

Radio Digest

EVERY WEEK **Illustrated** TEN CENTS

TRADE-MARK

Vol. II Copyright, 1922, R. D. P. Co. Inc. CHICAGO, ILL., SATURDAY, AUGUST 12, 1922 No. 5

CRYSTAL SET AMPLIFIES

POST OFFICE SETS SLASH WIRE BILLS

ETHER WAVES NOW USED TO SEND ORDERS

Cost Per Word to Follow Mail Planes Is One-Eighth of Cent

(Special to RADIO DIGEST)
WASHINGTON.—Steadily extending the operations of their Radio stations, the Post Office Department is cutting down its bills for telegrams. Besides using the fifteen stations between New York and San Francisco to keep in immediate touch with the progress of the air mail across the country, the department is also using ether waves to send out administrative orders, receive requisitions for supplies, and to get reports from inspectors on the condition of mail transportation during the rail strike.

It is absolutely necessary to follow the planes from station to station and to do this with telegraph service would be very costly. Figures compiled by officials of the Radio service show that the cost per ether word is less than one-eighth of one cent. The Washington station, WWX, handles 1,000 messages a month. Other stations have even heavier Radio traffic.

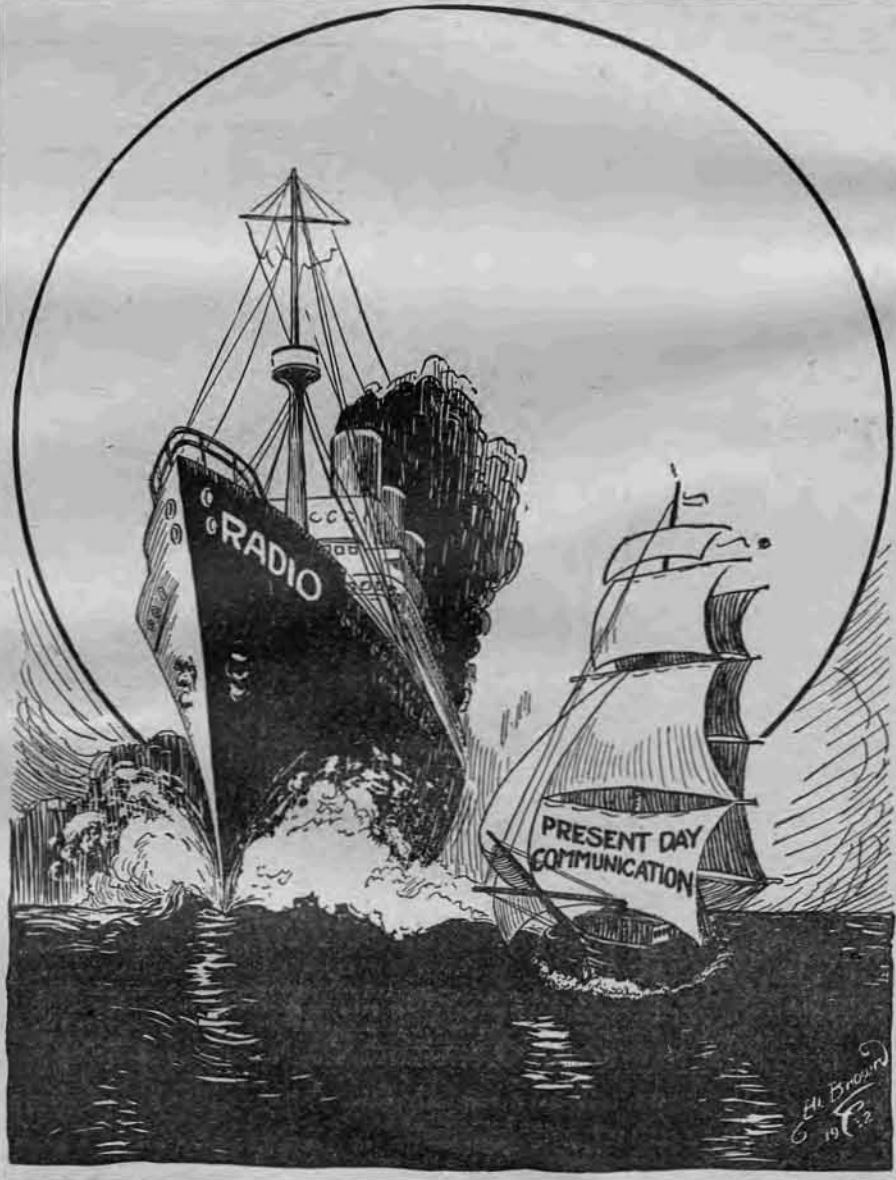
Announce Markets Daily
In addition to the air mail reports and other material, the Post Office Department Radio stations broadcast weather predictions and warnings and announce the market reports daily. Plans are being considered by the Post Office Department for changing at least a few of the fifteen Radio stations operated in connection with the Air Mail Service to provide both Radio telegraph and Radio telephone service. The stations are at Washington, D. C., Hazelhurst, L. L., Bellefonte, Penn., Cleveland, Ohio, Bryan, Ohio, Chicago, Iowa City, Ia., Omaha, Neb., North Clerk, Neb., Cheyenne, Wyo., Rock Springs, Wyo., Salt Lake City, Utah, Reno, Nev., San Francisco.

