocean. In the message the captain stated that his wife was a passenger on his ship, and that the stork was hovering overhead. The message briefly read:

"Captain's wife on board. Expect arrival of stork before we can reach port. Please assist."

This was a stumper for the doughty doctor, but it was an emergency in which he could not fail. He therefore detailed in language that could be understood by a layman the necessary directions to the far off freighter over which the stork flapped its wings. Two days later Dr. Ford received another message which read:

"Now have a new son. Appreciate your help, and in your honor will call the boy Napoleon Ford. God bless you."

Navy Plant Does 7,000 Miles Without Relaying

SAN FRANCISCO, CALIF.—The Naval Radio Station at Cavite, P. I., now transmits directly to the Pacific Coast by means of a newly installed "barrage" receiver here, thus covering a distance of about 7,000 miles without relaying. Previously trans-Pacific messages eastward were relayed from Cavite via Pearl Harbor, Hawaii. The new receiver, designed by the Radio research section of the Navy, is expected to save at least \$20,000 a year in coal and power bill at Pearl Harbor as well as considerable time. It will also aid in clearing Pacific traffic.

COLUMBUS, O.—The first annual picnic of the Columbus Radio club was to be held on September 1, at the storage dam north of the city.

PLAN TO DETERMINE VARIOUS SET RANGES

WASHINGTON.—The Bureau of Standards is planning, it is understood, to conduct comprehensive tests to determine the effective working ranges of Radio telephone communication when using various kinds of transmitting and receiving sets and vacuum tubes. Preliminary plans have been outlined.



ETHER TELLS DOOMED MAN OF REPRIEVE

George Rollins of Boston,
Under Death Penalty, Hears
News on Set

Report Broadcast by WGI

Information Brought Into Jail by
Invisible Waves May Lead
to Pardon

(Special to RADIO DIGEST)

BOSTON, MASS.—When George Rollins, sentenced to die for murder, was "listening-in" on his Radio set recently at the Charles Street Jail, Boston, he was given the "thrill of a lifetime" when he heard information which may bring about his pardon. Rollins in his cell was listening to the regular late news broadcast from Station WGI at Medford Hillside. Announcement was made that Governor Sproul of Pennsylvania was to release Frank Smith, alias Jesse Murphy, who confessed some months ago to one of the two murders of which Rollins was convicted. The two killings occurred in February, 1917, for which no one has yet paid the penalty. Rollins and his brother, Charles, were both implicated and convicted, the latter receiving a life sentence. While George Rollins was awaiting his penalty, Murphy, down in Pennsylvania, confessed to one of the murders. While he did not confess to the killing of which George Rollins is convicted, he has positively stated that Rollins did not do it, and that he, Murphy, knows who did.

First Case of Kind

Naturally, George Rollins secured a new lease on life when he heard the news by Radio that Murphy was about to be released from the Philadelphia Penitentiary and would be brought to justice in Boston. Boston officials have gone to Philadelphia to apprehend Murphy and bring him to Massachusetts.

This is the first instance of its kind in history in which a convicted life prisoner

(Continued on page 2)

Farmers to Be Protected from Blue Sky Swindlers

(Special to RADIO DIGEST)

CHICAGO.—Broadcasting may become a function of chambers of commerce throughout the country, according to Arthur G. Davis, assistant to Louis L. Emmerson, secretary of state of Illinois, who is charged with the suppression of "blue-sky" frauds within the state.

"In the work of the 'blue-sky' commission," in which the state department co-operates with the local chambers of commerce, we find that one of our greatest problems is to get some means of sending expert advice to investors over a wide area," said Mr. Davis. "The farmer is a pretty wise individual, particularly in Illinois, and if we can give him just an inkling of the real situation in regard to some fraudulent stock scheme he is usually able to take care of himself. I expect that in a few years there will be a broadcasting station in the room of nearly every local chamber of commerce for the dispersion of information and advice regarding business conditions."

Efficiency Aim of Paris Police in Use of Airphone

PARIS, FRANCE.—For a better policing of the city of Paris, regular Radiophone communication is now maintained between one police airplane, two police automobile ambulances and headquarters, all four being equipped for sending as well as receiving. Standard French military sets are used, supplied with current from a propeller driven generator on the airplane, and from storage battery driven motor generators in the ambulances.

Two 12-foot long steel tubes, attached at the end to a bakelite stick, form a mast to support a 120-foot single wire antenna, the other end of which is fastened to a short bamboo pole, driven in the ground. If no gas or water outlets are available for a ground connection, a copper wire mesh 30 by three feet is stretched out on the ground.

Only ten minutes are required from the instant of arrival to make the necessary set-up. Perfect telephonic conversation can be maintained among these stations within a radius of about 50 miles.

COAST'S STRONGEST AT PORTLAND, CLAIM

PORTLAND, ORE.—This city claims the most powerful transmitting and receiving station on the coast. It is to be used for private business, to furnish communication between the headquarters of a high-power company and its station more than twenty miles away making unnecessary the construction of a telephone line for that distance.

BREAK IN DEATH CELL

(Continued from page 1)

heard information by Radio that may bring about his freedom.

Rollins, who is an electrician, is the most prominent member of the jail colony. Sheriff John A. Kellher recently had an up-to-date Radio outfit added to the jail equipment and Rollins supervised the installation. Loud speakers were arranged throughout the buildings so that the prisoners could enjoy concerts, news broadcasts, sermons, etc., and Rollins was put in charge of Radio operations.

On a Thursday night, after he had tuned up, he listened in. One of the news dispatches stated that Murphy, the self-confessed slayer of Hall, had been paroled by Gov. Sproul and would be turned over to Massachusetts authorities to answer to the murder charge here.

Dances With Glee

Rollins tore the head phones off, danced and shouted with glee. Other prisoners in their cells heard the same announcement and shared his happiness by clapping their hands. Little attention was paid to the rest of the program of the evening.

Murphy will be placed on trial as soon as possible, and District-Attorney O'Brien states that if the Rollins boys are not implicated, during the trial of Murphy, Governor Cox will be asked to intervene in their behalf.

Sheriff Kellher and Deputy Sheriff Horgan are humane men and believe in doing everything possible for the prisoners in their charge. As George Rollins puts it, "they will go fifty-fifty with the men," and want to have them as contented as men can well be who are in forced confinement for their sins. They have given Rollins great leeway in the matter of setting up his receiving outfit, and he has done well with it, considering the fact that he has had no opportunity to go outside to examine other sets or even to purchase parts and supplies. He has had to make his requisition through the jail officials. The set is working well, but is not as complete as he hopes to have it in the near future. It is set up on a portable bench in a large cell room, overlooking the jail yard.

Description of Set

The installation employs a two strand aerial rather lower than the average, strung from the tower of the entrance building to one of the wings, and leading in to the bench on which the receiving apparatus is set up. He has grounded it to a telephone conduit leading out of the wing to a pole in the yard and thence underground to the office. The hook-up is one that his brother designed for him. He tried out a certain blueprint circuit that did not seem to work out well, and then discarded it for another method. This, he claims, is new and better working than some of the accepted systems. He has found a good deal of trouble with summer static, and has had the additional trouble of the jail surroundings being largely grounded due to so much iron in the construction of the floors, grating bars, doors and gates.

Has Loud Speakers in Cell Tiers

This set is made up of parts of different makes. The panel is home-made, the variometer a Remier, and the transformers of the Federal type, ratio 3 1/2 to 1. There are two variometers, and the set amplifies to three stages. Magnavoxes are used in different part of the jail, to accommodate the prisoners on the different cell tiers. Rollins has found the acoustics improved by placing the loud speakers at the far ends of the corridors rather than at the entrances to the cell tiers or in the great guardroom in front of the cells. He supplies all tubes from the same A battery, a 120-ampere hour Packard. The head telephones are of Holzer-Cabot manufacture and the lightning arrester is of the Brach vacuum type.

Gives Jail Church Services

With this set-up, incomplete as it is, he gets the Shepard (Boston) and Amrad (Medford Hillside) stations regularly, and has heard Schenectady at times. On Sundays he tunes up for the St. Paul's Cathedral Sunday morning service, which is reproduced in all parts of the jail.

Until the Radio set was installed, the jail has had no religious services in the 75 years of its existence. The church service is a great comfort to the prisoners, especially to Rollins, who seems to be more appreciative of this than anything else he gets from the ether, excepting perhaps the news about his own case and the strong probability that the trial of Murphy may result in his own acquittal and that of his brother.

Rollins is acting as the jail electrician, and has charge of the movie apparatus, as well as electrical work connected with the jail garage and autos, etc. An addition has just been completed will contain a large mess hall, a stage equipped with footlights and movie booth, and the Radio receiving set as well, which will either be removed to that room or connected with it.

Ontario Buys American Sets

WASHINGTON.—Figures just made public by the Department of Commerce for the export trade for May show that there were 92,328 pounds of Radio apparatus exported during the month, valued at \$186,525. By far the largest quantity of this apparatus was exported to the Province of Ontario, Canada.

Secretary of State Will Keep in Touch with U. S.

NEW YORK.—Since August 24th, when Secretary Hughes, Head of the Brazilian Commission, sailed from New York on the "Pan American" on the 4,800-mile cruise to Rio de Janeiro, he has been and will continue to be in constant communication with this Government through a special Radio set just installed on the Shipping Board vessel.

Practically, at least, the Secretary of State will maintain a floating State Department throughout his trip—although technically "at sea." Official communications from the "Pan American" will be cleared immediately and received with

"right of way" privilege either at the Naval Radio at Bar Harbor, Maine, or the Radio Corporation's stations at Port Jefferson or Riverhead, Long Island. Messages will be forwarded from either the Naval Station at Annapolis or commercial stations on the coast.

The special equipment, which was rushed from Washington to New York a few nights ago by a special messenger who stored the apparatus in an empty berth rather than trust it to the baggage car, will be capable of sending from Rio de Janeiro to Bar Harbor. It comprises a Federal arc transmitter, used in conjunction with a receiving set consisting of three stages of Radio frequency amplification, detector, and two stages of audio frequency amplification.

ASLEEP ON JOB? NO! NO JOB!



This picture is prophetic. In the very near future peaceful naps of tired messenger boys will no longer be disturbed for mere important messages that must be delivered. The Government has discarded its telegraph service and through the Post Office Radio department's fifteen stations is keeping in communication with all branches. Some of these stations take care of even heavier traffic than that of the Washington station which handles 1,000 messages a month.

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"DETROIT TO PACIFIC" CAR TRIES TO GET DIP

Attempts to Live up to Legend on Hood

LOS ANGELES, CALIF.—The legend, "Detroit to the Pacific," was the inscription that was carried on the hood of America's first Radio tour car, which was brought across the United States under the direction of Wallace Blood, giving Radio concerts at all of the night controls, and at many locations during the noon hour. Recently, Mr. and Mrs. Blood, made the journey down to Ocean Park, where they were to enjoy a swim in the "Grand Old Pacific," and to observe a California sunset. They parked their car on one of the steep grades leading down to the beach.

When they were ready to return to Los Angeles they found that a short circuit had run down both the car and the Radio batteries. Furthermore, that the crank for the car was missing. However, with the aid of two agreeable bystanders, Mr. Blood was able to roll the car away from the curb, thinking that Mrs. Blood was in the car and at the steering wheel. He let the car commence to roll down the hill, so as to get the engine started by putting the car in gear. But alas, as the car gained momentum he discovered that the car was driverless.

Mr. Blood made one leap to the running board of the now wild running automobile, and reaching through a window, he steered a wigwag-zigzag course down the street. After a wild flight which took the car without any fatalities down to the foot

of the hill and across the broad walk which skirts the ocean front, the car made one final leap into the loose sand and came to a stop with its front wheels just a few feet short of getting a "dip" in the surf.

So near that the prophecy seemed about to be realized, and yet, so far that it could not be realized in the full expression of its legend.

While maneuvering to extricate the car from its half-buried position in the beach sand, some droll wit, much to the amusement of the fast gathering crowd, read the legend-inscription which the car carried on its hood, "Detroit to the Pacific," and then he remarked:

"Too bad, old man, a few feet further and you'd a made it!"

Curses Bring Police in Hurry to Find Only Set

PITTSFIELD, MASS.—"So it's come to this has it Jim?"—followed by curses and screams, brought the police to the home of A. H. Everest here. Everest and his family were calmly sitting about their Radio set, equipped with a loud speaker, listening to "The Wolf," Eugene Walter's play produced at Station WGY of Schenectady, N. Y.

The police sat down, and enjoyed the remainder of the flight.

Form Club and Buy Set

LONDON, O.—The first Radio Club in this part of the state has been formed by thirty business men of London who have contributed sufficient funds to purchase a receiving set outfit for installation in their club rooms.

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Looking Ahead

Everyday Analogies for Radio. A continuation of the series by Letson Balliet is soon to start.

The first of a new series will begin in the next issue. This series will be written by H. M. Towne, who for a number of years has been employed in the laboratories of the General Electric Company.

How Music Is Broadcast. Have you wondered what goes on inside the Broadcast Station? Watch the future issues of RADIO DIGEST for this elucidating explanation.

Panel Units for Your Receiving Sets. Two additional panels of the standard type. The best way for an amateur to build up his set is by standard panels.

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.

Newsstands Don't Always Have One Left

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POST OFFICE CUTS "OLD MAN STATIC"

RESULTS GAINED BY OFFICIAL EXPERIMENTS

Air Mail Radio Section Drops Use of Regular Transmitting Type Antenna

(Special to RADIO DIGEST)

WASHINGTON.—Constant experiments by the Radio service of the Post Office department to attempt to limit static interference in receiving are beginning to secure results. These experiments seem to indicate that the day of the aerial antennae for receiving is over.

The following description of the tests conducted has been made by James C. Edgerton, superintendent of the Radio section:

"The Air Mail Radio section has eliminated the use of regular transmitting antennae for receiving purposes altogether, as it has been found that the static conditions prevalent especially in the middle west, made receiving impossible. Very good receiving conditions with favorable Radio signal strength have been obtained, however, through the use of 3 different methods of receiving, which are selected to conform to local conditions.

Types of Special Antennae

"There are large vertical outside multiple turn loops, secondly, underground horizontal buried loops and lastly underground antennae.

"The best results are obtained with the underground antennae when it can be laid in damp soil with a straight away of 1,000 feet. The horizontal buried loop is more or less of a new departure and has been very successful when well insulated and buried in water or very damp earth.

"In actual use well constructed underground antennae such as are used in the majority of the 15 stations in the air mail circuit the actual results are rather unusual. Communication has been carried on in the middle west between air mail stations when lightning was actually striking nearby. Receiving on an ordinary antenna would have, of course, been impossible long before the storm reached the vicinity."

Iowa State College Issues Bulletin Explaining Radio

IOWA CITY, IA.—In answer to the tremendous interest in Radio and the many inquiries about Radio equipment which have come to the members of the faculty at Iowa State College, the engineering extension department of the college has published a bulletin explaining the principles of Radio and giving estimates and costs of equipment. The author of the bulletin is L. F. Wood, associate professor of electrical engineering.

The college sending station WOI, is a busy place. Weather reports are sent out twice daily and musical programs are sent out frequently. One of the most interesting services has been the broadcasting of addresses by agricultural leaders of the college to a number of farm bureau picnics in different parts of the state.

The interest that is being shown in the state is illustrated by the fact that over 600 "fans" attended the Radio short course held at the college last spring.

Men in Army Camp Hear Program

CAMP McCLELLAN, ALA.—The 3,000 young men taking the course of military training here are being entertained two nights weekly by a long range Radio receiving station. The men are entertained at a large amphitheater. The men are from what is known as the Fourth Corps area, which includes the states of Alabama, Mississippi, Louisiana, Tennessee, North Carolina and South Carolina.

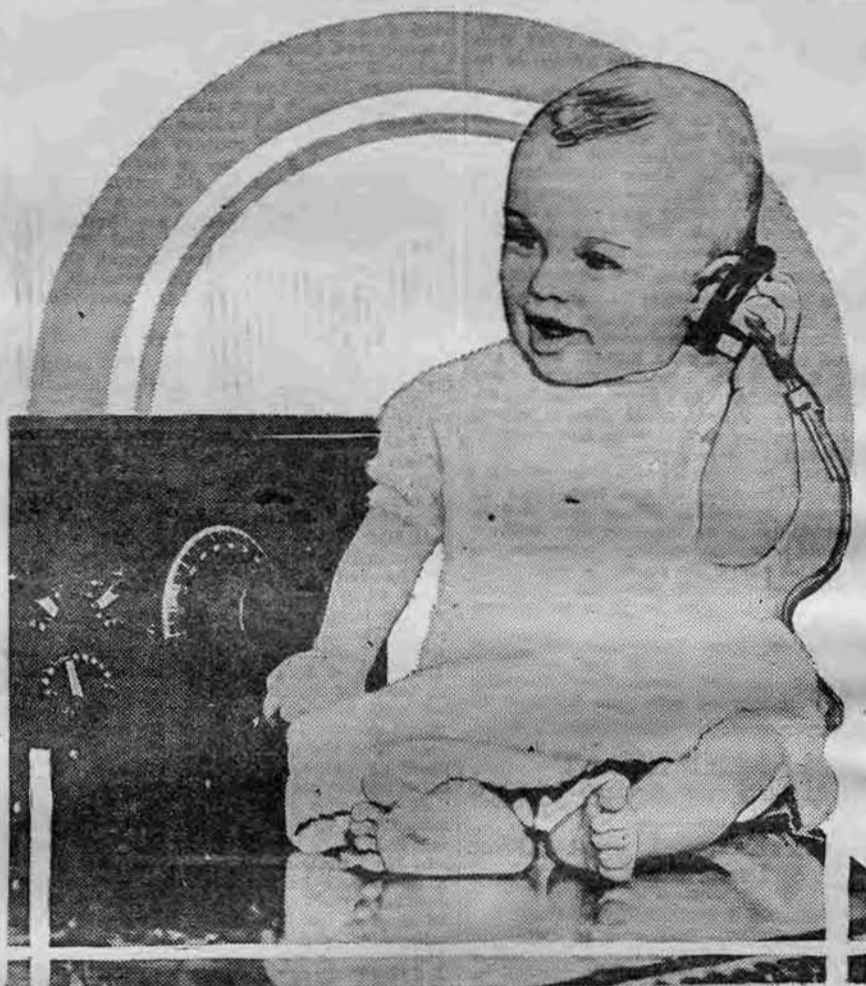
MAKERS ORGANIZE TO SELL STANDARD SETS

NEW YORK.—Four of the largest Radio apparatus manufacturers and a large number of the leading department stores have formed an organization to distribute standard Radio equipment on a national scale. Products handled will be those of the National Carbon Company, Radio Corporation of America, Dubilier Condenser & Radio Corp., and C. Brandes.

ARLINGTON TO SEND ITS FIRST PROGRAM

ARLINGTON, VA.—Station NAA, known as Arlington, Uncle Sam's big Radio headquarters, is soon to make its bow to the air with a regular broadcasting program. Powerful Radiophone equipment has just been installed and entertainment features will be sent on 2,650 meters. The station will be used for broadcasting important national announcements.

WHAT CARES HE FOR STATIC?



"Almost as good as the bottle," is the opinion of Radio held by six-months-old Roy Yates Sanders, Jr., of Atlanta, Ga. Roy apparently gets plenty of amusement from his daddy's outfit © U. & W.

POLITICIAN CAMPAIGNS ON "RADIO PLATFORM"

Stump Talks Cleverly Concern Only Ether Waves

CHARLESTON, S. C.—Here's a good hint for aspiring politicians. Don't talk politics at all. Instead, tell your audiences about Radio.

R. B. Howell, a candidate for congress in South Carolina, has made himself very popular in this way. Mr. Howell's speeches contain nothing about politics and nothing about the speaker himself. The topic is Radio.

He talks about the use of the Radio on the farm and in the isolated home, and the farmers, their wives and their sons and their daughters are flocking to hear him. He interests his audience, and they do not stop to ask if he is progressive or reactionary, or what not.

VETS' BUREAU TRAINS MEN TO WORK PLANTS

New Operators Secure Positions on Land and Sea

WASHINGTON.—Already the Veterans' Bureau has rehabilitated a large number of veterans in Radio, 282 more are in training. Some of these new operators have secured sea-employment in the Shipping Board and on privately operated vessels, while others have gone into various commercial companies, through the Radio Want Ads broadcast by station NOF, Anacostia, D. C. The Bureau now expects to furnish Radio operators for land service from the surplus which threatens to accumulate.

One hundred men have been trained in Radio at the Nola Radio School, New Orleans, forty at Loomis Radio School in Washington, and seventy at the Service Radio Institute also in Washington.

SERMON BY RADIO FLOODS MAIL BOX

LETTERS PROVE SIZE OF PASTOR'S AUDIENCE

Boston Minister's First Service Brings Messages from Far and Near

BOSTON, MASS.—Rev. Edward T. Sullivan, summer preacher at St. Paul's Cathedral (Episcopal), is just beginning to appreciate the size of his congregation since the first Sunday morning service broadcast from the cathedral through the Shepard Store's Station next door. He was probably one of the first clergymen in the country to have his regular Sunday morning sermon sent out by Radio. Broadcasting special evening services is an old story, but so far as is known a morning service as regularly conducted in a church has never been carried by Radio into thousands of homes. Those who fathered the experiment are hearing of the results from all over New England and from people who were far out at sea at the time.

More than a hundred letters of commendation have been received. Many of them bring pathetic little messages from the shut-ins, persons who because of sickness or other reasons have been unable to go to church for years. Every mail brings more letters.

Letters Come from Far

These letters came from Rhode Island, from summer places along the north shore, from cities and towns in Maine, New Hampshire and Connecticut, and from all parts of Greater Boston. There was one from Yarmouth, N. S. The Radio operator on a Boston bound liner even reported that the passengers had enjoyed Dr. Sullivan's sermon 150 miles out at sea. Patients in sanitariums listened to the service, and one touching letter came from Charles Street jail from a prisoner there.

One letter stated that in the writer's home listening at the time were two Methodists, one Roman Catholic and one Mohammedan. One man's mother-in-law, age 92, had been unable to attend church for the past year, and she particularly was pleased with the service. Another had not heard a church service for nearly 20 years.

License 13 New Stations

During Week August 12-19

CHICAGO.—Thirteen stations were licensed for public service broadcasting during the week of August 12 to 19. The one in Porto Rico makes the second phone broadcasting in that country. The list of licenses follows:

- WKAN—Alabama Radio Mfg. Co., Montgomery, Ala.
- KFBJ—Boise Radio Supply Co., Boise, Idaho.
- WKAP—Flint, Dutee Wilcox, Cranston, R. I.
- KFBK—Kimball-Upson Co., Sacramento, Calif.
- WKAQ—Radio Corp. of Porto Rico, San Juan, P. R.
- KPAY—W. J. Virgin Milling Co., Central Point, Oregon.
- WKAG—Edwin T. Bruce, M. D., Louisville, Ky.
- WJAZ—Chicago Radio Lab., Chicago, Ill.
- KFBM—Cook & Foster, Astoria, Oregon.
- WKAJ—Fargo Plumbing & Heating Co., Fargo, N. D.
- KFBL—Leese Bros., Everett, Wash.
- WKAH—Planet Radio Co., West Palm Beach, Fla.
- WJAX—Union Trust Co., Cleveland, Ohio.

Elks Use Radio at Boat Dance

LOUISVILLE, KY.—The Elks Club of Louisville, which has a weekly boat excursion and dance on the Ohio river every Thursday night, used a Radio receiving set on the boat recently and danced to the music sent out from broadcasting station WHAS. The dance music was furnished by Ches Meyer's orchestra, and it struck such a responsive chord that 160 encore requests were received.

THE ANTENNA BROTHERS

Spir L. and Lew P.

Now They'll Fire the Butler



NAVY DEPT. ORDERS 59 NEW "SUB" SETS

WILL BE BUILT ON CONFIDENTIAL PLAN

Experts Improve on Successful Outfit Rigged in Test on S-50

(Special to RADIO DIGEST)

WASHINGTON—Radio engineers of the Navy department have been so successful in the development of a special Radio telegraphic transmitting and receiving set for submarines that fifty-nine new sets have been ordered. They will be improvements on the experimental set installed on the S-50, which paid a visit to Washington recently, and was said then to be one of the best equipped submarines in the world. The sets will be constructed on confidential specifications drawn up by the Radio section of the bureau of engineering, based on experimental set building at the Washington navy yard.

What the Radio experts accomplished, however, is a remarkable saving, because practically new and very excellent long-distance sets will be available for all the big subs at a very small cost. By re-designing and remodeling old apparatus, barring a few small innovations and parts, the naval Radio experts have built up an entirely new standard submarine Radio set, better than that on the S-50.

Range To Be Great

The results in radius of action, Rear Admiral Robison, chief of the bureau of engineering, says, are twice what the Radio men hoped for when they began the experiments some months ago. In other words, instead of a radius of about 100 miles the United States Navy subs will have a radius of Radio transmission better than two or three times that distance in ordinary day-time communication.

The first set was installed on the R-22 and the resulting experiments proved that an excellent practical submarine set had been evolved by remodeling surplus apparatus and scraps of present equipment. New apparatus manufactured by concerns along the lines of the perfected specifications would have cost the Navy in the neighborhood of \$5,500 per set, instead of \$500, the estimated cost of remodeling and assembly. Fifty-nine times the difference is \$295,000, saved.

Another remarkable feat accomplished by the Navy was the perfection of the details of the set within six months. The original submarine set developed and built by a commercial concern required two and one-half years, or five times as long. When all the subs are equipped naval experts believe that these craft of the American Navy will be just a bit better equipped than those of any other navy in the world.

Sets Are of Tube Type

Very few details of the new sets are revealed, but it is known that they are vacuum-tube sets developed along original American lines. Late in the war, German submarines lying on the surface succeeded in sending messages during the night as far as 800 or 1,000 miles to their bases by using short wave lengths of about 300 meters. Spark sets were used until the last few months of the war, when vacuum tubes were introduced in sending.

The German spark transmitter was operated on a 500-cycle frequency and an input of two kilowatts. Much of their equipment they considered very confidential and after an unsuccessful engagement, they threw the important parts overboard or into the bilges. Although arc-transmitting sets are said to be dangerous for submarine use on account of the gases given off by the many electrical storage batteries, 2 KW. arc sets were used in British subs successfully.

Owing to the ability of the undersea craft to submerge with the aerial in place, it is possible to receive long-wave signals under water to a depth of about twenty feet, and short-wave signals to a lesser depth. In 1919, a submarine sixteen feet under water off New York, picked up signals sent out from Arlington, 200 miles away, and while submerged at eight feet, heard Nauen, Germany 4,000 miles distant, and also San Diego, California.

"Information" Circular Out

WASHINGTON.—The Bureau of Standards is constantly receiving requests for Radio information, and since the same information is called for by many of the inquiries received, the Bureau has prepared a circular known as "Sources of Elementary Radio Information."

This circular gives information concerning Radio periodicals, government Radio publications issued by various bureaus, Radio books from numerous publishers, laws and regulations, call letters, and safety precautions to be observed at stations, and it answers a few of the most usual elementary questions asked by the novice. It may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C.

Great Britain Considers Carefully Effects Ether Freedom May Have

Removal of Rigid Restrictions Leads to Question of Ultimate Result in Case of War—Civil Abuses Also Discussed—All Receiving Sets Registered Now

(Special to RADIO DIGEST)

LONDON, ENGLAND.—Whenever a new science takes the country by storm, as in the case of the advance in Radio, the question of Government restrictions regarding its misuse is more than important. This was one of the most discussed during the war and was in a way a drawback to the general development. Machines in the air could use the Radio telephone but were obliged to use a code in order to maintain secrecy while the enemy continued tactics along the same line. But in peace time codes are not given their just consideration until some vital link breaks and the peace of the public is in some way affected.

At a meeting held in London, England, a few days ago the question of "Radio and the New War" was discussed by several of the leading authorities. It was a closed meeting and while verbatim reports are not available, the representative of the RADIO DIGEST was given a few salient points which will have a direct bearing on the restrictions to be observed.

Restrictions Enforced for Protection

It was pointed out that in view of this thought, the restrictions, which have been holding up Radio development in the British Isles up to the past month, were enforced. Only a few broadcasting stations were given permits and firms manufacturing outfits were ordered to give a status of their company and also to keep a complete record of sets installed.

This was done for the express purpose of keeping the eyes of the war lords on the persons operating. Thus in case war were suddenly to be declared the authorities would have the situation immediately in hand and would be ready to cope with the enemy who might have had prepared to flash news in code to their respective war lords.

This might have been successful had not the new science gained the popularity that it had. Persons throughout the British Isles demanded sets and refused to

listen to war restrictions and precautions taken "for safety in case of war." The result was that a hurried gathering of all the various heads was called together to discuss the best means of safe-guarding the country and at the same time to meet the requirements of the populace.

Revamp Plans

The result briefly is that all warships and airplanes of the British services as well as military stations equipped with Radio apparatus will be equipped with powerful sets at an early date in order to keep full reports of stations operating. Coast-guard stations will also be equipped and will report on stations erected by amateurs along the coast. The post office authorities have been authorized to issue licenses to fans and notices have been sent broadcast over the country to inform enthusiasts that a license is necessary.

This was practically the extent of the information given out chiefly because those at the secret meeting are themselves only embryonic authorities and will be obliged to follow the new science closely in order to safe-guard the country and at the same time maintain the best wishes of the general public.

Civil Abuses of Science

What of the misuse in the country itself? This has been another question that has troubled Scotland Yard to no small extent. The action was first brought to light when two London bookmakers lodged a complaint against three clients who had literally robbed them of many thousands of pounds. The bookmakers pointed out that one client in London had installed a set and was working with a friend who was equipped with a powerful set located at the race-track.

As soon as a race was finished the winner would be given by code or a number. Then a messenger would be despatched post haste from the London station with a large bet to the bookmaker. In view of the fact that the results had not been received by wire the bookmakers would accept the business. In three weeks they were obliged to suspend their operations as the result of the swindle. They investigated and discovered the ruse.

It was the practice of the fan at the race track to rent a small room overlooking the track previous to the race, meet and then install his set. With the aid of a good pair of field glasses and a pre-arranged plan of signals the results could be flashed to London in advance of the telegraph results.

ARMY RIGS GIGANTIC PLANT AT COLUMBUS

Remote Control Station Will Have 1,000-Mile Range

COLUMBUS, O.—A gigantic Radio station, is now under construction by signal engineers of the Fifth Army corps at the United States General Army Reserve depot, east of this city, which when completed will have a range of 1,000 miles and will operate on a wave length of from 2,800 to 3,100 meters. The station is a duplicate of the continuous wave station at Fort Benjamin Harrison, Ind. While it will be used solely for government business, there is the possibility, barracks officers announce, of conducting a regular program at intervals later on, on a 380-meter wave length, allowing Columbus stations to tune in and receive these programs.

The station will operate on the basis of a remote control system, by means of which officers of the Fifth Army Corps signal headquarters, at the barracks, will regulate the sending of messages over the transmission apparatus several miles away at the general reserve depot. The aerial at the depot will be 200 feet high, with a counterpoise of 50 single wires ten feet above the ground. This counterpoise will be 600 feet long.

New Orleans Air Waves to Honduras Direct by Dec. 1

NEW ORLEANS, LA.—E. Toledo Lopez, consul for Honduras, stated his country would be in direct Radio communication with New Orleans by December 1. Work is being pushed on the new station at Tegucigalpa, capital of his country, with that end in view, he said. The station's equipment will cost approximately \$745,000. The antennae will have a total length of 1,000 feet and will be supported on towers 431 feet high. A secondary station will be completed in October, to establish communication with the ports of Tela and Castilla.

The United Fruit Company owns the plants. Arrangements have been made with the company to handle official messages for the government of Honduras.

VOICE AMPLIFIER AT WWX ADDS 50 MILES

Addition Increases Post Office Plant Radius

(Special to RADIO DIGEST)

WASHINGTON.—The sending radius of WWX, the Postoffice Department Radio station has been considerably extended by the installation of a voice amplifier. For the first time this summer, the Washington Radio station has been able to have good communication with the Bryan, Ohio, station.

The improvement has been secured by inserting an intermediate voice amplifier between the microphone and the 50-watt power amplifier.

It is estimated that the installation of this device will increase the modulation 20 per cent. Previously a conservative estimate of the broadcast radius of the station was 100 miles. This assumed extreme static conditions. Tests indicate that this estimate may now be increased to 150 miles. It is thought that when the static season is over, the increased modulation will boost the broadcast radius of WWX about 500 miles.

Besides handling air mail and other Postoffice Department business, WWX broadcasts weather forecasts, market reports and crop reports.

Remodeled Hotel to Have Receivers in Dining Room

BIRMINGHAM, ALA.—The Moulton hotel which will soon be remodeled here at a cost of \$25,000 will have as one of the features of its new dining room a Radio receiving set. Guests as they dine will be entertained by concerts as sent out by leading broadcasting stations. Harry New manager, who is the first hotel man in this section to realize the value of Radio, is expecting his remodeled dining room to prove even more popular than at present.

Tacoma to Have Airphone Show

TACOMA, WASH.—A new feature will be incorporated in the plans for this year's electrical show, a Radio department. At this time last year the Radiophone had not made its appearance here. Radio telegraphy had its enthusiasts at that time, as it has now, but the practice of listening to concerts broadcasted daily from such stations as KGB, Tacoma Ledger station, was practically unheard of. Hundreds of Tacoma homes now boast receiving sets costing all the way from a few dollars up to as much as one wants to pay.

RADIO MOVIE CAMERA READY FOR FIRST TEST

Professor's Device Carries Pictures and Words Through Air

NEW YORK.—An interesting development which Prof. Reginald Aubrey Fessenden already has in working order, and which will be demonstrated in the near future, is the transmission of moving pictures of scenes in distant cities.

With the apparatus he has developed it will be possible to point a Radio camera, connected to a Radio loop, at the steps of the Capitol in Washington, and by so doing enable every Radio subscriber actually to see the president deliver his inaugural address. Subscribers may note every slight gesture he makes, as well as hear his words by means of the Radio telephone.

The size of the picture slightly limited at present, is four feet by four feet on a screen 12 feet away, or four inches by four inches on a screen 12 inches away. The coarse-graininess of the image at a distance of 12 inches corresponds to the 50-dot per inch process plate photo.

Shipping Board Rearranges Arlington Broadcast Plan

(Special to RADIO DIGEST)

WASHINGTON.—Arrangements have been made by the United States Shipping Board Emergency Fleet Corporation with the Naval Communication Service to make an important change in the system of broadcasting messages to Shipping Board ships through the Arlington Radio station.

Heretofore these messages have been sent at the end of a long schedule, sometimes nearly an hour in duration, and it was necessary for Radio operators on these vessels to copy an unusual amount of material which was of no interest to them, such as the weather conditions at interior points, in order to make sure that there were no messages on the schedule for them.

It has now been arranged that the call letters of all ships for which messages are on hand will be transmitted immediately following the time signals, so that all other vessels may immediately return to 600 meters instead of having to listen an hour or more on 2,650 meters.

Radio Needs Trained Men

Radio is sweeping the country like wild fire. Thousands of dollars are being spent for expensive outfits. RADIO EXPERTS are needed everywhere to keep this equipment in order and to sell and install new outfits.

Be a Radio Expert

I will train you quickly and easily in your spare time, to become a RADIO EXPERT so you can install, construct, repair and sell Radio equipment. I am a Graduate Electrical Engineer and from actual experience I will give you exactly what you must know to make the really big money in radio.

FREE My Consultation Service to you is FREE. This outside help which I gladly give you is, in itself, worth more than the small cost of the Complete Course.

START NOW

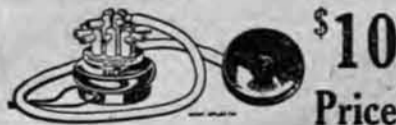
Don't let others beat you to the big money. Start now and within a few weeks' time I will train you at home, at an amazingly low cost, to become a RADIO EXPERT. Write for "Radio Facts" sent free without obligation.

A. G. MOHAUPT, Electrical Engineer
American Electrical Association
4515 N. Winchester Ave., Chicago

WRITE
TODAY

★ Radio Bugs! ★ Try This on Your Cat's Whisker

To the tune of Yankee Doodle



Gregg's Listen In set. Is a marvel, you bet. Through which the waves come abuzzin'.

Attach to the phone. You now use alone. And the program is heard by a dozen.

Yes, a dozen hear the news. A dozen hear it dandy. Everyone should have Gregg's Set. Because it is so handy.

The family should get Gregg's Listen In set. Does for all, even uncle and cousin. No more all alone. Does on use the phone. The set sends it out to a dozen.

Write for Catalogue

Gregg Company
Room 505, 35 South Dearborn Street
CHICAGO



Lew Cody, movie star, greatly enjoyed his first experience as Radio speaker. His initial broadcast was from WLW, Cincinnati



Announcer for KYW, comfortably located at the microphone while his voice speeds magically through the air



Studio of Station KYW, Chicago, showing the location of the piano, microphone pickup and amplifying desk

Chicago Station, KYW, First in World to Broadcast Grand Opera

Westinghouse Plant, Opened Nov. 11, 1921, Transmitted Entire Season During Mary Garden's Regime as Director—Innovated Pipe Organ Music by Ether Waves

CHICAGO.—The Chicago Radiophone broadcasting station of the Westinghouse Company holds one world's record of which it is very proud. KYW, as it is registered with the government, was the first station in history to broadcast grand opera. This occurred during the celebrated regime of Mary Garden as director of the Chicago Grand Opera Company and was the particular event of the Radio world during the time opera was broadcast. KYW was, also, the only broadcasting station ever to broadcast an entire operatic season as it did in Chicago during the last season.

On Nov. 11, 1921, Armistice Day, the anniversary of the close of the war, which in a way was the father of broadcasting, the Westinghouse Company opened its station located on the Commonwealth Edison Building at Chicago, Illinois. This station was opened by arrangement with the Chicago Edison Company, who desired

to open it with the broadcasting of complete grand opera from the Auditorium Theatre, Chicago. The grand opera started its season the following Monday, November 14, 1921. This was the first case in which complete grand opera from the overture to the final chorus was sent out by Radio telephone.

Put Other Innovations in Effect

Since it was first started, KYW has been faithfully operating every night as well as during the day. In addition to broadcasting grand opera, it put into effect a number of innovations in Radio, among which were the broadcasting of daily stock reports from the Chicago Board of Trade rooms.

Another new thing which Chicago first tried was the installation of a pipe organ in the broadcasting studio in order to send out this beautiful music when selections were played that required an organ for best rendition.

The station at KYW which is on top of the Commonwealth Edison Building has recently been made more powerful and has had its antenna raised. With these changes, a far greater range can be expected from this station next winter than it previously had.

NEW YORK.—Radio waves from Queenstown, Ireland, were amplified here recently with such success that they disturbed the proceedings of the Supreme court in a building opposite the receiving station.

Plan to Transmit Harmony of Wilds

National Parks Consider Broadcasting Whistling of One Million Marmots

HELENA, MONT.—One million marmots will whistle for the world by Radio waves, if the weird proposal now said to be receiving serious consideration by the National Parks bureau is accepted.

The proposal calls for installation of a broadcasting station having a normal radius of 1,500 miles, which will be heard almost from coast to coast, using a 200-watt set and sending on 360 meters, to be installed in the wilds of Glacier National park.

"What for?" you ask. So did the bureau. Then the sponsors explained that there are a million marmots living in a dense colony in the fastness of the Rockies, 50 miles north of Glacier Park station, Montana, and near the Canadian line. The marmot looks like a prairie dog but whistles like a canary.

Marmots Give Whistling Chorus Now it is said that on clear nights the "thrilling chorus" of these musical whistlers can be heard for miles from their colony, so that tourists in the park sit enthralled by the beauty of their untutored harmony.

"The perfection of Radio now suggests the idea of broadcasting this volume of weird whistling music to Radio receivers as far as the ether waves will carry it," the sponsors continue, in an outline of their project. "When the full chorus is on, it sounds as if a whole city of people were playing piccolos in concert. The Radio fan who is lucky enough to listen in will have no trouble to readily recognize these marmots without any preliminary announcement from the Rocky Mountain broadcasting station."

Airwave Popularity Grows in Schools in Louisville

LOUISVILLE, KY.—Not only has the free school of instruction in everyday Radio established by the Louisville Times and Courier-Journal in co-operation with local Radio supply houses proven popular, but the school idea is growing fast and spreading out. After Credo Harris, director of the WHAS studio, made an address to teachers at the Eastern Kentucky Normal School at Richmond, Ky., last week on the educational benefits of Radio, Professor J. F. Coates, head of the institution announced that he would begin immediately a course of instructions for teachers which would enable them to install and operate Radio sets. Radio sets may be installed in most of the schools eventually.

LEW CODY ENJOYS FIRST RADIO TALK

"No One Could Talk Back," Says Pleased Film Star

(Special to RADIO DIGEST)

CINCINNATI, O.—"I enjoyed my first experience of delivering a Radio address because no one could talk back to me, and if any one became tired of listening to me he or she could 'hang up' without my knowing it."

This statement was made recently by Lew Cody, famous motion picture actor, after he had delivered a very interesting address at the Radio broadcasting station of the Crosley Manufacturing Company, Cincinnati, Ohio, the call letters of which are WLW.

Mr. Cody, in his first experience at a broadcasting station, described to the thousands of persons who were "listening in," how motion pictures are made; taking as an example one he recently completed in the wilds of Canada.

Mimics Dialect of Half Breeds

His imitation of the dialect of the half-breeds with whom he came in contact was great, and was appreciated by all those



Trained roller canaries, singing in a studio room under the direction of Prof. A. H. Hazlett, Berkeley, Calif., furnished a delightful concert recently for thousands of fans © INT.