French Amateurs' Waves Soon to Bridge Atlantic

PARIS, FRANCE.—Amateurs of France are constructing continuous-wave transmitters with enthusiasm and it is believed only a matter of a few weeks until many of these will bridge the Atlantic, duplicating the feat of the American amateurs.

AIR WAVES GET BEST OF BAD HARBOR FOGS

NEW YORK.—The Radio piloting cable in New York harbor is said to save ship operators from \$500 to \$4,000 an hour, depending on the size of the vessel. Since its installation this cable, enabling ships to enter port in spite of the bad fogs which occur practically ten days a month and delay ships a day or more, has saved many thousands of dollars to ship owners and operators.



CHICAGO MAN USES GALENA BUT NO TUBES

C. E. Butterfield Discovers Method of Amplification Using Three Detectors

Boosts Signals Double

Inventor Tells of Circuit—Believes More to Be Accomplished by Experiment

Crystal detector amplification, of great importance to every amateur possessing the less expensive crystal set, has been accomplished successfully by C. E. Butterfield of Chicago who has been able to double the strength of received signals without recourse to three electrode vacuum tube detectors or amplifiers.

Working on the circuit proposed by a South American amateur for crystal amplification, Mr. Butterfield discovered the new arrangement which proved so satisfactory. While not giving near the amplification possible with a tube set, the results were acclaimed very good considering the saving in material outlay. Another advantage of the crystal amplifier has been found in its minimum amount of distortion in voice and music reception.

The circuit uses three galena detectors, a tuning device such as a loose coupler, two audio frequency amplifying transformers, three fixed condensers, a high voltage or B battery and telephone receivers. A schematic diagram is given on page 2.

Battery Pushes Signals Through
The battery was necessary to furnish currents to help the weak incoming Radio signals push their way through the amplifying transformers and detectors.

"While many Radio authorities contend that the circuit using only crystal detectors cannot be made to amplify as has been done in this case," Mr. Butterfield said, "it is possible to do so. Whether a

(Continued on page 2)

RADIO TO CUT YEARLY LOSSES ON SHIPMENTS

Will Be Used to Check on Goods in Transit

NEW YORK.—An announcement made by Jonathan Starr, president of the Shippers' Clearing House Company, says that Radio is to be used in saving the shippers of America some part of their usual annual loss, which is somewhere in the neighborhood of \$100,000,000.

The system, it is explained, is to be entirely for the use of the shippers in checking up their goods in transit to eliminate as far as possible losses through thieving and careless handling. There will be no commercial messages handled and the entire system is planned as a time and money saver for its owners.

Stations will be established in thirty-two cities between here, the West coast and New Orleans.

Dealers Keep Tab on \$150,000 Patent Suit

Decision in Alleged Infringement Case to Decide Rights

NEW YORK.—The first gun in a series of Radio patent suits and counter-suits was fired today by the bringing of an action in the Supreme Court, New York, against the Wireless Specialty Apparatus Company, for \$150,000 damages and an injunction restraining continuance of the publication of a series of patent warning advertisements which have recently appeared in the technical and trade press throughout the country.