AIRPHONES HELP TO LAY CANADIAN MAPS

SURVEYORS TOTE SETS TO PICK UP TIME

Signals Aid Mappers in Getting Accurate "East and West" Positions

VANCOUVER, B. C., CAN.—Surveyors employed on surveys of the Mackenzie river district, are carrying with them, as part of their equipment, small Radio receiving sets, to promote the efficiency of their work. This does not mean that after a hard day's work they will spend the evening hours listening to bedtime stories or music from WJZ or CFCA. Far from it. The music that will interest them most will be a few faint ticks which represent something of great importance to a surveyor—correct time.

When the Radio fan hears the time signal come through at the close of the evening's broadcast program, he checks up his watch so that he can be on time in the morning. Things are otherwise on the Mackenzie. The surveyor uses it in his work for a variety of purposes, one of which is to find his true longitude, or east-and-west position.

Where Signals Are Used

The surveyor is able to get his local time very accurately by taking observations of the stars with his surveying instruments. After he has done this let us suppose that while listening in with his Radio set he receives a time signal from Ottawa. He finds that the time in Ottawa is exactly so many hours, minutes and seconds faster than his local time. By means of a few calculations he changes time into distance and the result tells him just how far west of Ottawa he is.

In actual practice the surveyor does not have to depend on time signals from Ottawa, but is able to get them daily from a number of high powered stations in various parts of the world. He then calculates his longitude from Greenwich.

Superiority of Radio

Various other means of finding the longitude of a place have been used by explorers and navigators, but the use of time signals has been found the only way both easy and accurate. Where telegraph was available, the signals could be sent by wire, but elsewhere less reliable methods had to be used.

One of these methods was to carry to the place of observation several high grade watches or chronometers keeping Greenwich time and there compare them with the local time obtained from the stars. Remembering the fact that no timepiece can be made to keep perfect time, especially when being carried on a long and rough trip, and that an error of one minute in the time means an error of a good many miles in position, it can be seen that this method is not suitable for high grade survey work.

With the long arm of the Radio time signal, the topographical surveys branch expects to be able to reach out far beyond the end of the longest telegraph wire and locate the correct position of any point with a probable error less than the length of an ordinary city block. In fact, by using instruments more elaborate than those used in surveying, longitudes have been determined with only a probable error equal to the width of a street.

Governor Stephens Opens First Big Western Show

(Special to RADIO DIGEST)

LOS ANGELES, CALIF.—The first Radio exposition of any size to be held on the Pacific Coast was successfully launched on its way here under the guidance of the United Spanish War Veterans of Southern California, on Monday, August 14th. The exposition, which continued throughout the week, was held on the roof of the Arnold Building, at Seventh and Figueroa streets. Governor William D. Stephens officially opened the show, which from the opening indicated its success.

Among the interesting features of the show were the latest inventions in Radiophony. A very interesting demonstration of Radio Therapy was given by Prof. H. La V. Twining. This consisted of passing sparks through the human body. A Radio factory in miniature, showing the manufacture of sets and their assembly, kept interest of the visitors. It was displayed by the Western Radio Research Laboratories. The art of transmitting or broadcasting with the different kinds of instruments was explained.

Air Music Amuses Prisoners

LOUISVILLE, KY.—Radio for the entertainment of prisoners made its first appearance in the jail here last week. Jailer Thomas Dover superintended the installation of a powerful receiving set and more than 200 prisoners in the Jefferson County Jail were entertained in the jail chapel by both the afternoon and the evening concerts of Station WHAS.

Navy Is Real Pioneer in Radiophone Field

First Used Ether Waves in 1907 as Experiment

WASHINGTON.—Considerable credit is always given the Navy for its pioneer work in many lines among them electrical development, but a recent conversation with an officer of the Radio section revealed the following items which are not generally known:

In the electrical field the Navy was the pioneer in many lines. Starting with the incandescent lamp, every new electrical discovery was fathomed and adopted by the Navy before its commercial use had been found practicable or profitable.

The Navy Department enabled the General Electric Company to produce the first electrically propelled ship in the collier Jupiter, now the airplane carrier Langley.

The Radiophone which through broadcasting has become the talk of the country, is simply the coming into commercial use of a development that has been in general use in the Navy for the last five years. It was installed experimentally in 1907 for communicating between the ships of a fleet.

Navy Owns Many Plants

Many of the great Radio telegraph plants that now encircle the globe are owned and operated by the Navy. Without the Navy's interest, experiments and research, as well as their substantial contracts for apparatus, the Radio industry in this country, it is said, would be in foreign hands.

The Radio compasses that flank our great seaports are owned and operated by the Navy, but through their use any vessel of any country can be told to a degree what her direction is from any station within call and thus fix her position whether in fog or storm. This makes for better navigation and saves many a big liner from disaster as well as delay in making port.

Static interference is an element to be reckoned with in all phases of Radio work and has never been entirely eliminated. The Navy Department, however, has been engaged in research work looking to the elimination of static longer than any other government department. While results have been attained which have reduced interference from this source to about half, it has not yet been completely removed.

NEW SETS FOR ARMY SEMI-RIGID AIRSHIPS

Antenna May Be Installed Inside Craft's Envelope

DAYTON, O.—Army plans for new Radio sets for their semi-rigid airships call for central power stations which would include generators geared to gasoline engines, after the fashion in which a magneto is driven, but never before attempted. The French tried out belt-driven electrical generators, but with little success. However, representatives of the Air Service Engineering Department at McCook Field expect to develop a central power plant that will give sufficient power for putting one-half kilowatt in the antenna and also power for light, heat and electrical control work.

The Army Air Service plans to use the new Signal Corps Set 135, combining Radiophone and telegraph circuits good for distances up to seventy-five miles and 200 miles respectively.

Range to Be long

The range will be greater than is planned for the big Martin Bombers, however, as better facilities for erecting aerials are available on airships than on planes. One method considered is to install the antenna within the envelope; another is to suspend it below the ship, drawing it up upon landing; while a third contemplates hanging the wires of the aerial along the sides and over the top of the ship. Experiments will determine which of these methods is the most efficient.

Naval Radio experts are loath to reveal their definite plans for the Radio equipment of the ZR ships, but it is said they may parallel the army's ideas, although their ships will be about twice the size of the largest army semi-rigids now planned, giving them more latitude and more room for equipment.

KDKA Acquires Orchestrelle

E. PITTSBURGH, PA.—So that the chapel services from KDKA may have the added advantage of organ music, and that the thousands who make up the audience of this station may become familiar with the many special organ compositions, an Aeolian Orchestrelle has been installed through the courtesy of the C. C. Mellor Company of Pittsburgh. The first series of recitals will be by Marcus Guy Lovelace, one of the pioneers in adapting organ music to motion pictures and who has arranged many scores with that purpose in mind.

Book Reviews

The New Armstrong Super-Regeneration Receiver, How to Construct and Operate It. By Kenneth Harkness. An eight-page leaflet, giving six diagrams and seven half-tones of the famous receiving sets and hook-up. Price, 50c.

Fowler's Practical Radio Text Book. A text book that tells you what you want to know about Radio. It explains Radio in plain language and it will help to get better results from your set. Price, \$1.25.

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

How to Retail Radio. A new book telling of tested plans and methods and policies for the dealer in Radio. Financing, location, store equipment and arrangement. Price, \$2.

Elements of Radio Telephony. By William C. Ballard, Jr., M. E. A reliable, authoritative discussion, in simple form, of the essential principles of Radio telephony and their application. The use of mathematics has been almost entirely avoided. Price, \$1.50.

The Thermionic Vacuum Tube and Its Applications. By H. J. Van der Bijl, M. A., Ph.D. This book supplies the first comprehensive and reasonably concise treatment of principles of operation and the more important phenomena exhibited by the passage of electrons through high vacua. Price, \$5.

The book department of the Radio Digest is prepared to send you any of the books on Radio published, whether listed in our Book Review or not. Let us know what book you want, send us your check and we will see that the book is mailed to you. Postage stamps in payment for books not accepted. Send money order or check. Book Department, Radio Digest Illustrated, 123 W. Madison St., Chicago, Ill.

Ether Concerts Grace Fair

HILLIARD, O.—For the first time in the history of county fairs in this section, Radio concerts will feature the programs to be given three afternoons, September 13, 14 and 15 at the Franklin County Fair here. Arrangements are being completed by LeRoy Dobyns, secretary, to have several extra concerts put on by broadcasting stations at Columbus, Ohio.

English Fans After Licenses
LONDON, ENGLAND.—Up to June 3 approximately 11,000 receiving and 450 sending licenses had been granted to owners of Radio sets in England, according to Assistant Postmaster-General Pike Pease.

He stated that he was not yet in a position to make a statement with regard to broadcasting schemes as the question was still under discussion with the associated manufacturing companies.

Carter Radio Co.
209 S. STATE STREET
CHICAGO

CARTER TU-WAY PLUG takes TWO head sets at same time; takes ALL types of cord tip terminals. Price \$1.50 each.
If Your Jobber Is Unable to Supply, Write Us

RADIO MAILING LISTS

6900	Retail Radio Dealers covering the United States, by states, price per thousand	\$ 7.50
828	Radio Manufacturers	per list 10.00
1022	Radio Supply Jobbers	per list 10.00
260	Owners of Radio Stations	per list 4.00
14000	Radio Amateurs and Managers of Radio Stations	per M. 7.50

These are neatly typewritten and ready to send you on receipt of remittance covering the amount. Guaranteed 95% correct.
Trade Circular Addressing Co., 165 W. Adams St., Chicago, Ill.

For Efficiency, Quality, Tone BUY

ESTRU LATTICE



VARIOMETERS — VARIOCOUPLERS — INDUCTANCE COILS — RADII TUNERS

For Sale at All Responsible Dealers. If Not, Write Giving Your Dealer's Name
DALTON, WHITTIER, TRUE CO.
2905 W. Madison St. Chicago

CROSLEY

Better—Cost Less

Two Outfits That Have Taken the Country by Storm

A REVELATION to those who have had the opportunity to try them out, the Tuned Radio Frequency Amplification feature of the Crosley Model VI and Model X and other larger models have met with universal success.

By placing one stage of Tuned Radio Frequency Amplification before the detector tube we not only amplify the signals before they reach the detector, enabling it to work more efficiently, but also make sharper tuning possible and eliminate interference and static to a wonderful degree. These sets are especially designed for broadcast reception, covering a range of from 200 to 600 meters wave length and we believe they cannot be equaled at any price.

Write for our new illustrated and descriptive catalog

Sold through dealers and jobbers everywhere. If your dealer does not handle CROSLEY instruments write us direct.

CROSLEY MANUFACTURING COMPANY

DEPT. RDI 6 CINCINNATI, OHIO

The Radiophonist's Mart

THE USE of the light current lines as an aerial is not a strictly new development. Many aerial light plugs have been produced for Radio work with varied degrees of successes.

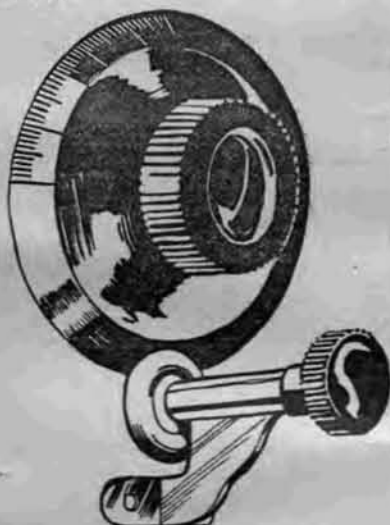
The "Super-Antenna" as illustrated, is manufactured by the Radio Sales & Service Corp., of Chicago, Ill. This screw attachment for an ordinary lighting socket has been tried successfully on both crystal and vacuum tube detector sets. Two binding posts are mounted on the end of the device. The one binding post is marked "C" while the other is unmarked. If the receiving set has a series condenser in the antenna circuit, best re-



Convenient Light Plug Aerial

sults are obtained by using the "C" binding post for the aerial connection. This puts a condenser of .0005 microfarads in series. In the event that the receiving set has a series condenser, the unmarked binding post is used. The socket can be turned either on or off. If when turned on a hum is heard in the set, the plug is taken off and the attachment plug to the barrel is reversed. The "Super-Antenna" can be used either on alternating or direct current circuits of from 30 to 150 volts potential. The receiving set is tuned in the usual manner.

THE ELIMINATION of capacity effects and vernier adjustment of dials has been found necessary in many of the sets, especially those having a natural critical adjustment. There have been numerous vernier adjustments designed and placed on the market to supply the needs of the amateur constructing his own set.



Dial Vernier Attachment

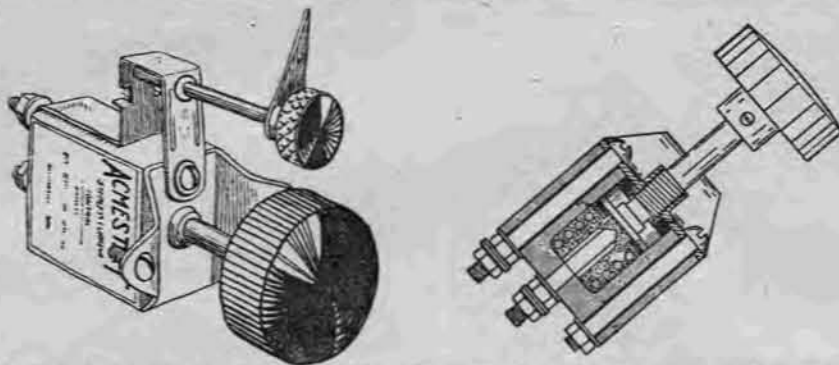
The type "QR 100 Vernier Adjuster" shown in the picture is manufactured by the Robinson Specialty Company of Keyport, N. J. The attachment is easily fitted to the panel and permits accurate dial adjustment. It can be thrown out of use by merely sliding the knob back a little. The rubber tire, or rotating element, makes positive contact with the dial. Because of the insulating qualities of the tire capacity effects are reduced to a minimum. The frame is neatly nickel-plated and makes an attractive addition to the panel.

Body Capacity and Noises

The effect of body capacity indicated in some receiving systems by the change in the signals when the hand is placed near or removed from the controls may be greatly reduced by shielding the back of the panel with sheet copper, tinfoil, or brass and by employing dials insulated from the shafts and grounded through brushes. In some receiving sets the entire case is lined with metal or constructed of metal, and the negative side of the vacuum tube filament battery is grounded to further reduce the local disturbances.

Noises are sometimes caused in the telephones by loose connections in the receiving set itself or by poor batteries either in the filament or plate circuit. A blue glow in the tube and a drop in signal strength means that too much plate voltage is being employed. Flickering of filament intensity is caused by a discharged filament battery.

Powdered Carbon Used in Rheostat



THE ACMESTAT, manufactured by Acme Electrical Mfg. Co., of Milwaukee, Wis., is a filament control rheostat for vacuum tubes. It is of the compression type in which the resistance of the circuit is varied by the contact resistance of a powdered resistor enclosed in a compression chamber operated by a plunger and screw.

A powder would crowd or pack when once compressed into a given space and would tend to remain in the "wad" shape, therefore causing the release of pressure to open the circuit at the surface of contact between the plunger and wad. To offset this trouble, a means for breaking up the wad is supplied in the form of a spiral spring, which is compressed with the powder upon application of the plunger pressure. When pressure is released on the wad and spring, the latter opens up and crumbles up the wad—thus restoring the original high resistance gradually and effectively.

In order to make the resistance element act with a gradual change, the screw knob is used. Further, in order to cut out resistance when the compression is complete, a short-circuiting switch is included in the outfit. This switch consists of a knife edge at the top of the center terminal as shown in the sketch and as the compression increases the plunger contact approaches the edge and finally strikes it, thus making metallic and positive contact.

Owing to the powdered nature of the element, the same is practically indestructible. By mixing the conducting material with noncombustible material to regulate the resistance, the element becomes practically noncombustible. Further, the enclosure of the same in porcelain insures

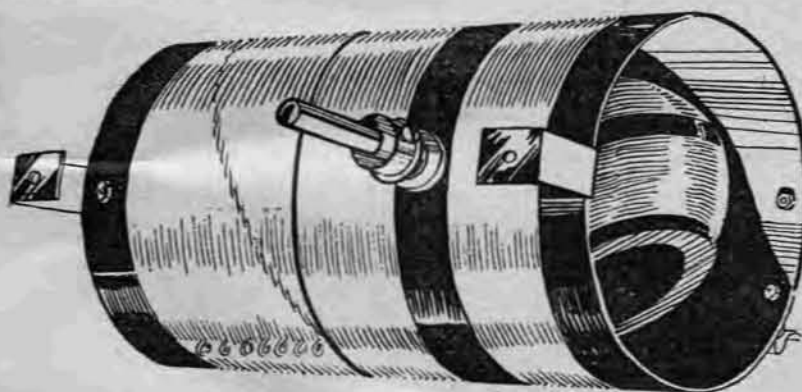
safety from contact with outside inflammable material.

To open the circuit, the screw is opened up with gradual increase of resistance, thus insuring automatically, the breaking of a small current instead of a large one. In order to open the circuit entirely, particularly when the starting resistance is desired to be of some initial value instead of infinite with gradual decrease, the plunger may be made to stop at the desired initial resistance and a contact outside of the resistance material proper be broken. A stop is provided to prevent the plunger from opening beyond the desired stopping point.

A smooth regular application of current is desirable in order that automatic and manual application of power may be readily regulated or "felt" by the operator. This feature of the acmestat is suitable for regulation where a given movement one way or another brings about an approximate definite change. For instance in Radio work where a dial is turned say ten points to the right and audible beats are obtained in the high frequency current as a result, then repeating the movement to the left a corresponding ten points to obtain a similar set of beats, the medium or "in tune" position can readily be judged.

In order to increase the speed of adjustment, an external snap switch is added of simple design, but positive on and off action. The latter enables one to adjust the filament current to approximately the proper value with the vernier knob and to then turn on or off the battery current instantly without turning the plunger knob several turns. Final adjustment is reduced to a small adjustment of the knob by the snap switch.

Coupler Has 200-3,000 Meter Range



TO THE amateur whose time is limited, the construction of loose couplers, variocouplers and variometers is impossible. Still the cost of the individual units is apt to be beyond the range of his pocketbook. A tuning unit in which all the elements of the usual form of tuning apparatus are combined and ready for assembly, is of especial interest to such novices.

The "All-Range Coupler" shown in the illustration is manufactured by the Radio Guild, Inc., of New York City. It is designed for efficient reception on all wave lengths from 200 to 3,000 meters. It is constructed in such a way that there is no loss in reception of short waves. This is accomplished by winding the short wave turns in a single layer. The loading inductance consists of a three-layer bank winding on the same tube. The rotor is suspended between the two divisions of the single layer winding.

Taps are provided at frequent and correctly spaced intervals. The taps on the short wave section permit reception to below 200 meters. A bakelite tube is the foundation for the windings of green double silk covered copper wire. The winding is laid on by hand and is unusually uniform. All metal parts are

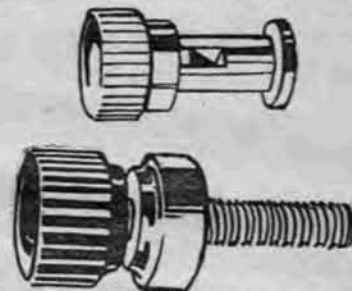
nickel plated. In appearance, engineering design and workmanship, the device is worthy of attention.

With a hundred foot aerial, single wire and without a series antenna condenser, the wave length will be found to be about 200 to 3,000 meters. The tickler winding permits oscillation over the entire scale and allows the coupler to be used with any of the popular types of regenerative circuits. The windings are exceptionally neat and the construction of the taps makes soldering a simple matter. Fahnestock clips simplify the connection to the rotating or tickler coil.

ALTHOUGH binding posts used in a Radio receiving set may appear to be unimportant parts, still they have much to do with the appearance of the set and may save considerable exasperation in making connections. The first function of a binding post is to afford a means whereby external connection can be made to any of the interior or inaccessible apparatus. The connection must be positive and offer the least amount of electrical resistance. In order to accomplish this, a positive and firm pressure must be exerted on the connecting wire.

Its construction should be such that when fastened on a panel or board, it will have no tendency to loosen or rotate. Its appearance should be neat and attractive. Yet, due to the number required on the average panel, they must also be reasonable in price.

Two new forms of binding posts are illustrated, which are manufactured by the H. H. Eby Manufacturing Company, of Philadelphia, Pa. They embody several new and novel features. The one called "The Corporal" has a base tapped to take standard machine screws or threaded

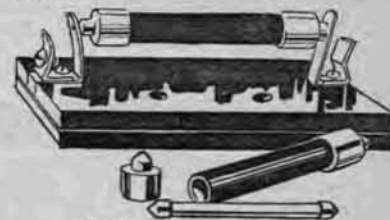


"The Corporal" Above, and "Ace" Below

studs. Heavy knurling of the base eliminates the necessity of doweling, and reduces the tendency of the posts turning and loosening to a minimum. It has an all metal base with a polished nickel or bright brass finish, and comes in sizes of $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$ and 1 inch. Instead of the usual adjustable threaded tap it has a square slot 3-32 inch wide with a plunger traveling up and down. The pressure is adjusted by means of the cut.

The other type is identified under the name "Ace." This post has a nickel-plated brass base with a solid 8-32 threaded stem extending approximately $\frac{1}{2}$ inch below the base. The base of this post as in the one above, is heavily knurled to prevent turning when mounted. A hole is drilled through the neck sufficiently large to take a No. 15 bore wire. This post is supplied with a black insulated knob $\frac{1}{2}$ inch in diameter and approximately 7-16 inch high.

VARIABLE grid leaks are by no means a new innovation on the market, but the type presented has many interesting features both from the viewpoint of construction and design plus reliability. It is manufactured by the Federal Telephone & Telegraph Company of Buffalo, N. Y.



Variable Cartridge Grid Leak

The leak is made in three standard resistances ($\frac{1}{2}$, 1 and $1\frac{1}{2}$ -megohm) and is so designed as to be adjustable between wide limits. The resistance unit is carried inside a shell of insulating material between two metal terminal members so proportioned as to fit the condenser mounting. A high grade of insulating material is used. The terminal ends are of brass with highly polished nickel finish. When assembled the resistance unit is hermetically sealed. Its resistance is not changed by temperature or moisture. It may be disassembled and a change made in its resistance value in a very short time. Through its use the choice of grid resistances to exactly suit any receiving equipment or vacuum tube is made possible. The resistance can be reduced by wiping the inside connector with a cloth, or increased by rubbing a soft black lead pencil on the surface. The grid leak snaps into place between the two spring clips on the mounting receptacle. The mounting has a hard rubber base and comes equipped with a grid condenser, if desired. The hard rubber parts are highly polished and all metal parts brightly nicked, making a pleasing addition to any Radio apparatus.

To Authorize 400-Meter Wave

WASHINGTON.—The Department of Commerce contemplates inaugurating a new class of license for broadcasting stations which can meet certain requirements. These stations will be known as Class "B" stations and will be authorized to use the wave length of 400 meters. The qualifications necessary for obtaining this class of license will be ready for distribution within a few days, and will also be published in the September issue of the Radio Service Bulletin.

The new wave length may be used only with specific authority of the Department, in special cases recommended by the District Radio Inspectors, where interference is at a maximum.

Radio-phonograph Broadcasting Stations

Corrected Every Week.

CONTENTS AND HOW BEST TO USE—

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 is merely an index. One wishing to find the calls of the stations in his vicinity, will find this index useful. All licensed broadcasting stations in operation are given in the index, while only those which have made special reports to RADIO DIGEST, are given in the station schedule list.

Station Schedules

AGI, Presidio of San Francisco, Cal. 50 mi. Signal Corps, U. S. A. Sun, 7-9 pm, instruction. Pacific.

CFCA, Toronto, Canada. 460 only. 500 mi. Toronto Star. Daily ex Sun, 7:20-9:30 pm, baseball, stocks, concert. Tues, Fri, 8:30-9:30 pm, concert, address, Eastern.

CFBC, Vancouver, Canada. 440 only. 500 mi. Daily Province. Daily ex Sun, 8:30-9:30 pm, news, weather, concert. Pacific.

CFCC, Montreal, Can. 440 only. 300 mi. Marconi Co. Daily, 1-1:30 pm, concert. Mon, Thurs, 8-9 pm, concert. Eastern. Daylight saving.

CHBC, Calgary, Canada. 410 also. 1,000 mi. W. W. Grant Radio Ltd. (Morning Alberta.) Daily, 8:45-10 pm, news, stock quotations, music. Mountain.

CHB, Toronto, Canada. 440 only. 500 mi. Marconi Co. Tues, 8-10 pm, concert. Eastern.

CHCQ, Calgary, Canada. 400 only. 200 mi. Western Radio Co. (Calgary Herald.) Daily ex Sun, 3:30-4:30 pm, music, news, baseball; 7:45-8:45, music, etc. Sun, 7:45-8:45 pm, church service. Mountain.

CHVG, Toronto, Canada. 410 only. 200 mi. Metropolitan Motors Co. Daily ex Sat and Sun, 5:50-6:50 pm, concert. Eastern.

CJBC, Montreal, P. Q., Can. 290 and 420. 40 mi. Dupuis Freres. Wed, Fri, 9-10 pm or 8-9, music etc. Eastern.

CJCA, Edmonton, Canada. 450 only. 500 mi. Edmonton Journal Ltd. Daily ex Sun, every evening, music, lecture, story, news, weather, markets, etc.

CJGD, Toronto, Canada. 410 only. 200 mi. Eastern Co. Daily ex Sat and Sun, 4:4-3:30 pm, concert. Sat 12-12:30 pm, concert. Eastern.

CJGG, Winnipeg, Canada. 410 only. 300 mi. Manitoba Free Press. Daily ex Sun, 10-10:30 am, news; 12-1 pm, reports, Mon, Thurs, 8-10 pm, concert. Tues, 7-8 pm, music, Fri, 5:30-5:45 pm, music, Sun, 8 pm, church service, Eastern.

CJNC, Winnipeg, Canada. 420 only. 500 mi. Tribune Newspaper Company. Daily ex Sun, 12-2 pm, markets, news; 7-10:30, concert, baseball. Sat, 2-3 pm or 3-4, kiddies' hour. Sun, 2-4 pm or 4-5, sacred concert; 7-8:30, concert. Eastern.

CKRC, St. John, N. B., Can. 400 only. 150 mi. Jones Electric Radio, Ltd. Daily, 9-10 pm. 60th meridian.

DN4, Denver, Colo. 240 only. 1,500 mi. Colorado National Guard. Daily ex Sun, 8:15 pm, weather, news, concert. Thurs, 8:15-9:30 pm, special concert, speech. Mountain.

KOKA, Pittsburgh, Pa. 1,000 mi. Westinghouse Elec. Mfg. Co. Daily ex Sun, 10-10:15 am, 12:30-1 pm, 2-2:30, 4-4:30, music; 7:30, bedtime story; 7:45, news; 8:30-9:30, music, news. Sat, 2-4 pm, concert. Sun, 8:45 am, 3 pm and 7:30, church service, Eastern.

KDN, San Francisco, Cal. 455 also. 250 mi. Leo J. Merberg Co. Daily ex Sun, 11-12 am, 1-2 pm, 4:30-5:30, concert; 7-11:15, weather; 8:30-9, concert. Sat, nothing after 5:30 pm. Sun, 10-11 am, sacred concert, Pacific.

KDVT, San Diego, Calif. 250 mi. Southern Elec. Co. Daily 7:30-9 pm, news, weather, concerts, lecture, Pacific.

KDVL, Salt Lake City, U. 485 also. 300 mi. Salt Lake Telegram. Daily ex Sun, 7-8 pm, music, baseball, news, weather; 9-9:30 (occasionally). Sun, 2-3 pm, church service, Mountain.

KDVS, Great Falls, Mont. 200 mi. Tribune, Wed, 8-10 pm, bedtime story, concert, Sun, 4 pm, church service, Mountain.

KDVS, Honolulu, Hawaii. 750 mi. Star-Bulletin. Daily ex Sun, 12:15-1:15 pm, stocks, markets, business news; 6:00-7:30, concert, lecture. Sun, 11-12 pm, church service; 4-6 pm, concert, lecture. Honolulu.

KDZE, Seattle, Wash. 300 mi. The Rhodes Co. Daily ex Sun, 3:30-4:15 pm. Mon, Wed, Fri, 7:15-8:15 pm. Pacific.

KDZN, Fresno, Calif. 50 mi. The Herald-Buford Co. Daily ex Sun, 4-5 pm, news, sports, music. Mon, Wed, Thurs, Sat, Sun, 7-8 pm, music. Tues, 8-9 pm, music. Fri, 8-9:30 pm, music. Sun, 10-11 am, sermon. Pacific.

KDZI, Wenatchee, Wash. 300 mi. Elec. Supply Co. Daily ex Sun, 4:30-5:30 pm, music. Mon, Wed, Fri, 8-9 pm, concert. Sun, 11-12:30 pm, church service. Pacific.

KDZZ, Denver, Colo. 500 mi. Wm. D. Pyle. Mon, Wed, 8:15-9:30 pm, concert. Mountain.

KDZZ, Everett, Wash. 100 mi. Kinney Bros. & Stimpell. Daily ex Sun, 2:30-3:30 pm, 8-9:30 pm. Pacific.

KFAC, Glendale, Cal. 455 also. 150 mi. Daily News. Mon, Wed, Fri, 8-8:15 pm, baseball, news, Mon, Thurs, 8-9 pm, concert. Sat, 7-8 pm, dance music. Pacific.

KFAD, Phoenix, Ariz. 455 also. 100 mi. Mon, Wed, Fri, 8-9:15 pm, concert, weather, stocks, markets. Sun, morning, church service. Mountain.

KFAE, Pullman, Wash. 260 mi. State College of Washington. Irregular.

KFAF, Denver, Colo. 1,000 mi. Western Radio Corp. Mon, Tues, Wed, Fri, Sat, 8-9 pm, music, news, etc. Mountain.

KFBD, Hanford, Calif. 100 mi. Calif. Radio Lab. Daily ex Sun, 3-4 pm, 8-9, Sun, 5-6 pm. Pacific.

KFBE, San Luis Obispo, Calif. 50 mi. Cliffe's Elec. Shop. Daily ex Sun, 4-5 pm. Tues, Fri, 7-8 pm. Sun, 10-11 am. Pacific.

KFC, Seattle, Wash. 700 mi. Northern Radio & Electric Co. Daily, eight hours, miscellaneous, Pacific.

KFI, Los Angeles, Calif. 200 mi. Earle C. Anthony, Inc. Daily, 1:45-2:30 pm, music, news; 4:30-5, news. Sun, 10:45-11:30 am, 4-5 pm. Pacific.

KFU, Grizzly, Cal. 500 mi. Precision Shop. Mon, Tues, Sun, 8-9 pm, concert. Sun, 8-4 pm, concert. Pacific.

KFZ, Spokane, Wash. 300 mi. Doerr Mitchell Elec. Co. Daily ex Sun, 7:30-9:30 pm, concerts and voice. Pacific.

KGB, Tacoma, Wash. 200 mi. Wm. A. Mullins Elec. Co. (Tacoma Ledger.) Daily, 4-5 pm, 7:30-9:30. Pacific.

KGC, Hollywood, Cal. 300 mi. Elec. Lighting Supply Co. Tues, Thurs, Sat, 7:30-8 pm, concert. Pacific.

KGF, Pomona, Cal. 150 mi. Pomona Fixture & Wiring Co. Thurs, 7:30-8:15 pm, news, markets, concert. Mountain.

KGG, Portland, Ore. 500 mi. Hallock & Watson Radio Service. Daily ex Sun, 8:30-9 and 7-7:30 pm, baseball scores, markets, news. Sat, 9:10 pm, instruction. Sun, 4:30-6 pm. Pacific.

KGN, Portland, Ore. 500 mi. Northwestern Radio Mfg. Co. Daily, 12-1 pm, concert, lecture; 2:30-3:30, miscellaneous. Mon, Fri, Sun, 9-10 pm, health bulletin, concert. Tues, 7-7:30 pm, miscellaneous; 8-9, concert. Wed, Thurs, Fri, Sat, 7-7:30 pm, miscellaneous. Pacific.

KGO, Altadena, Calif. 300 mi. Altadena Radio Lab. Daily, 1-2 pm, 6-7, Pacific.

KGW, Portland, Ore. 200 mi. Ship Owners Radio Service Inc. (Daily Oregonian.) Daily, 3:30-4:30 pm, news etc. Mon, 7:30-8:30 pm, concert. Wed, 8-10 pm, concert. Fri, 8-9 pm, concert. Sun, 7-8 pm, church service. Pacific.

KGU, Honolulu, Hawaii. 485 also. 150 mi. The Honolulu Advertiser. Daily, 7:30-9 pm. Tues, Thurs, Sat, special program. 150th meridian. (Three hours later than Pacific.)

KGY, Lacey, Wash. 100 mi. St. Martins College. Tues, Fri, Sun, 8:30-9:30 pm, concert, news, Pacific.

KHD, Colorado Springs, Colo. 200; 485 meters only. 100 mi. Aldrich Marble & Granite Co. Daily except Sun, 8:15 am, weather, forestry, bulletins, etc. Mountain.

KHJ, Los Angeles, Calif. 50 mi. C. R. Kierulff & Co. (Los Angeles Times.) Daily ex Sat and Sun, 1-1:45 pm, 7:15-8, concert, lecture, news. Pacific.

KJC, Los Angeles, Calif. 100 mi. Standard Radio Co. Harbor Bros. Daily ex Sun, 11:30-12 noon. Mon, 10-11 am, Wed, 8-9 am. Sun, 1-2 pm, 5-6. Pacific.

KJJ, Sunnyvale, Cal. 1,000 mi. The Radio Shop. Tues, 8:15-9 pm, concert. Fri, 7:30-8:15 pm, concert. Pacific.

KJR, Seattle, Wash. 200 mi. Northwest Radio Service Co. Daily ex Sun 8-9 pm, miscellaneous. Pacific.

KJS, Los Angeles, Calif. 100 mi. Bible Inst. of Los Angeles. Tues, Wed, 12-12:30 pm, sacred music, lecture. Sun, 11:30-12:30 pm, sacred music, sermon. Pacific.

KLB, Pasadena, Cal. 300 mi. J. J. Dunn Co. Mon and Fri, 7:30-8:15 pm, concert. Sun, 3-4 pm and 8-9, concert. Pacific.

KLM, Monterey, Cal. 150 mi. Noggle Electric Works. Daily, 12-12:30 pm, weather, markets, news; 7-8 pm, concert. Pacific.

KLP, Los Alamos, Cal. 1,500 mi. Colin B. Kennedy Co. Mon, 7:30-8:30 pm, industrial news, concert. Thurs, 8:30-9 pm, concert. Sun, 4-5 pm, concert. Pacific.

KLS, Oakland, Cal. 150 mi. Warner Bros. Daily, 12-1 pm, concert. Sat, 3-3:15 pm, concert. Pacific.

KLZ, Denver, Colo. 485 also. 1,000 mi. Reynolds Radio Co. Daily ex Sun, 7:30 pm on, news, markets, bedtime story, concert. Sun, 8-9 pm, church service. Mountain.

KMC, Redding, Calif. 100 mi. Lindsay-Weatherill & Co. Mon, Wed, Fri, 8:30-9 pm, concert. Pacific.

KMO, Tacoma, Wash. 200 mi. Tacoma Times. (Love Electric Co.) Daily ex Sun, 11-11 pm, 6-7, 9:15-10, concert, news, lecture. Pacific.

KNJ, Roswell, N. M. 300 mi. Roswell Public Service Co. Daily, Sun, 7-9 pm, weather, financial, markets. Tues, Sun, 7-9 pm, church service. Mountain.

KNN, Los Angeles, Calif. 100 mi. Bullock's. Standard Radio Co. Tues, Thurs, Fri, 10-11 am. Pacific.

KNT, Aberdeen, Wash. 400 mi. Grays Harbor Radio Co. Daily, 5:50-6:30 pm, 7:30-8:15, news, concert. Pacific.

KOA, Denver, Colo. 485 only. 100 mi. W. H. Smith (Y. M. C. A.). Daily, 9:55-10:25 pm, time, weather reports. (Teletype only.) Mountain.

KOG, Los Angeles, Calif. 300 mi. Western Radio Elec. Co. (Evening Herald.) Daily, 12:15-12:30 pm, markets; 6-9:30, news. Tues, Wed, Fri, 8:15-9 pm, concert. Pacific.

KOH, Los Angeles, Calif. 300 mi. Holzwasser Inc. Daily ex Sun, 4-5 pm and 8:15-9, concert, news. Sun, 10-11 am, 4-5 pm and 8:15-9, church service. Pacific.

KQP, Hood River, Ore. 100 mi. Blue Diamond Elec. Co. Daily ex Sun, 7-7:30 pm, news. Mon, Wed, Fri, 8:30-9:15 pm, concert. Pacific.

KQV, Pittsburg, Mo. 100 mi. Doubleday-Hill Elec. Co. Daily ex Sat and Sun, 12-12:30 pm, 2:50-3 pm, Mon, Wed, Fri, 10-11 pm. Sat, 12-12:30 pm. Sun, 4-5 pm. Eastern, daylight saving.

KQW, San Jose, Cal. 200 mi. Chas. D. Herrold. Daily, 11:30 pm. Wed, 8:15-9 pm, concert. Pacific.

KQY, Portland, Ore. 100 mi. Shubs Elec. Co. Daily, 1-2 pm, 6-7, miscellaneous. Pacific.

KRE, Berkeley, Cal. 100 mi. Maxwell Elec. Co. Sun, 1-2 pm, 6-7 pm, concert. Pacific.

KSD, St. Louis, Mo. 1,000 mi. St. Louis Post-Dispatch. Daily ex Sun, 4 pm, markets, news, concert; 7:45 pm, concert, lecture. Central.

KSL, San Francisco, Cal. 50 mi. The Emporium. Daily ex Sun, 10-11 am, concert, news; 2-3 pm, concert, educational talk. Sun, 2-3 pm, concert and educational talk. Pacific.

KSS, Long Beach, Calif. 25 mi. Prest & Dean Radio Research Lab. Daily ex Sun, 3:30-4:30 pm, news, concert. Pacific.

KTW, Seattle, Wash. 200 mi. First Presbyterian Church. Sun, 11-1 pm, 7:30-10, church service. Pacific.

KUO, San Francisco, Cal. 1,500 mi. San Francisco Examiner. Daily ex Sun, 3-3:30 pm, and 5:30-6:45, news, etc. Sun, 5-6 pm, news, etc. Pacific.

KUY, El Monte, Calif. 500 mi. West Radio Co. Daily ex Sun, 4-4:45 pm, lecture, concert. Mon, 8-9 pm, lecture, concert. Thurs, 8-9 pm, concert. Pacific.

KVQ, Sacramento, Cal. 1,000 mi. J. O. Hobeicht (Sacramento Bee). Daily ex Sun, 5:30-6:30 pm, concert, news, markets, weather. Wed and Sat, 8-9 pm, concert, lecture. Central.

KWG, Stockton, Cal. 1,500 mi. Portable Wireless Telephone Co. Daily ex Sun, 4-5 pm, news, concert, markets. Tues and Fri, 8-9 pm, concert. Sun, 2-3 pm, concert. Pacific.

KWH, Los Angeles, Calif. 300 mi. Examiner. Daily, 12-12:30 pm, music, news, crop reports. Daily, 5:30-6:30 pm, music, news. Sunday, 2-3 pm, sacred concert. Pacific.

KYG, Portland, Ore. 700 mi. W. P. Hawley, Jr. Tues, Thurs, 9-10 pm, concert. Sat, 8-9 pm, concert. Pacific.

KYJ, Los Angeles, Cal. 1,000 mi. Leo J. Merberg Co. (Lambert's.) Daily ex Sun, 4-5 pm, concert, markets, weather, news. Mon, Thurs, Sat, 8-9 pm, same program. Pacific.

KYW, Chicago, Ill. 485 also. 800 mi. Westinghouse Elec. & Mfg. Co. Daily ex Sun, 9:45 am-1:20 pm, market quotations every half hr; 3:15, news, markets; 3, baseball; 4:15 and 6:30, news. Real markets and stocks; 7:30, baseball, bedtime story; 7:45, feature; 8-9, concert; 9, news. Sun, 2:30 pm, church service. Central, daylight saving.

KZC, Seattle, Wash. 50 mi. Public Market & Dept. Store Co. Daily ex Sun, 8:45-7:15 pm, prices of food-stuffs. Pacific.

KZM, Oakland, Cal. 200 mi. Preston D. Allen. Daily ex Sun, 7:15-7:30 pm, news. Tues, 7:30-8:15 pm, concert. Fri, 8:15-9 pm, concert. Pacific.

KZN, Salt Lake City, U. 100 mi. Deseret News. Daily ex Sun, 3-4 pm, weather, markets, music; 8-9, news, concert. Mountain.

KZY, Oakland, Cal. 1,500 mi. Atlantic Pacific Radio Supplies Co. Daily ex Sun, 3:30-4:30 pm, concert; 8:45-1 pm, news. Wed, 7:30-8:15 pm, concert. Sat, 8:15-9 pm, concert. Sun, 11-12:15 pm, church service; 3-4 pm, concert. Pacific.

WAAG, Shreveport, La. 50 mi. Bordeaux Co. Daily, 7:30-9 pm, baseball, concert. Central.

WAAN, St. Paul, Minn. Commonwealth Elec. Co. 100 mi. Daily ex Sun, 11-11:30 am, 2-2:30 pm, 9-9:20, Central.

WAAJ, Boston, Mass. 50 mi. Eastern Radio Inst. Mon, Wed, Fri, 9-10 pm, concert. Eastern.

WAAK, Milwaukee, Wis. 485 also. 300 mi. Glubel Bros. Daily ex Sun, 10 am, markets, weather; 11, markets; 12-10 pm, markets; 1:25, closing markets; 2, and every hr. after, concert, test; 7, weather; 7:15, baseball; 7:30, concert. Central.

WAAL, Minneapolis, Minn. Minnesota Tribune-Anderson Beamish Co. 100 mi. Daily ex Sun, 9:40-10 pm, news. Central.

WAAO, Charleston, W. Va. 40 mi. Radio Service Co. Daily ex Sun, 8:45-7:45 pm, music, news, weather, baseball. Eastern.

WAAP, Wichita, Kan. 200 mi. United Elec. Co. Daily, 12-1:30 pm, music, news; 5, weather; 7:15-7:30, sports, markets; 9:45-12, talks, music, and code on C. W.; 10:30, weather. Tues, Fri, 8 pm on, concert, etc. Central.

WAAQ, Greenwich, Conn. 600 mi. New England Motor Sales Co. Daily ex Sun, 9:30 am-5:30 pm, every half hr. Eastern, daylight saving.

WAAT, Jersey City, N. J. 10 mi. Jersey Review. Wed, 7-8 pm, concert, lecture. Sun, 7-8, church service, concert. Eastern.

WAAV, Athens, O. 500 mi. Athens Radio Co. Daily, 7-9 pm, miscellaneous. Central.

WAAW, Omaha, Neb. 100 mi. 485 also. Omaha Grain Exchange. Daily ex Sun, 8:15 am, 9:45, 10:45, 11:45, 12:30, 8, markets. Central.

WAAZ, Youngstown, O. 300 mi. Youngling Bayner Music Co. Tues, Thurs, Sat, 5:45 pm, baseball, news; 7:30, music; 8-9, address, music. Eastern.

WAAZ, Emporia, Kan. 250 mi. Hollister-Miller Motor Co. Daily ex Sun, 8:45-12:15 pm, market quotations every half hr; 7-8 pm, concert, weather. Sun, church service. Central.

WBAA, Lafayette, Ind. 100 mi. Purdue University. Fri, 8:15-8:30 pm, educational lecture. Other features irregular. Central.

WBAB, Syracuse, N. Y. 1,000 mi. Andrew J. Potter. Daily ex Sun, 7-8 pm, concert, baseball, weather, news, bedtime story. Sun, 6:30-7:30 pm, church service, etc. Eastern.

WBAD, Minneapolis, Minn. Minneapolis JI-Sterling Electric Co. 100 mi. Daily ex Sun, 9-10 am, markets, music; 2:30-3 pm, concert. Central.

WBAG, Bridgeport, Pa. 485 also. 300 mi. Diamond State Fibre Co. Daily ex Sun, 10:45-11:15 am, weather, markets. Central.

WBAH, Minneapolis, Minn. The Dayton Co. 100 mi. Daily ex Sun, 1-1:30 pm, 3-3:20, 5-5:20, 9:20-9:40, Central.

WBAJ, Toledo, O. 450 also. 500 mi. Marshall-Gerken Co. Tues, Thurs, Sat, 6-7:30 pm, news, bedtime story. 8:00 pm, concert. Eastern.

WBAM, New Orleans, La. 100 mi. I. B. Rensnyon. Daily ex Sun, 10-11 pm, real estate bulletins, lecture, concert. Central.

WBAN, Paterson, N. J. 100 mi. Wireless Phone Corp. Daily ex Sun, 10:30 am, on the hour to 9:30 pm, concert, baseball. Eastern.

WBAP, Fort Worth, Tex. 485 also. 100 mi. Star Telegram. Daily ex Sun, 8:45-9 am, opening markets; 11-11:30, weather, markets; 1:30-2 pm, closing markets; 2:45-4, news, road conditions; 5:15-5:30, police; 6:30-8:45, baseball, police news; 9:30-10, music. Sun, 11-12:15 pm, church service; 2-2:30 pm, sermonette; 8:30-9, concert; 8:45-7, baseball. Central.

WBAQ, South Bend, Ind. 100 mi. Myron Southern Radio Corp. Daily, Sun, 11 am, weather; 9:30 pm, markets. Mon, Wed, Fri, 8:30-9:30 pm, concert. Sun, 11 am, 8 pm, church service. Eastern.

WBZ, Springfield, Mass. 500 mi. Westinghouse Elec. & Mfg. Co. Daily ex Sun, 7:30 pm, children's hour; 7:45, markets, weather, lecture; 8-9, concert. Sun, 8 and 9, church service. Eastern.

WCB, Newburgh, N. Y. 100 mi. Newburgh Daily News. Daily ex Sun, on half hour 12:30-6:30 pm, news, sports, concert; 10:30-11 pm, concert, feature. Eastern, daylight saving.

WCAQ, Fort Smith, Ark. 500 mi. John Fink Jewelry Co. Fri, Sun, 8-10 pm, music, talks, sermon. Central.

WCAH, Columbus, O. 300 mi. Etrekin Elec. Co. Tues, Fri, 7-8 pm, concert, bedtime stories. Sat, 3-4 pm, lecture, music. Central.

WCAK, Houston, Tex. 200 mi. W. P. Daniel. Daily ex Sun, 7-15 pm, news, etc. Wed, Sat, 3-9 pm, concert. Sun, 3-4 pm, concert. Central.

WCAL, Northfield, Minn. 400 mi. St. Olaf College. Fri, 9:15-10 pm, concert, lecture, news. Sun, 8:30-9:30 pm, chapel, music. Central.

WCAQ, DeFiance, O. 200 mi. Tri-State Radio Mfg. Co. Daily, 11:30-12:30 pm, 3, baseball; 6-6:30, baseball, concert. 5, special program. Central.

WCAT, Rapid City, S. D. 385 only. 100 mi. S. D. State School of Mines. Daily ex Sun, 9:30 am, weather; 3:30 pm, storm warnings. Central.

WCAW, Quincy, Ill. 200 mi. Quincy Elec. Sup. Co. (Quincy Herald.) Daily ex Sun, 8:45 am, markets; 11, markets; 11:45, 12:45, 8, music, baseball. Wed, Thurs, Sat, 8:30-9:45 pm, concert. Sun, 6:30-7:30 pm, religious. Central.

WCE, Minneapolis, Minn. Findler Elec. Co. 100 mi. Daily ex Sun, 10-10:45 am, 4-4:15 pm. Central.

WCK, St. Louis, Mo. 50 mi. Stix Baer & Fuller (Grand Leader). Mon, Wed, Fri, 6:45-8 pm, concert, lecture, bedtime story. Eastern.

WCN, Worcester, Mass. 485 also. 100 mi. Clark Unit. Daily, 11:15 am, 5:15 pm, weather. Evening program irregular. Eastern.

WDAB, Portsmouth, O. 100 mi. H. C. Summers & Son. Mon, Wed, Sat, 2-2:45 pm, 8:30-9:30 pm, concert. Sun, 2-2:45 pm, church service. Eastern.

WDAF, Kansas City, Mo. 500 mi. Kansas City Star. Daily ex Sat and Sun, 3 pm and quarter hours after, baseball. Mon, Wed, Fri, 7:30, news, concert. Central.

WDAH, El Paso, Tex. 500 mi. Mine & Smelter Supply Co. Tues, Thurs, Sat, 7:30-8:30 pm, concert. Mountain.

WDAJ, College Park, Ga. 300 mi. A. & W. P. R. R. Co. Daily, 9-10 pm, concert etc. Central.

WDAL, Jacksonville, Fla. 485 also. Times-Union. Daily ex Sun, 3-3:15 pm, 4-4:15, 5-5:15, 8-9:15, baseball, markets, weather; 9-9:50, general. Eastern.

WDAP, Chicago, Ill. 485 also. 1,000 mi. Midwest Radio Central Inc. Daily ex Sat and Sun, 9:45 am, 10:45, 11:45, 1:45 pm, 3:15, foreign exchange; 3:17, closing Chicago stocks. Sat, 9:45 am, 10:45, 11:45, 12:45 pm, foreign exchange; 12:17, closing Chicago stocks. Sun, 8:30-10:30, concert. Central, daylight saving.

WDAQ, Brownsville, Pa. 200 mi. Hartman-Riker Elec. & Mach. Co. Daily ex Sun, 10:30-10:50 am, music; 12:50-1:10 pm, music, news, weather; 5:05-5:30 pm, music. Tues, Thurs, Fri, 9:15-10 pm, concert. Sun, 5 pm, chapel. Eastern.

WDAU, New Bedford, Mass. 50 mi. Slocum & Kilgallon. Mon, Wed, 7-9 pm, concert etc. Eastern, daylight saving.

WDAA, Atlanta, Ga. 485 also. 500 mi. Georgia Ry. & Power Co. Daily ex Sun, 6-7 pm; 9-9:35. Sun, 2:50-4:30 pm. Central.

WDAX, Centerville, Ia. 250 mi. First Nat. Bank. Daily ex Sun, 11:30 am, 2:30 pm, markets, news. Tues, Thurs, 7:30 pm, 9:30 pm, concert. Eastern.

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; 8:45, church service. Central.

WDOZ, Tuscola, Ill. 70 mi. James L. Rush. Daily ex Sun, every half hr, 3:30 am-12:15, Chicago Board of Trade quotations. Tues, Fri, 7-8 pm, concert, entertainment. Central.

WEAB, Fort Dodge, Ia. 250 mi. Standard Radio Equip. Co. Daily, 7:30-9:30 pm, music, news. Sun, 8-9 am, church service. 2-3:30 pm, music. Central.

WEAD, Atwood, Kan. 485 also. 150 mi. N. W. Kansas Radio Supply Co. Daily ex Sun, 11-11:30 am, markets, music; 12, markets; 1:45 pm, markets; on half hour 3:15 to 6:45, news, baseball. Tues, Wed, Thurs, Sat, 7:30-9, concert. Sun, 11 am, church service; 3 pm, sacred music; 7:30, church service. Central.

WEAH, Wichita, Kan. 485 also. 500 mi. Lander Radio Co. Daily ex Sat and Sun, markets at 8:40 am, 9:40, 10:40, 11:40, 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.

WEAK, St. Joseph, Mo. 100 mi. J. B. Abernethy. Daily, 12-1 pm, St. Joseph live stock markets; 7:30-8:45, church service. Central.

WEAN, North Plattefield, N. J. 75 mi. Borough of N. Plattefield. Daily, 7:30-8 pm, music, police news, etc. Eastern, daylight saving.

WEAN, Providence, R. I. 100 mi. Shepard Company. Daily ex Sun, 3-5 pm, music; 6-8, bedtime stories, baseball, weather, music. Mon, Wed, 8-10 pm, concert. Eastern, daylight saving.

WEAP, Mobile, Ala. 485 also. 50 mi. Mobile Radio Co. Daily, 4-5 pm, 7-8:55. Central.

WEAS, Washington, D. C. 100 mi. The Hecht Co. Daily ex Sun, 3-4 pm, music, retail news. Wed, 7-8 pm, concert. Fri, 7:30-8:30 pm, concert. Eastern.

WEAV, Nashville, Tenn. 200 mi. Sheridan Elec. Service Co. Wed, Fri, Sun, 8-9 pm, concert, news, etc. Mountain.

WEAZ, Waterloo, Ia. 100 mi. A. C. Sweetman, Mon, Thurs, Sat, 7-8 pm, news, concert, lecture. Central.

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. Corrado Co. (Wichita Beacon.) Daily ex Sun, hourly, 8:40 am-10:40 pm, stock markets. Daily, 10:45 am and 4:30 pm, weather; 8-10 pm, baseball, concert, lecture; 10:45 pm, weather. Sun, 8-10 pm, church service, concert. Central.

WFAA, Dallas, Tex. 485 also. 250 mi. News-Journal. Daily ex Sun, 12:30-1 pm, weather, talk; 2-3:30, baseball, markets, news; 3:30-3:45, markets, news; 4:45-7, general, final; 8-8:30, concert, Sun, 2-2:30 pm, chapel; 3:00-4:45, sacred concert; 9:30-10, baseball, weather. Central.

WFAC, Superior, Wis. 100 mi. Superior Radio Co. Daily, 7:30-9 pm. Central.

WFAD, 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, weather; 8-10 pm, church service; 8 pm, concert. Central.

WFAJ, Waterford, N. Y. 340 only. 300 mi. Radio Engineering Lab. Wed, Sat, 7:45-10 pm, concert. Sun, 2-4 pm, church service. Eastern.

WFAM, St. Cloud, Minn. 485 also. 100 mi. Granite City Elec. Co. Daily ex Sun, 3:30-4:00 pm, markets; 7:30, concert. Central.

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; 7:45-8:55, baseball, news, concert. Sun, 11 am, church service. Central.

WFAU, Sioux Falls, S. D. 300 mi. Argus Leader. Daily ex Sun, 7:30-8 pm, baseball, concert. Tues, Thurs, special concert, 8-9 pm. Sun, 7:30-8 pm, concert. Central.

WFAV, Lincoln, Neb. 485 also. 300 mi. Univ. of Neb. Daily ex Sun, 10:10 am, weather, markets. Sat, 9-9 pm, concert. Central.

WFAZ, Binghamton, N. Y. 50 mi. A. L. Kent. No fixed schedule.

WFI, Philadelphia, Penn. 350 mi. Strawbridge & Clothier. Daily ex Sun, 1-16 pm, news; 3:30-4:30, concert; 5:30-6, baseball. Mon, Fri, 6:30-7 pm, Radio talk. Tues, Fri, Sat, 7:30-8:30 pm, concert. Fri, Sat, (alternate weeks) 7:30 pm, concert. Sat, 9:30 pm, Sun, 4 pm, church service. Eastern, daylight saving.

WFO, Dayton, O. 485 also. 300 mi. Rike-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.

WGB, Houston, Tex. 485 and 600 also. 250 mi. GRY Radio Co. Daily ex Sun, 8:30-9:30 am, police, news; 12:30-1:30 pm, music, readings; 4-5, baseball, news. Mon, Wed, Fri, 8 pm on, concert. Eastern.

WGAJ, Encarnada, Porto Rico. 200 mi. Spanish-American School of Radio Telegraphy. Irregular. 7:30-11:30 pm, entertainment. 6:00 Meridian.

WGAL, Lancaster, Pa. 35 mi. Lancaster Elec. Supply & Construction Co. Mon, Wed, Fri, 7-8 pm, concert, lecture. Sun, 3-3:30 pm, church service. Eastern.

WGAN, Orangeburg, S. C. 150 mi. Orangeburg Radio Equipment Co. Daily ex Sun, 10 am, markets, weather; 11:45, time, 1:45, 2:45, 3:45, 4:45, 4:50-4:55, 5-6. Wed, Fri, 10-11 pm, Central, daylight saving.

WGB, Madison, Wis. 100 mi. North Western Radio Research Corp. 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, 10:45-12 am, sermon. Central.

WGAZ, Grand Bend, Ind. 300 mi. South Bend Tribune. Daily ex Sun, 8:30 am, Home hints, menus; 2-3 pm, news, music; 7-8, news, music. Central.

WGH, Montgomery, Ala. 1,000 mi. Montgomery Light & Water Power Co. Tues, Thurs, Sat, 11 am, weather; 4 pm, storm warnings; 8:30-9:30, concert, agricultural. Sun, 8:30-9:30, church service. Central.

WGI, Modford, Hillsde, Mass. 500 mi. Am. Radio & Research Corp. Daily ex Sun, 2:45 pm, music; 7:30, baseball, news; 7:45 pm, police reports. On Tues and Thurs, 7:30 and 7:45 pm programs at 7:45 and 7:50 pm, respectively. Sun, 3 pm, church service; 7:45 am, sacred concert. Special features week nights, 7:30-9 pm. Eastern.

WGL, Philadelphia, Pa. 200 mi. Thos. F. J. Howlett. Tues, Thurs, Sat, 7:45-11:30 pm, concert. Eastern.

WGR, Buffalo, N

WHQ, Rochester, N. Y. 485 also. 50 ml. Times-Union. Inc. Daily ex Sun, 12-12:15 pm, news, concert; 7:30-8, markets, bedtime story, lecture; 8-8:30, concert. Sun, 3 and 7:30 pm, church service, Eastern.

(Indianapolis Star.) Daily ex Sun, 10-11 am, music; 10:15, financial, markets; 1-2 pm, music; 1:20, markets; 4-5 pm, music; 4:15, police notes; 4:50, baseball. Mon, Wed, Sat, 8:30-10 pm, concert. Central.

State, City, Call
Alabama: Birmingham, WIAG, WSY
Mobile, WEAP
Montgomery, WGH, WKAN

State, City, Call
Wichita, WAAP, WEAH, WEY, WHAN
Kentucky: Louisville, WHAS, WKAG, 9ARU
Paducah, WIAR

RECEIVING RECORDS? SEND THEM IN-

The complete list of receiving record holders, appears only once each month. The next complete list will appear in the September 23 issue of RADIO DIGEST.

- Station, Miles Record and by Whom Heard.
DN4-1,010-O. E. Frazier, Watts, Cal.
KFAF-850-B. J. Jelinek, Dousman, Wis.

- WGAG-950-H. S. Rahiser, Pittsburgh, Pa.
WGAU-360-R. U. Waite, Vineland, N. J.
WGR-910-C. N. Schwab, Grinnell, Ia.

Vacuum Tube Current Flow

Changing the number of cells in the B battery of a vacuum tube circuit battery changes the positive potential of the plate of the tube. If the positive potential on the plate became greater it would have a greater attraction for the flying electrons in the tube and hence in a given time more electrons would arrive at the plate and be pumped around the circuit by the battery.

- Florida: Jacksonville, WCAN, WDAL
Miami, WFAW, WYAZ
Pensacola, WGAN
Tampa, WDAE, WEAT, WHAW

- State, City, Call
Portland, WJAL
Sanford, WFAF
Maryland: Baltimore, WCAO, WEAT, WKC

Coupling Devices

The separation of the signals of one broadcasting station from those of another, is more readily accomplished by a tuning device possessing a coupling arrangement than with a tuning device having a single coil for single circuit receivers.

A certain loss in signal strength occurs in transferring the energy from the primary coil to the secondary coil of a loose coupler or vario-coupler. It is a question, therefore, which must be decided by the amateur himself as to whether he will choose a loose coupled receiving set with better tuning qualities or a single coil set with a slight increase in signal strength.

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Bringing Nations Close Together

Universal Use of Radio in the Next Decade

THE POPULARITY of Radio is merely a start in the right direction and the average person does not realize its usefulness. It is quite possible and within reach of the next decade to see a Radiophone in every home. It will be an especial boon to persons living in the country or small towns. The Radiophone will do as much toward placing community life in close communication as telegraphy, both wire and Radio, has done to place the nations in close touch with each other.

Enthusiasm Abroad Is Unanimous

England's Activities Aid Manufacturers Here

ACTIVITIES abroad stimulate trade to a great extent in this country. Just because Great Britain is beginning to do a good business in Radio, the English colonies in the Pacific are expected to soon take up the science. This will be of great benefit to the United States.

The American manufacturers are closely watching these countries, believing there will be a large market for apparatus. At present the American manufactured goods are the best in the world, and owing to experience and factory equipment they will be in a position to compete in price with the products of any other country. It will not be so very long before the amateur in America will be able to relay his message to another person in Paris, London or Sidney.

Voice Culture for Broadcasting

Vocal Training Becomes Necessary for Transmission

BROADCASTING presents a new era in voice culture. At a not far distant date there will be schools of instruction in the art of vocal training for microphone artists. There arise new conditions and new ways to use the voice to the best advantage in order that expression may be brought out and registered properly in the transmitting instrument.

For a long time we have been accustomed to hear the voice on a phonograph in dramatic singing, monologue and recitation without the assistance of gesture or facial expression. When an artist now is called upon to communicate a mood or thought by Radiophone he begins to realize that an invisible audience demands expression in quite a different way than that of the phonograph. Radio is fast beginning to be a great factor in the development of a new art.

Influence of Amateur Relay Stations

Practical Development Comes from the Youth

THE ADVANCEMENT of Radio has had considerable aid from the amateur relay stations. Much of the most important practical development work in Radio has resulted from the activities of these relay men and it is natural that the manufacturers of amateur and experimental apparatus should seek to please this large and ever-increasing class of Radioists.

Men in every walk of life all over the country are already realizing that Radio is no longer an isolated realm of mysterious dots and dashes, into which none but the initiated may venture. They know that Radio is now approaching a commercial possibility. They are interested in following the progress of this rapidly advancing art.

Moreover, their interests cover a broad range of wave lengths in general use. They require a simple, efficient receiver with a considerable wave length range.

Coincident with the rapid strides in Radiophony has come an increased use of continuous wave transmitting apparatus, both in amateur and commercial fields. The need for receiving equipment particularly adapted for the reception of continuous wave signals is therefore emphasized.

In a continuous wave receiver it is essential that the number of tuning adjustments be reduced to a minimum, since each adjustment is accompanied by a change in the frequency of a received signal. The receiver must be free from external capacity effects and the regenerative action must be stabilized so that small changes of wave length will not necessitate readjustment of the regenerative control.

The design of a regenerative receiver to include in its range the amateur as well as longer wave lengths (up to and including 3,000 meters) is a difficult problem. Efforts in this direction ordinarily take the form of loading coils and large shunt capacities.

The entrance of the new fan into the field is accompanied by much help from the relay amateurs, or "bugs," as they are best known. Manufacturers can do well to learn from the experience of the "bugs," many of whom have handled a key for over a decade.

Ye Ed Asks 'imself

Question.—What is the meaning of "natural period" or "natural wave length?"

Answer.—The "natural period" or "natural wave length" of an antenna is the frequency of oscillation or length of wave which will cause the antenna system alone to oscillate periodically. This natural wave length in meters may be said to be approximately four times the overall length of the aerial in feet.

Question.—What is the meaning for the word "Litzendraht?"

Answer.—"Litzendraht" is a form of wire very much used in Radio systems. It is composed of a large number of small insulated wires all stranded bunched together into one wire. The reason for the use of this German word is to define the construction. Litzendraht wire has low resistance to very high frequency currents and is therefore extremely useful and efficient in Radio windings.

Question.—Explain fully the use of the word "heterodyne."

Answer.—"Heterodyne" in the terminology of Radio telegraphy is an audible beat. This beat is introduced as a secondary Radio frequency oscillation in the receiving circuit, produces a beat of "difference" frequency which is the difference between the received signal and "artificial" frequency. Dr. Fessenden invented this system.

Question.—In describing regenerative circuits it is customary to refer to the use of an expression called "feed-back" in such a circuit. What is the meaning of this term?

Answer.—The inventor of the regenerative system was Major E. H. Armstrong and during the war he was generally nick-named "Feed-Back Armstrong." Aside from this nick-name in connection with his invention a definition of the expression "feed-back" may be said to be the process of introducing the output of a tube into the input of a tube for the purpose of bringing about amplification in the rectifier tube.

Question.—What are damped, C. W., and I. C. W. waves?

Answer.—A C.W. wave in Radio telephony is a continuous wave. This use of the words continuous wave is not ambiguous.

An I.C.W. wave is continuous wave that is interrupted. An interrupted continuous wave is an audible signal and does not need heterodyne.

Damped waves are those which die out, each oscillation's amplitude being smaller than the one preceding. Generally damped waves are sent out by spark transmitters.

Question.—What is the means for distinguishing between broadcasting stations so that the operator of a receiving set may determine the location of the signals received?

Answer.—In obtaining a license from the Government for operating a broadcasting station a call signal must be used. This call is composed of a number of letters such as KDKA, representing Pittsburgh, and KYW, representing Chicago. In accordance with the rules of the Government station transmitting broadcasting service is obliged to give its call letters in sending out such service. This announcement generally takes place with the following expression:

"This is KYW broadcasting from — — etc."

After such broadcasting starts, however, this call is not repeated, and unless the announcement is obtained when the program starts it will be difficult to distinguish between the two broadcasting stations. Some stations are now repeating their calls at various intermissions in the program.

Condensed

By DIELECTRIC

How many autos have you seen equipped for Radio reception? They are not so plentiful that the majority of folks would let one pass without turning to rubber at it. There are a good many more than most of us realize, however. It's a great aid in touring. If you've sat behind the wheel dodging strays at nearly every crossing, and trying to figure out the directional effect of a loose coupled flivver, then you'll appreciate a quiet hour with your 2,000 ohms at the end of the day's trip. Suppose you have your car filled with female broadcasters, who never respect the requirement for a three-minute intermission during an entire outing. Just tune 'em out and get on 360 meters. Static will sound sweet to your ears at such a time.

Speaking of static; it's not only annoying, but seems also to have intelligence. I was trying to get the returns from the scrap between Leonard and Tendler the other night thru static—persistent, roaring static! Each time Mr. White announced "the men are sparring for an opening," Old Static kept quiet. Yet before he could tell us where the blows were landing, O. S. was crashing in full blast. That didn't just happen, did it?

Now what are we going to have? Have to guess for a while because Hollis Mather is keeping it secret. However, we learn he has eliminated the usual rectifiers in some fashion. That's a start, but when may we have the rest of the information? His set sounds quite simple to manage with only one tuning control and a "modulator." If Mr. Mather should send me one perhaps I'd pick up more gossip.

RADIO INDI-GEST

They'd Probably Play "After the Rain"

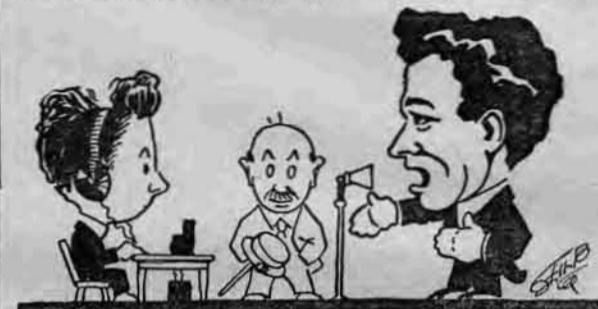
(Special to RADIO INDI-GEST)

Percy Laking, Radio Station 9CU, wants to know what would happen if someone should shout "Fire!" into a broadcaster.—E. G. Waste.

Why Barber Shops Need Sets

"Does Radio-broadcasting promote the growth of hair?"

A spectator, evidently impressed by the fine "crops" adorning the heads of members, put this question to the chairman at a meeting of Radio fans in Toronto a few days ago. It was quite possible, he was informed, that electric waves were responsible for promoting the



growth and not a single member at the meeting could recall a bald-headed operator.

Whereupon the meeting broke up as a result of all of the more aged persons rushing home to clap on their head-sets.

Fried Ham and Eggs, Fried Radio

At Muncie, Ind., bacon was fried by means of a Radio current. At last an explanation for that "frying" noise!

Epilogue

It's far from a thing of beauty, I know,
But for wonder, it hasn't a mate—
I'm speaking now of that little glass tube
With filament, grid and plate!

They cost like the devil, but still we buy;
We'll have them whatever the rate,
For you can't do much sans the little glass tube
With filament, grid and plate!

It puzzles us all as to just how it works,
But knowledge will come if we wait,
And some day, perhaps, we'll know all about
The filament, grid and plate!

You'll put your galena in a box,
And for money your folks you'll bait
Till they "come through" with sufficient jack
For a filament, grid and plate!

And when you have a tube in your set
You'll turn down date after date,
For your only love, my lad, will be
A filament, grid and plate!

Of all the things that we don't like,
Our most particular hate
Is to burn out one of those doggone tubes
With filament, grid and plate!

—Detroit News.

Wifey Will Know All About 'em



With the Radiophone in receptive mood, all the family quarrels may be enjoyed by the neighbors without putting ears to the walls or opening the windows.—"Topics of the Day" Films.

A-Year-Or-So-Hence

Scene opens.
Sweet Voice from Station BOOH: "Say, you big lummux, wadayamean by trying to pam off that tinfoil jitney? Put in a regular coin and I'll give you your wave length!"
Curtain.

Tune in on 485 Meters, Girls

People living in isolated places are greatly benefited by the Radio weather reports. The girls now know when it is going to be hot enough to wear their furs.

Sh! Don't Tell the Prohibitionists

The most remarkable thing about the rapid spread of Radiophones is that it has occurred without a law forbidding it.—Baltimore Sun.

Radio Telephony for Amateurs and Beginners

Part XII—Useful Information. Section II—Data and Tables

By Peter J. M. Clute

WHILE a large number of enthusiasts are interested in Radio for the entertainment and educational value of the broadcasting service, yet the average amateur cares more for the constructional details and theoretical functioning of the receiving and transmitting equipment than he does for the actual signals he handles. Practical and helpful information is required concerning the apparatus with which the desired results may be obtained.

In the succeeding paragraphs, it has been found advisable to bring together a large amount of informative data that may prove useful and valuable in the construction, operation and understanding of the workings of any set.

Frequency and Wave Length Table

The length of a single wave may be determined by dividing the velocity of the electromagnetic wave by the frequency of oscillation. If the frequency is high, the wave length will be low, and vice versa. Thus, if the frequency of the oscillations is 833,300 cycles per second, the wave length will be 300,000,000 divided by 833,300, or 360 meters, where 300,000,000 is the velocity of the waves in meters per second. On the other hand, if the wave length is known, the frequency may be determined by simply dividing the velocity of the electromagnetic waves by the length of the wave.

The above discussion may be conveniently summed up in the equation:

$$W.L. = v \div f$$

where W.L. is wave length in meters, v is the velocity of waves in meters per second and f is the frequency in cycles per second.

The following table enumerates some of the commonly used wave lengths corresponding to various frequencies:

Wave Length (meters)	Frequency (cycles per sec.)
50	6,000,000
150	2,000,000
200	1,500,000
250	1,200,000
300	1,000,000
360	833,300
375	800,000
400	750,000
450	666,600
600	500,000
800	375,000
1,200	250,000
2,000	150,000
3,000	100,000
8,000	37,500
10,000	30,000

Condenser Capacity and Dielectric Constant

The maximum possible charge of a condenser depends upon its insulation and the strength of the dielectric between its plates to resist disruptive charge. The strength of a dielectric is the measure of its ability to resist puncture or leakage discharges. The specific inductive capacity or dielectric constant of any material is its ability to store up electrostatic charges as compared to air, at normal pressure, taken as a standard.

A list of dielectric constants is given below:

Substances	Dielectric Constant
Air (normal pressure)	1.000
Air (compressed)	1.004
Paraffin	2.000
Turpentine	2.200
Paper	2.500
Hard rubber	2.500
Ebonite	2.500
Sulphur	3.000
Petroleum	3.100
Beeswax	3.150
Shellac	3.300
Common glass	3.500
Vulcanized fibre	5.000
Bakelite	5.200
Crown glass	6.960
Flint glass	7.000
Mica	8.000
Plate glass	8.460
Celluloid	8.500

Capacity depends upon the area of the plates, upon the dielectric medium, and upon the thickness of dielectric between conducting surfaces. The capacity varies directly as the area of the plates, directly as the dielectric constant and inversely as the distance between plates. This relation is expressed by formula as:

$$C = \frac{KS}{4 \times 3.1416 \times d}$$

where C is the capacity in farads, S is the area of one plate in square centimeters, d is the thickness in centimeters of dielectric separating plates, and K is the "dielectric constant." Thus, a condenser with a thin dielectric, or a small spacing between plates, has a larger capacity than one having a thicker dielectric, all other conditions being equal.

Resistance of Wires and Specific Resistances

The resistance of a given metallic conductor depends not only upon the material of which it is composed, but also upon the dimensions of the conductor. For a

wire of a given material under constant conditions of temperature, etc., the resistance is found to be directly proportional to the length and inversely proportional to the cross-sectional area. That is, the longer a conductor is, the more its resistance will be. Also, the smaller the area of cross-section, the greater will be the resistance of the conductor. Hence, if l is the length in centimeters and S the cross-sectional area in square centimeters, the resistance R, in ohms, is given by

$$R = kl \div S$$

where k is a constant depending on the nature of the material of which the wire is made, and is called the "specific resistance" of the material. If both l and S are equal to unity, the resistance is equal to k. Thus, we may define the "specific resistance" or "resistivity" of a material as the resistance of a wire of the material of which the length is one centimeter and the cross-section is one square centimeter.

If the wire is cylindrical, or circular, and of radius r, the resistance is given by

$$R = kl \div (3.1416 \times r^2)$$

since the cross-sectional area is $(3.1416 \times r^2)$.

The following table gives specific resistance at 0°C. in millionths of an ohm (microhms) of some pure metals, but it must be borne in mind that a mere trace of an impurity may very largely influence the specific resistance. The specific resistance also depends to a considerable degree upon the state of the material as to hardness. That is, as to whether it has been annealed or not, and if so, under what conditions the annealing has been accomplished.

Material	Specific Resistance (Microhms)
Silver	1.45
Copper (annealed)	1.57
Copper (hard-drawn)	1.60
Aluminum	2.63
Zinc	5.65
Brass	7.10
Phosphor Bronze	8.36
Iron	9.62
Platinum	10.92
Nickel	12.15
Lead	20.38
German Silver	20.96

In the following tabulation is given a list of metals and their relative resistivities and conductivities, as compared with copper (annealed) as a standard:

Material	Relative Resistivity	Relative Conductivity
Silver	0.923	108.30
Copper (annealed)	1.000	100.00
Copper (hard-drawn)	1.019	98.20
Aluminum	1.674	59.75
Zinc	3.590	27.90
Brass	4.522	22.10
Phosphor Bronze	5.325	18.78
Iron	6.127	16.31
Platinum	6.955	14.39
Nickel	7.738	12.92
Lead	12.980	7.71
German Silver	13.312	7.51

Enameled Wire Data and Table

Enameled wire is made by alternately coating and baking upon pure bare copper wire a special grade of elastic enamel, which builds upon the wire a film that is smooth, glossy and free from lumps or roughness. This enamel, being nonhygroscopic, does not absorb moisture like cotton or silk insulation. The enamel film combines flexibility with toughness and uniform thickness and provides a permanent covering, withstanding temperatures which would destroy any cotton or silk covering. Enameled wire will stand a temperature of 600 degrees without charring, burning, or otherwise becoming materially injured. This wire can be twisted into almost any shape without damage to the enamel insulation. It is impervious to the action of ordinary solvents, weak acids or alkalies, alcohol, mineral oils and water, and undergoes no chemical change under extreme heat.

The dielectric strength of enameled wire averages about 600 volts per mil of thickness, or many times that of cotton.

The greatest advantage of enameled wire over silk or cotton-covered wire is that, due to the difference in the thickness of the insulation, many more turns can be wound in a given space. A saving in space up to 50 per cent can be readily effected by the use of enameled wire.

No.	Enamel Wire B. & S. Gauge	Outside Diameter	Turns Per Linear Inch
120827	12
140658	15
160523	19
180417	24
200333	30
220266	37
240212	46
260169	58
280136	73
3001075	91
3200865	116
3400685	145
3600545	178
3800440	232
4000340	294

Sizes of Grid Leak Units

The sensitiveness of operation of vacuum tubes designed for common usage is greatly increased by inserting a small condenser in multiple with a high resistance in series in the grid circuit. The character of grid control is dependent directly upon the bias potential maintained upon the grid. The necessary bias potential for varied conditions of use may be obtained either by tapping one terminal of the grid circuit from a fixed resistance in series with the filament rheostat, through which filament current flows, or by employing a "grid leak" connected across the "grid condenser" or between the grid and the filament.

Experience has shown that the use of the "grid leak" is the more practical method of controlling the grid potential. The function of the grid leak is to present a leakage path across the grid condenser so that the potential of the grid in respect to a terminal of the filament may be kept at some desired value. The potential held on the grid is calculated by Ohm's law and is, therefore, equal to the product of the grid current and the grid resistance.

The value of grid leak unit to be used for any particular amateur receiver depends upon the design of the apparatus, the type of antenna-ground system, grid condenser, and other minor factors. The value of grid condenser capacity generally used is .00025 mfd. with a grid leak unit of 1 megohm. The best values to be used vary somewhat with different vacuum tubes. If the grid leak resistance is excessively high, slow leakage will occur, causing a sputtering (gas engine exhaust) sound in the phones. On the other hand, too low a resistance will result in too rapid a leakage, causing a weak signal, inasmuch as the negative grid potential cannot accumulate to full value for each wave.

Different detector and amplifier circuits require grid leaks of different values. Likewise, the proper capacity for the grid condenser should be determined by experimenting with values between .0002 and .0004 mfd.

The grid leak unit which gives proper bias potential on the grid exists between 0.5 and 3 megohms. Various values may be obtained by using three units of about 0.5, 1 and 2 megohms respectively. With these units, the experimenter may obtain a number of values by connecting the units singly in series, in multiple or in series-multiple, thus having a range between 0.5 and 3.5 megohms.

Inductance of Single Layer Round Coils

If a wire, through which a current is flowing, is coiled, each turn of the coil will have a magnetic field around it. Thus, the total field strength is increased for the same value of current, inasmuch as the fields due to each turn of wire add to each other. Hence, by coiling a given length of wire, its inductance is increased. Therefore, it can be stated, that the more turns there are wound in a given space, the greater will be the inductance. In Radio work, the main object of coiling is to get the necessary length of wire in a reasonably small space where it can be easily handled and adjusted.

The inductance of any single layer round coil (solenoid) may be computed from the formula

$$L = \frac{.03948 \times R^2 \times N^2 \times K}{I}$$

Where L is the inductance of the coil in centimeters, R the radius of the coil in centimeters, N the number of turns of wire, I the equivalent length of coil in centimeters, and K is a variable depending upon the value of the ratio of the length of coil to its diameter.

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The table below gives the values of K for various values of the ratio of l ÷ D, where l is the length and D the diameter of the tube, both in the same unit, as centimeters:

Ratio of— l ÷ D	K
0.05	0.9791
0.10	0.9588
0.15	0.9391
0.20	0.9201
0.25	0.9016
0.30	0.8838
0.40	0.8499
0.50	0.8181
0.75	0.7478
1.00	0.6884
1.50	0.5951
2.00	0.5255
3.00	0.4292
4.00	0.3654
5.00	0.3198

The inductance, L, calculated from the above formula, may be reduced to microhenries by simply dividing the inductance in centimeters by 1,000. This is derived from the fact that 1,000 centimeters equal one microhenry. Again, 1,000 microhenries equal one millihenry.

Calculation of Natural Wave Length of Aerials

The natural, or fundamental, wave length obtained with any aerial or circuit without the introduction of other elements may be calculated from the following formula:

$$W.L. = \frac{l \times 4.2}{3.048}$$

where W. L. is the wave length in meters, and l is the total length in feet of antenna, lead-in and ground wires.

In the accompanying table, there have been tabulated a few values of fundamental wave lengths, as computed from the above formula:

l (feet)	W.L. (meters)
75	103
80	107
90	124
100	137
125	172
150	207
175	241
200	275
225	309

With any of the above aerial systems, it would be necessary to add extra inductance in the circuit, if it is desired to receive on a wave length of 360 meters.

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Spider Web Coils Make Efficient Set

Pins in Disk Edge Give Windings Proper Shape

As I have seen nothing in your magazine, which I have been taking from the beginning, about spider web coils, I will describe the outfit I am now using and which seems to be equal to or superior to anything on the market today. While I was perfectly able to buy a complete

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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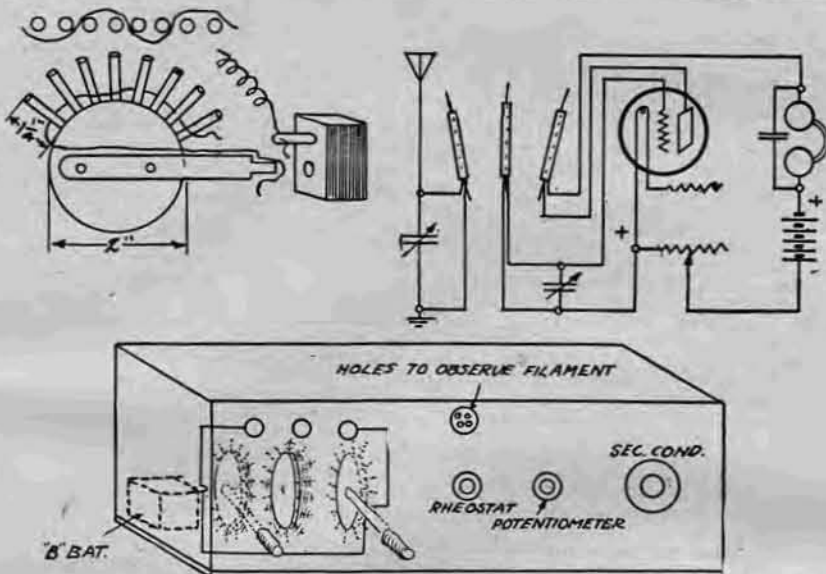
outfit, when I became interested in Radio early in the summer, I preferred to build my own, during odd moments of my spare time; and thereby become better acquainted with the subject. I first started with a loose coupler and I made a good one. With it I was able to hear Chicago and Detroit and a few other stations on a crystal detector. I then added a vacuum tube and the results were much better. I then made me a small variocoupler, putting one coil in the grid circuit and the other in the plate circuit. This was a decided improvement and the amplification was such that under the best conditions I was able to hear when standing fifteen feet away from the phones. This circuit will greatly please anyone that is using the simple plain circuit with his loose coupler and vacuum tube.

I was not satisfied, however, and the next improvement was to put in a set of honeycomb coils. The music came much better and more natural on these and the tuning was much sharper so that I was able to tune in many more stations. I next experimented with the spider web coils. I first used the regular winding on a form with a 2-inch center and tapering blades. This was not any better. I then tried the method of winding the wire around two blades at a time but found this difficult to wind so as to keep the wire in place, and I did not get any improvement. I then sawed out a 2-inch round piece from some one-quarter inch panel stock. In the edge of this I bored 43 small holes and inserted in these holes short lengths of round wooden applicators, such as can be had from almost any doctor or medical supply house. I made three of these. On the one I wound 60 feet of No. 22 S. C. C. wire, taking off a tap at 15, 30, 40, 50 and 60 feet. This was for the primary coil. For the secondary I used No. 28 S. C. C. wire and used 90 feet, tapping it at 15, 30, 45, and every 10 feet thereafter. For the tickler I used the same size wire as for the secondary, but only put on 60 feet, tapping it at 15, 30, 40, 50 and 60 feet. The winding is important as the wire goes in and out, taking two pegs at a time, and must be watched very closely or a mistake will be made. If it is wound evenly and correctly the result will be a flat coil that will look like a piece of crochet work.

To use these in the honeycomb mountings I simply tacked a small wooden arm on the side of the wooden core of the coil and cut a round peg-like end to slip into the socket on the honeycomb mounting. The first end of the wire was simply placed over the end and is held in place when the plug is inserted. I then took a small piece of wire about 6 inches long and on one end of it I fastened a small metal paper clip. The free end of the wire was slipped in the slit in the projecting arm of the honeycomb mounting and the paper clip was put onto the different taps to see where the reception was the best.

My aerial consists of two ribbons taken from the field windings of a couple of Ford magnetos and is about 150 feet long. I am getting best results by using 15 feet of primary, 45 feet of secondary and 30 feet of tickler. The extra wire does not seem to act in any appreciable way as a choke and will enable one to tune up in the neighborhood of 1,000 meters. This set will now bring in the music as loud as most sets with a one-stage amplifier. I am using simply a detector tube and get Chicago, Detroit, Milwaukee, St. Paul, Pittsburgh, Schenectady, St. Louis, Kansas City and Atlanta, Ga., besides a number of smaller stations and this is about all that anybody is getting.

COMPLETE LAYOUT AND HOOK-UP



I shall try and improve the tuning by making a small vernier condenser to place in parallel with the secondary condenser and then I think I have reached the limit without using a second tube.

This set has been the result of ideas and suggestions of others as well as my own and I am glad to pass it along to the other fellows knowing that anyone that makes up a set in this way will be more than pleased. It is a simple matter to fix up other mountings to use in place of the honeycomb mountings so that they can be used in the same way.

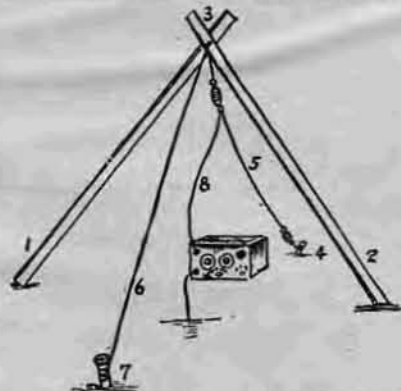
To tune the set adjust the primary and secondary, setting them about an inch and a quarter apart. Set the tickler out about the same distance, then move the secondary condenser back and forth until you hear the whistle of some one's tubes. Then with the left hand on the tickler and the right hand on the secondary condenser, adjust the two so that the music or voice comes in loudest. If the whistle continues while the tickler is moved all the way out, use less tickler. Then adjust the primary condenser which should have been set at about 20 or 30 degrees, and the filament until the tuning is at its best. To tune in some stations it may be necessary to set the primary a little further in or out and then start tuning again. If the tickler fails to tickle, reverse the leads and try again.—J. R. Wilkinson, M. D., Kankakee, Ill.

Homemade Spaghetti

Have you ever been in need of some use for cambric tubing, spaghetti, and discovered that there was none at hand? If this happens to you at any time, just hunt up a round shoestring used on ladies shoes and you will find that this makes good insulation for small wire. Just push the wire through the center.—Vernon D. Hagelin, Geneseo, Ill.

A Portable Aerial Support

The portable aerial support shown in the illustration can be used on the roof of a house or in the camp. If the lower ends of the pieces, 1 and 2, are closed the support can be placed on the running board of a car. The aerial can be erected in any open space by driving a stake in the ground and spreading the pieces 1 and 2. These pieces are joined at 3. The aerial may be drawn up by the rope 4



and attached to a stake, car, cottage, tree or other object. The aerial wire 5 can be made as taut as desired by closing the two parts 1 and 2. The holding wire 6 is fastened to the stake 7. The lead-in wire to the receiving set is 8. The materials required are two lengths of wood 2 inches square, one 5-inch bolt and nut, 15 feet of rope and one hook.—B. Hagerman, Chicago, Ill.

How to Make a Grid Leak

The person who assembles his own Radio set generally does so to save as much money as possible. One article on which he may save considerable is the grid leak, which is relatively inexpensive to make, or may cost nothing. It may be made as follows: A small paper tube is rolled and a thread is run through it. The thread should first be soaked in India ink. This is shown in Figure 1. The size of the thread will, of course, determine the capacity of the leak. Next slip two empty cartridge shells on the ends, as shown in Figure 2. These shells should fit tightly. This makes a grid leak cartridge which may be snapped into clips as shown in

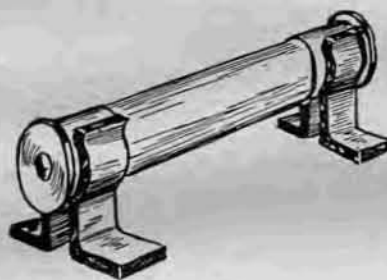
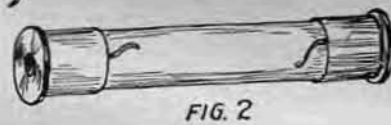
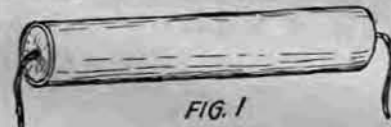


Figure 3. Several of these cartridges may be made with different sized thread and changed as required, or if preferred the thread may be merely caught under the set screws which hold the grid condenser in place and used without the tube at all.—Albert E. Jones, East Milton, Mass.

Buzzer Test Box

When using a buzzer test the noise from the buzzer itself is at times troublesome and drowns out the sound in the phones. One way to do away with this is to place the buzzer in a cigar or similar box and packing cotton all around it. The box is suspended from the table on which the set is placed by a few rubber bands. The crystal may now be adjusted without the interference from the buzzer's own noise.

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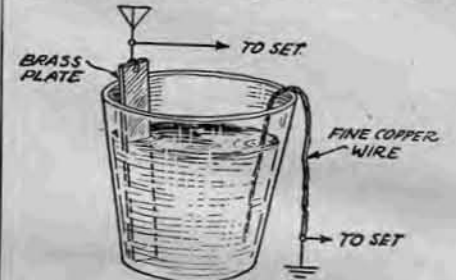
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Static Removed with a Solution of Salt Water

A recent thunderstorm caused considerable static and it was difficult to hear the concert from KYW. My ear drums were well tested. However, I received the concert with less static than we have in winter, just a faint hiss. This is the way I overcome the difficulty:

Take a glass of water and put a spoonful of salt in it. Take a tap off the lead from the antenna just ahead of the binding post on the set and connect it with a brass plate 1 by 2 inches in size.



Place the plate in the solution. From the ground post just before it goes to the set, tap on a very fine wire of copper and place the other end in the glass.

By varying the distance between submerged plate and wire you will find a point where the static is overcome.—Captain Wm. Avery, Chicago, Ill.

Novel Crystal Detector

Secure a large fountain pen cap and two strips of sheet brass or copper one-quarter inch wide and one-half inch longer than the fountain pen cap. Insert these strips on opposite sides of the cap and bend the ends down. Take a lump of galena and break it up into pieces about the size of buck-shot and fill the cap with in one-half inch of the top. Fit a rubber cork tightly in the cap and this will retain the crystals and hold the brass strips in place. Connect flexible wires to the brass strips and connect in the circuit in the usual manner. It is not necessary to hunt for a sensitive spot as some are always sure to be in contact. For changing the adjustment just shake the detector.—O. F. Hawley, Sioux City, Ia.

A Good Ground

A good ground conductor can be made from the ribbon taken from the coils of the ignition wheel on a Ford car. There are about fifteen coils on each wheel. One coil of ribbon is ten feet long. The coil is made of copper ribbon. Solder the lengths together and bury the length in the ground for about one foot. This will make a better ground than a water pipe.—Joe McCormack, Gadsden, Ala.

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Simple Instructions for the Beginner

By Harry J. Marx

Radio Receiving Sets

FALL is here and with it many new amateurs have joined the ranks of the already immense army of fans. These beginners need explanations and helps of the most extremely simple nature.

The newcomers, as well as many other amateurs whose pocketbooks limit the extent of their equipment, are interested in crystal sets.

These will receive local broadcasts satisfactorily, BUT there are many tricks of operation, of hook-ups and design which mean the success or failure. Mr. Marx will from time to time, as in the following article, clear away many points of doubt in this respect.

—Editor.

RADIO receiving sets for broadcasting reception can be divided into two classes under the headings of Crystal Detectors and Vacuum Tube Detectors. A few definite points or suggestions on how to get the maximum results from these sets will be of considerable use to the man who is just taking up Radio this Fall.

It must be clearly understood that crystal detectors in themselves have no amplifying qualities. For this reason it is necessary that all losses be cut down to a minimum. This point naturally requires most consideration in crystal detector sets rather than the tube sets, because the latter, if properly designed, are capable of overcoming some of the losses due to inefficient connections and construction, whereas, in the crystal receivers such losses cannot be made up.

Numerous articles have described the method of installing antennae. The aeriels are usually insulated at certain points to avoid the leakage of energy to the ground. An insulator may be efficient when installed but it does not necessarily follow that its efficiency is permanent forever more. Many are the possibilities of its losing its insulating qualities entirely. As aeriels are usually erected on roofs of buildings they are naturally in close proximity to the chimneys. It is therefore not unusual to find after the set has been in operation for a few weeks that the antenna wires, insulators, et cetera, have become covered with a thick coating of soot, dirt and even grease. Rainfall may wash some of this away, but very often then accumulation is sufficient to account for a considerable loss of energy, due to leakage to the roof and from there to the ground. This, then, is the first possible source of trouble. The aerial should be periodically inspected and kept clean.

About Crystals

Crystal detector sets use a variety of minerals for rectification although the galena crystal has been most popular. The contact to the crystal is made by means of the point of a fine wire which rests lightly upon it. The surfaces of any

mineral crystal is never found to have uniform sensitivity. Certain spots can always be located where the best reception is obtainable. Dirt, dust, and grease will collect on the surface of a crystal and are, therefore, destroyers of its sensitivity.

On no account should the crystal be touched with the fingers, or a microscopic layer of grease will be deposited on its surface and reduce its rectifying properties. For this reason, crystal detectors are often enclosed in glass to prevent the collection of dust and to reduce the possibility of the crystal surface being touched.

It is not good practice to rub the cat whisker point across the surface of the crystal. The best results are obtainable by lifting the wire clear and touching the different spots until the proper adjustment is located. Where the adjustment is accomplished by means of a universal joint, the entire surface of the crystal can be covered from point to point.

A good crystal will have numerous sensitive points and should be treated carefully and delicately so that its uses and advantages are available when reception

more robust in substance. A pair of these crystals should be chosen which enable the maximum number of adjustments to be made. The zincite crystals should be formed with the projecting joint to bear against or to be in contact with the surface of the opposing crystal.

Naturally the copper pyrites should be as flat as possible. When adjusted, the pressure should be sufficient to hold them together firmly but not very heavily as it will have a tendency to crumble the delicate zincite. If the detection is not found to be very sensitive, it may be improved by carefully scraping away the surface of both crystals, but attention should be paid to the fact that neither one of them should be touched by the hand.

Use of Carborundum

The carborundum crystal in the past has had considerable more popularity than at the present time. Carborundum is not a natural mineral, but is formed artificially through heat in a special furnace. The best form of carborundum contact is by means of a polished steel point. Phonograph needles are very practical for this purpose. The pressure should be very firm and the surface of the crystal and the point must be cleaned carefully to avoid dirt and grease.

If the steel point is found to be rusty

pose of brushing the crystal occasionally to avoid the accumulation of dirt on its surface.

Hints Regarding Wiring

Crystal detector circuits are usually of the type requiring a simple tuner made up of a coil of wire, a number of turns in the circuit being controlled either by a tap switch or by sliders running over and making contact with the turns of wire. For more accurate tuning a condenser can be added in parallel with the coil. If a double circuit is used it is more usually of the inductively coupled type.

In the same manner the secondary may have tap switches or sliders. The coupling may be of the fixed type, that is, both windings are on the same tube, or of the loose coupled type, where the one winding is on a smaller tube that rotates, slides, or varies in some fashion in relative position with regard to the other.

In the same manner as above, variable condensers can be shunted across this secondary coil.

Trouble shooting on a tuning coil outside of disconnections of the wires, resolves itself into imperfect contacts between the slider and the wire or the rod, or between the tap switch and the contact points. Another possible source of unsatisfactory reception is shorts between numerous turns of wire. Here again an accumulation of dirt and grease or worn off copper wire particles may result in sufficient losses to materially affect reception. In fact it is not unusual to find a novice trying to tune a crystal detector receiving set having the coverings of the wire windings thoroughly saturated with moisture.

Soldering Connections

Actual disconnections may frequently be found at the point where the moving portion of a switch or coil is connected to a wire. Flexible wire is often soldered to a rotating shaft and a common source of trouble is due, not only to a poor mechanical, but also to a poor electrical connection.

Resoldering of such connections requires a little care. The flux should be of the non-corrosive type of the connection wires will be gradually eaten away by the acid used in the ordinary flux. Care should be taken that the flux is not allowed to drip or run over the balance of the apparatus, as it will form a film which is similar in effect to a high resistance grid leak and may cause serious loss of signal strength.

Turning coils, if wound on wooden cylinders, are apt to give considerable trouble because of the shrinkage of the wood and the consequent loosening of the windings. For this reason it is advisable to use some material such as bakelite, fibre or hard rubber which does not shrink, and at the same time is a perfect insulator.

The use of wooden panels painted in suitable colors is also to be guarded against on account of the resultant leakage caused by most paints.

Taking all things into consideration, the amateur will find that it pays to get the best grade of apparatus and material, rather than to try to avoid some of the expense by purchasing low grade quality of material.

H. M. Towne—

WILL take the place of Peter J. M. Clute, beginning with the next issue of RADIO DIGEST. The conclusion of Mr. Clute's splendid series of articles will leave a vacancy which only can be filled by such a writer as Mr. Towne. His first article will tell the amateur the basis on which to make the selection of the Radiophone receiver for his home.

Mr. Towne is a man who has grown up with Radio. He had his first experiences with aerial and ground in the days of the coherer and decoherer. Few of the fans of today appreciate the difficulties under which a "bug" of that period worked. The hard work necessary in order to keep the signals coming in, however, had its reward, for excellent training in the fundamentals of the science was obtained. Mr. Towne is now employed in the laboratories of the General Electric Company.

—Editor.

is desired. All crystals vary in the amount of pressure for best results; some require but a light resting of the wire on their surface while others necessitate considerable pressure for contact. Only considerable careful experimenting will enable the amateur to get the best result for the particular type of crystal in his set.

Zincite and Copper Pyrites

A crystal detector that is very sensitive, if properly used, is the combination of zincite and copper pyrites. Zincite is a reddish crystal which requires careful handling, copper pyrites, however, are

it should be polished with fine emery paper. The carborundum detector, however, is as delicate as the galena and its adjustment is much more permanent and is not easily jarred out of place. For best results, two dry cells of about 4 volts and a potentiometer are necessary so that the potential applied to the crystal can be carefully controlled.

It will be found that one adjustment of the potentiometer will give the best results and for this reason it is advisable to fix the adjustment when this point has been found. It is advisable to keep a camel's hair brush on hand for the pur-

Regenerative Set Tuning

The way to tune in a station on a regenerative set is as follows: First, heat the filament of the tube; second, set the primary inductance switch on a given contact and vary the condenser in the antenna circuit very slowly throughout its range. If the desired station does not come in set the primary inductance switch on another contact and vary the condenser as before. Third, after the station comes in set the condenser at the point where it can be heard the loudest. Then vary the tickler coil on the variometer until the signal comes in with suitable loudness.

Where honeycomb coils are used first heat the filament and place the honeycomb coils which give the desired range of waves in the coil mounting. Set the movable coils at about 30 or 40 degrees with the fixed coil. Second, vary the antenna condenser slightly and then the secondary condenser throughout its range. If the desired station does not come in vary the antenna condenser more and the secondary condenser through its range as before.—Charles Fitch, New York.

Soldering Made Easy

When you are soldering the wires from the taps on your coupler to the switch points, and it is found difficult to hold the solder, iron and wire at the same time, remember this kink:

Procure some acid core wire solder, scrape the insulation from the wire for about one-quarter inch and slip the hollow wire over the end of the wire. Flatten the solder on the wire with pliers. While holding the solder with the pliers, break off the solder; place the solder and wire on the contact point and apply the hot soldering iron.—Vernon D. Hagelin, Geneseo, Ill.

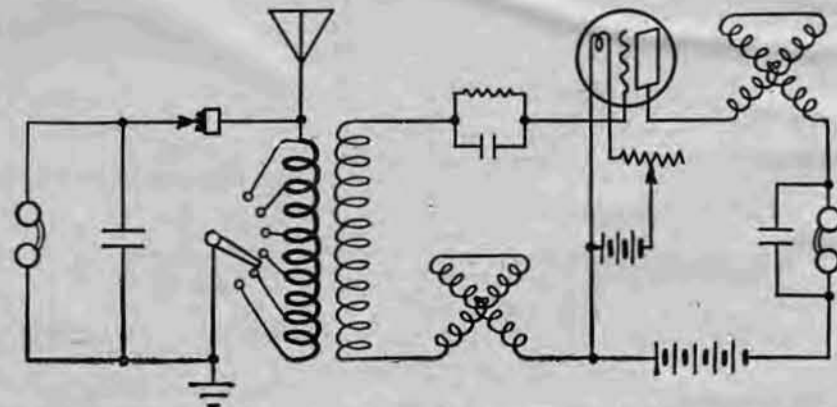
Regenerative-Crystal Hook-Up

The circuit shown in the illustration is that of a short wave regenerative receiver and single circuit crystal detector hook-up which works fine. I have a homemade regenerative receiver and crystal detector which I am using, as shown in the hook-up. The primary and secondary of my variocoupler are made of cardboard tubing and the rotors and stators of the variometers are cardboard tubes of the same size as those used in the coupler. I have had this set in operation for some

to take a little wire and connect the detector to the coupler binding posts and make the connection to the phones with a pair of test clips.—Eugene Falkner, Ft. Smith, Arkansas.

Joining Broken Tube Filaments

Tubes will burn out and some of them before they have served their time. Some of these tubes may be readily repaired in the following manner. Place the bulb in a socket, which can be held in any position, and connect it up to the battery wires



time, and it is working nicely. There are two broadcasting stations in my city at present, and it was while listening to one of these stations that I hit upon the idea of using the primary of the variocoupler as a single circuit crystal receiver and saving my batteries and detector filament. The only change necessary is

to the filament binding posts with a rheostat in the line. Turn the rheostat to low and then hold the tube horizontally and rotate the bulb slowly. If the ends of the broken filament touch, there will be a light in the bulb. The bulb should be kept still in that position and the current turned on slowly by means

of the rheostat until the filament welds together permanently. Sometimes such a repair will last a considerable length of time and will save the price of a new tube.—Glenn E. Ganfn, Escanaba, Mich.

Tapping Coils

In constructing homemade coils for the receiving set some consideration should be given to the tapping operation. If the taps are taken too far apart tuning will be difficult and perhaps impossible. The station which is wanted may be located between two taps, and that is one reason why signals are heard louder when a switch arm is placed between adjacent switch points. The wave is somewhere around there and it is doing its best to be tuned right.

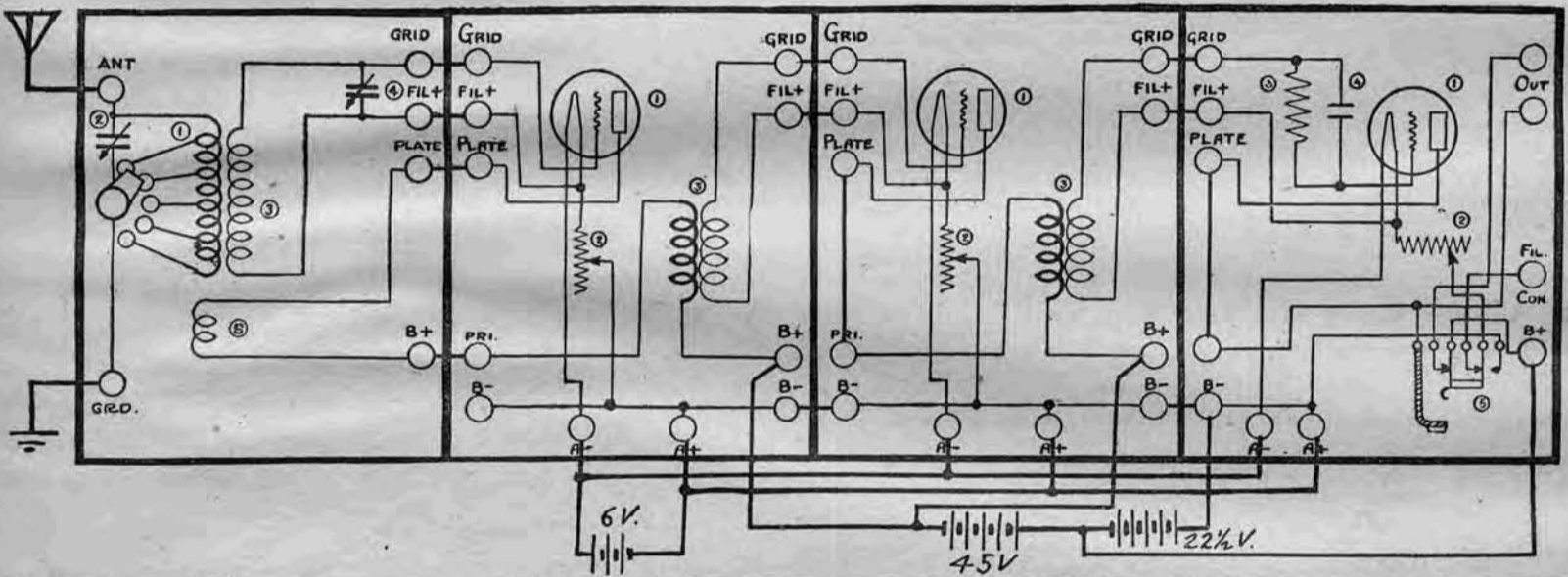
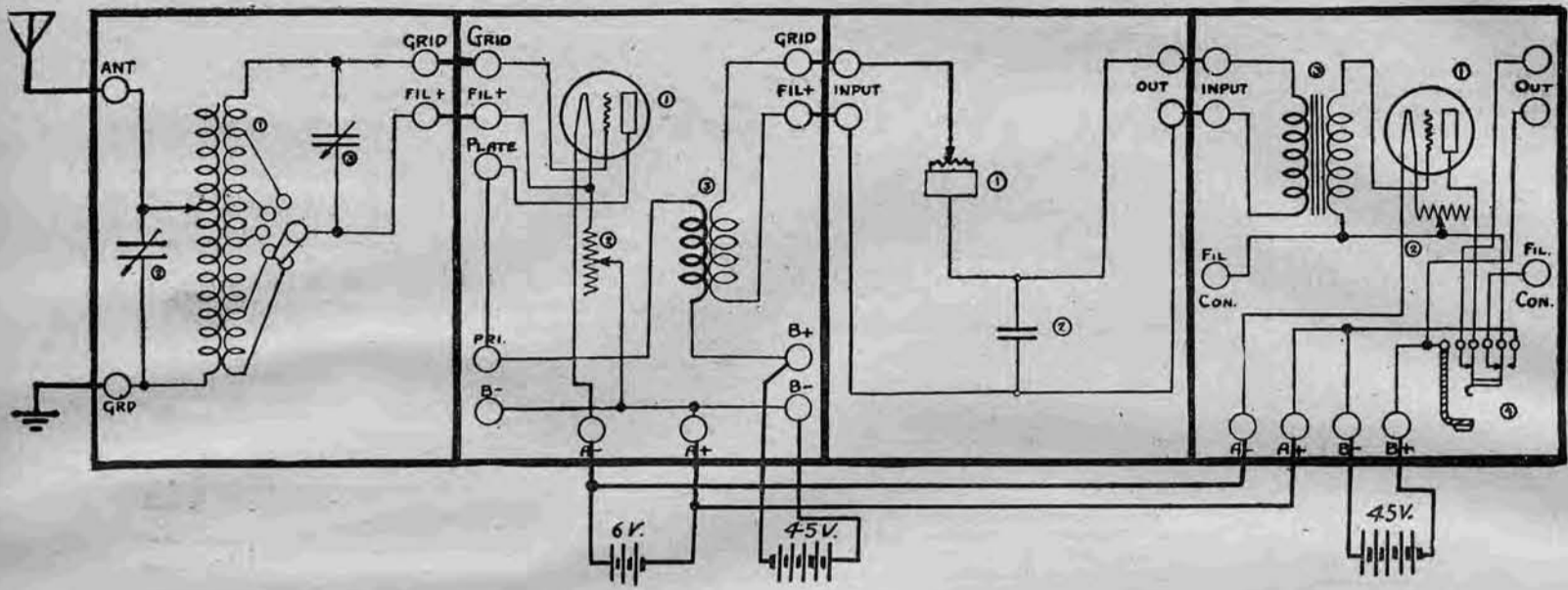
The "units" and "tens" method is probably the best. Where a single switch arm is to be used it is better to tap the beginning for the winding closely, say every five turns, and then go on the increase with eight, and then every ten turns. The tuning around 300 to 400 meters will be facilitated.

Spider Web Coil Forms

Find nine equidistant points on the periphery of an old disc phonograph record, and draw a line from each point to the center. With a hack-saw cut slots 1/2 inch wide along these lines to about 2 inches from the center. Then weave the wire between slotted pieces. By making several coils of varying sizes, a wide range of wave lengths can be covered. Another way is to mount a multi-tap switch in the center of the record and bring down taps to it from the winding. The circuits in which these coils are used are the same as those for De Forest honeycomb coils.—A. C. Piepkorn, Milwaukee, Wis.

Panel Units for Your Receiving Sets

By Harry J. Marx



Two more diagrams are given above to illustrate the method of connecting the panel units for complete receiving sets. The top diagram shows the loose coupler tuning panel (described July 8th) in circuit with a Radio frequency amplifier panel (described July 29th), the crystal detector panel (described August 6th), and one step of audio frequency (described July 29th). The four units when so assembled give one stage of Radio frequency, detector, and one stage of audio frequency. The crystal detector is used rather than the tube detector because of its advantage of minimum distortion. This combination includes accurate tuning by means of the loose coupler, efficient amplification of the received currents before rectification, the minimum distortion afforded by crystal detector, and the amplification of the rectified current. These good

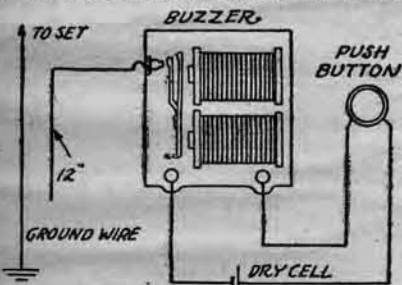
features will give extremely efficient results for both local and long distance reception. The method of connecting to one another and to external batteries, ground and aerial, is clearly indicated. The lower diagram illustrates the variocoupler and tickler tuning panel (described August 12th) in circuit with two stages of Radio frequency (described July 29th), and the vacuum tube detector panel (described July 22nd). The tuning panel which is the one in which a tickler rotor was added to the variocoupler, will permit very close and accurate tuning in company with the advantage of regeneration. The addition of the two stages of Radio frequency amplification makes this combination of panel units an especially efficient receiver for long distance broadcasting.

How to Connect a Buzzer

A buzzer test is desirable for a crystal detector. One of these testers may be made from an ordinary door-bell with the clapper removed, one dry cell and a push button. The buzzer is connected as shown in the accompanying diagram with one wire running from the vibrator post to the ground wire of the receiving set. This wire is not connected to the ground wire, but should be extended parallel to it for about twelve inches with two or three inches of space between them.

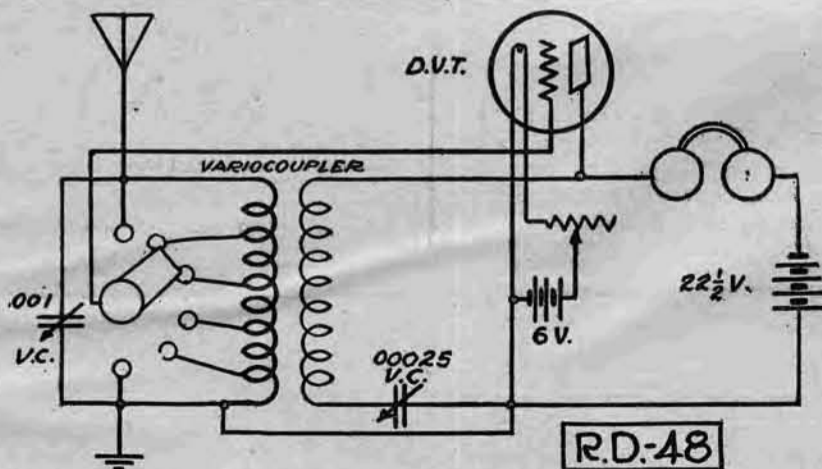
It is a good idea to place the push button on the floor, where it can be pressed by the operator's foot, leaving both hands free to adjust the detector. The buzzer will be inaudible to the operator.

To find a sensitive spot on the crystal where signals will be heard loudest, connect the receiving set in the usual way, place the phone receivers to the ears and press the push button. The buzzer acts as a miniature Radio transmitting station, setting up weak waves, which are picked up on the ground wire from the vibrator



wire. When a sensitive spot is located on the crystal, a distinct buzzing sound will be heard in the receivers. Adjust the cat whisker until the buzzing is at maximum strength and your detector will be ready to pick up Radio signals.

HOOK-UP RD-48



This hook-up shows another form of using the secondary of a variocoupler as a tickler in the plate circuit. The tickler winding in series with the .00025 mfd. variable condenser is shunted across the phones and "B" battery. A .001 mfd. variable condenser is shunted across the primary coil for making fine wave

length adjustments. The tap switch is used to adjust the secondary circuit. The circuit is not as complicated as might appear on the surface. It is a simple one to tune and very good results have been obtained. To the amateur who takes pleasure in experimenting with different hook-ups, this one is especially recommended for trial.

The detector serves to transform inaudible Radio waves of high frequency into low frequency waves which are audible by permitting the Radio current, which alternates at the rate of about 1,000,000 cycles per second, to pass in one direction only in a series of direct spurts. You may have to try out a num-

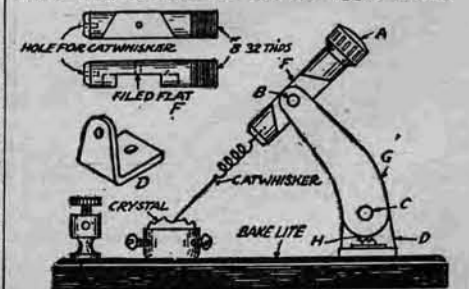
ber of crystals before finding the right one, but these are inexpensive and the amateur can have quite a supply on hand kept in a dustproof receptacle when not in use. Also handle them in such a way that the fingers do not touch the surface of the crystal, as the oil and moisture of the skin help to make them less sensitive.

Fixed Galena Adjustment

In order to keep a crystal detector in perfect adjustment first find the most sensitive spot by a buzzer test. When the point of the "cat's whisker" is well placed, drop some hot beeswax or paraffin around it. In practice, this has kept the whisker in place for months, and eliminates the necessity of seeking the elusive sensitive spot every time the set is to be used.—Clyde Wright, Montreal, Can.

A Good Detector Design

Usually it is quite difficult to adjust a detector easily, especially if it is home-made. The one shown in the illustration will be found to adjust readily and it is not hard to make. The arm G with its base D are made of 1/8-inch sheet brass. The piece G is fastened to its base D with a small rivet C. This arm and base are fastened to the bakelite base with the screws H. For the feeler arm F, a piece of 1/8-inch brass rod is used, flattened on one side so that it will lay snugly against the side of the arm G. It is fastened in place with a rivet B. At the upper end a



hole is drilled and tapped to receive the cat whisker, and when the cat whisker is in place it is soldered. The cup for holding the crystal is of the ordinary kind.—William Hunt, Denver, Colo.

Questions and Answers

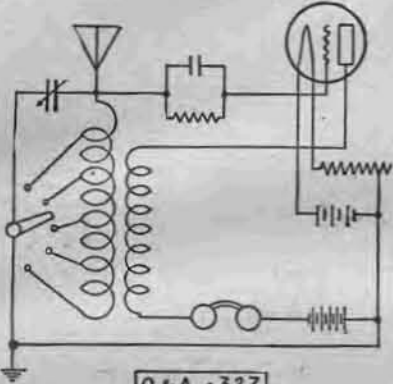
Wrong Hook-Up

(327) PHB

Enclosed please find picture and diagram of a receiving set hook-up. Am not able to receive anything, not even KYW which is about 60 miles away. Have been following the RADIO DIGEST instructions for tuning in with a Vacuum tube detector and get the noises as explained but not KYW or even wireless telegraph.

Connections are all soldered and cell screws gone over to see that they were tight. If you can make any suggestions, how to improve this set, or explain what my troubles may be would be greatly obliged.

How many miles would this set be good for? Station WWJ is about 300 miles away. Would I be able to tune in?



Q & A -327

A.—Your hook-up is wrong. See Q. and A. 327 on this page. Range, 100 miles.

Long Distance Receiver

(442) FJL

I am taking advantage of your kind offer to ask a few questions. I am contemplating building a vacuum tube set and would like you to look over the drawing I am sending so that you will know how I intend to make it. I want this set to be regenerative. Please answer these questions:

1. Could I receive from San Francisco, Cal., and Denver, Colo., with it, using a good aerial?

2. Is there a better way to make it than I have shown? How?

3. Is it all right to have the honeycomb coils so I can hear the longer wave lengths?

4. If you think this set will be all right for the stations named in first question, please give me the hook-up showing also how to connect the batteries, aerial and ground, as I do not know a great deal as yet about Radio.

A.—1. Range depends on amplification used. Advise Radio frequency. See page 15, issues 9 and 10, June 10 and 17.

2. Set is all right as is.

3. Yes.

4. See answer to Question 1.

About RD-9 Hook-up

(416) JJP

What kind of tuning coil is used in hook-up diagram No. RD-9 on loose sheet No. 4 of the May 6th issue?

2. If a loose coupler is used, what other kind of coil can be used to get good results and how can it be made?

3. What distance will this outfit receive?

4. Can a detector-amplifier be used with good results?

A.—1. Variocoupler.
2. Can be either loose coupler or honeycomb coils.
3. Distance about 75 miles.
4. Yes.

Combination Set

(439) PAM

Will accept your invitation to ask a question. Please give me a hook-up for one step Radio frequency, detector and one step audio frequency amplification in connection with two variometers and a variocoupler making it possible to use the detector alone, detector and one step radio frequency, or detector and both steps as required using a plug and jack system.

A.—See RADIO DIGEST issue No. 12, July 1, page 13, for hook-ups. Also page 15, issues 9 and 10, June 10 and 17.

Winding Data

(465) FCC

Am making my own regenerative set, using 2 variometers and a variocoupler. The secondary winding, I used No. 32 cotton covered wire, winding 26 turns to a side. The primary I wound with 62 turns of No. 22, making a unit and ten switch.

Will this be right or should I have used larger wire and wound both alike? I thought that by using smaller wire in the secondary I would get more resistance. Will it work O. K.? If not, please give me

the correct winding data for same.

A.—See page 13, issues 9 and 10, June 10 and 17, for winding data. It will probably work all right, but No. 32 is pretty small on the secondary. No. 24 would have been better here. Resistance is NOT the object.

Effect of Condensers

(468) EWS

As a reader of the RADIO DIGEST I would like to submit a few questions to you.

1. Does a variable condenser in series

with the aerial increase or decrease the wave length?

2. What effect does it have in series with the ground?

3. What effect across the primary circuit?

4. What effect across the secondary circuit?

A.—1. Decreases the wave length.

2. Same.

3 and 4. Increases the wave length of circuit with increase in capacity of condenser used.

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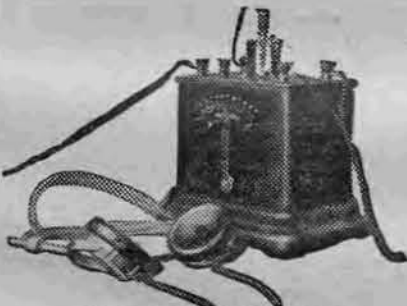
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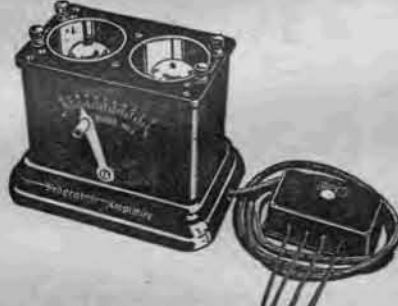
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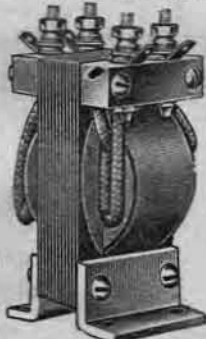
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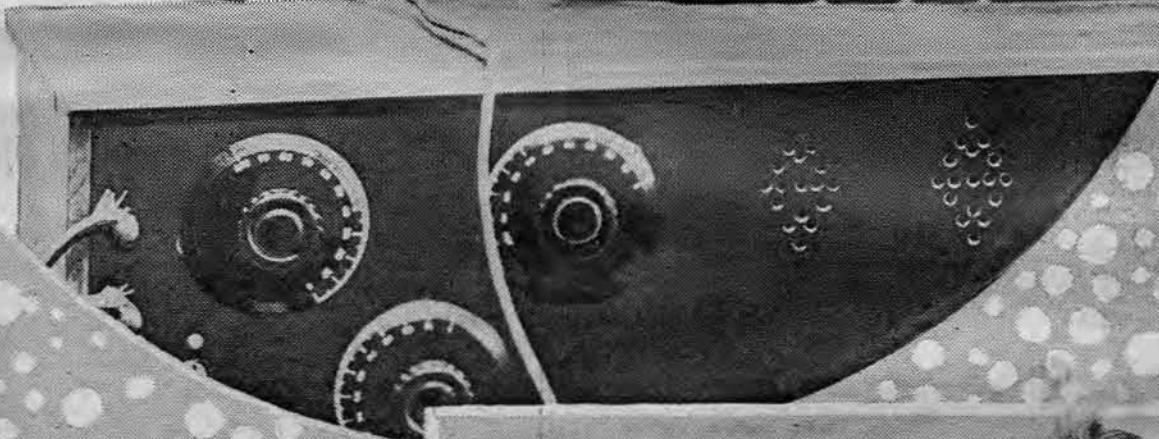
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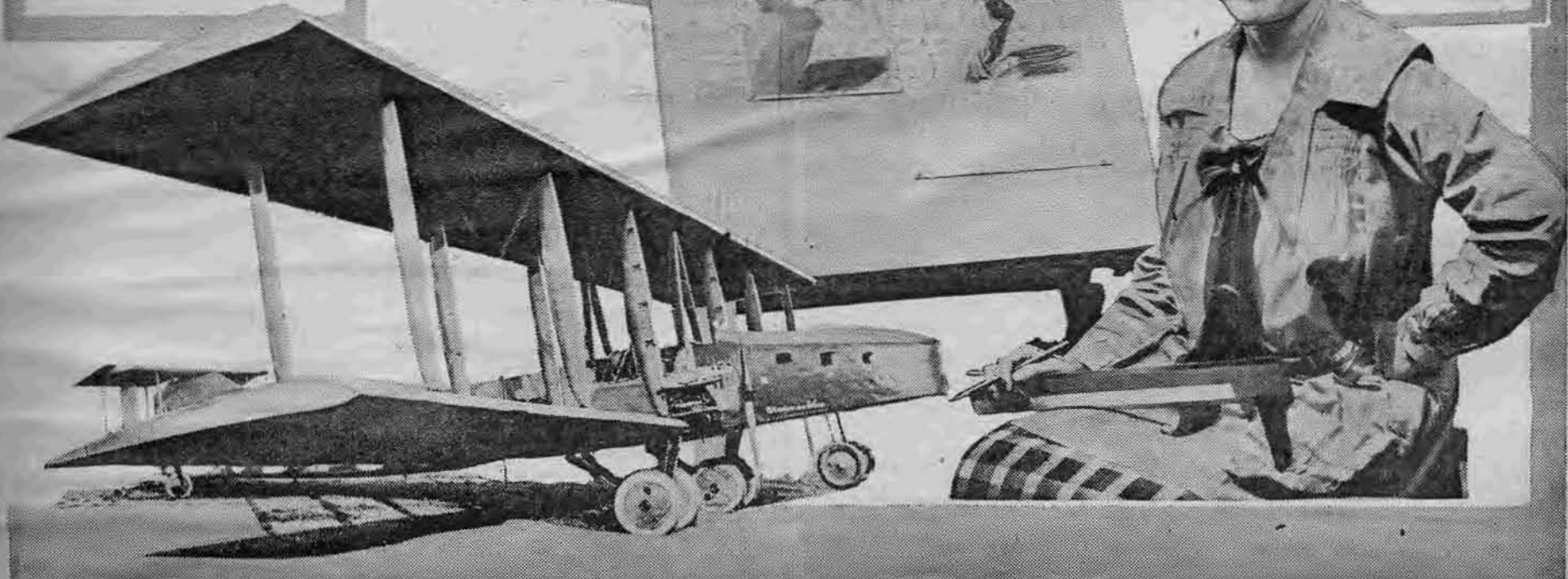
The movie world, as well as the every day world, is interested in Radio. You may think that a movie actor has plenty of time to listen in on Radio, but if you were there in the studios you would come to the conclusion that there was some work attached to the profession. However, Wanda Hawley takes enough time to hear what she desires to hear from the air.

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One of the new French bombing planes which has passed all tests is shown below. This giant plane carries complete Radio equipment.

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Miss Nellie Stevens is the first and only woman to send a Radio picture. The picture proved to be of Miss Virginia Valie, movie star, when it was decoded.

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