The suit is being watched with considerable interest by hundreds of Radio manufacturers and dealers throughout the country who will be guided by court decision as to their rights in regard to the alleged patent infringements described in the advertisements.

BELGIUM RIGS PLANT IN WARFARE CENTER

BRUSSELS, BELGIUM.—The Belgian state has just started a giant Radio station at Ruysselede, near Bruges, in the center of the Flemish country famed from being the center of the four years of trench warfare. This plant is intended to communicate with the Belgian colony in central Africa. It will perhaps be the most powerful plant in the world. The aerial will have eight towers 750 feet high.

CRYSTAL AMPLIFIER

(Continued from page 1)

loud speaker could be used with this set I have not been able to determine, but I believe that this would be possible with a few more steps of amplification. However, as it stands the signal strength is at least doubled.

"While the range of the set is not greatly increased by the amplification, several miles are added. How much farther it is possible to receive can be determined only by experimentation.

Not Hard to Set Up.

"In connecting the various instruments together, very little trouble will be experienced. Any form of tuning inductance may be used, but better results will be obtained with a loose coupler, as it will permit closer tuning, an important factor.

"The most sensitive crystals must be used, galena being preferable. However, if a very sensitive crystal is used in the first detector, it will be found that the amplifying detectors will not require ones so sensitive. Crystals may be tested by a buzzer.

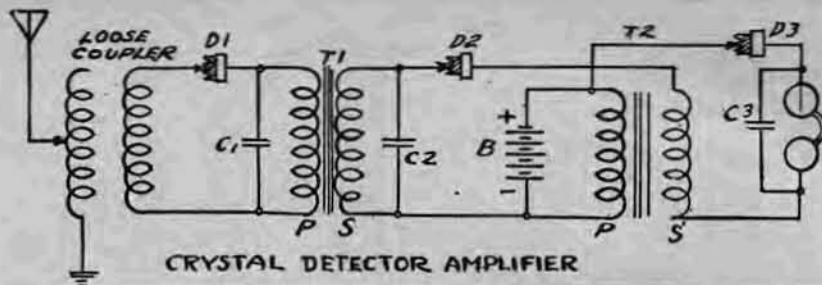
"In adjusting the detectors, the cat whiskers of the amplifying detectors should rest on their respective crystals. Then the first detector (D1 in diagram) is adjusted by means of the usual buzzer scheme. The adjustment of this detector is very important and should be made carefully.

"One point to bear in mind is this: The second detector must not be carried to the primary of the second transformer, but must go to the secondary. If this is not done, it will be found that the signals will not carry through the second transformer."

Circuit Diagram and Constants.

The circuit used by Mr. Butterfield is given on this page. In the diagram, D1, D2, and D3 are galena detectors. C1, C2, and C3 represent fixed condensers of 0.001 microfarad capacity. T1 and T2 are both ordinary audio frequency amplifying transformers of the type found in tube sets. Their primaries are indicated by P and secondaries by S. B is a 22½-volt battery, connected as shown. This may be increased with somewhat better results. The best voltage must be determined by experiment.

The telephone receivers are no different from those possessed by every amateur. A loose coupler with adjustable primary and secondary inductance values was found best suited to the circuit.



CRYSTAL DETECTOR AMPLIFIER

Bugs' Interest Splits on Armstrong Circuit

Some Experimenters Return to More Reliable Radio Frequency

CLIFTONDALE, MASS. — Attention at present in Radio reception around New England is divided between the Radio frequency amplifier using a coil antenna and the new Armstrong super-regenerative arrangement. Several have tried the new circuit with more or less success, and some have gone back to Radio frequency as their standby while still experimenting with the super-regenerator.

One of the first experimenters to try out the Armstrong hook-up was G. W. Nichols of 29 Whitney street, Cliftondale, and he reports very satisfactory results, omitting the filter and the third tube, which functioned as an amplifier. Without even the use of a loop or coil antenna he has succeeded in bringing in the following sta-

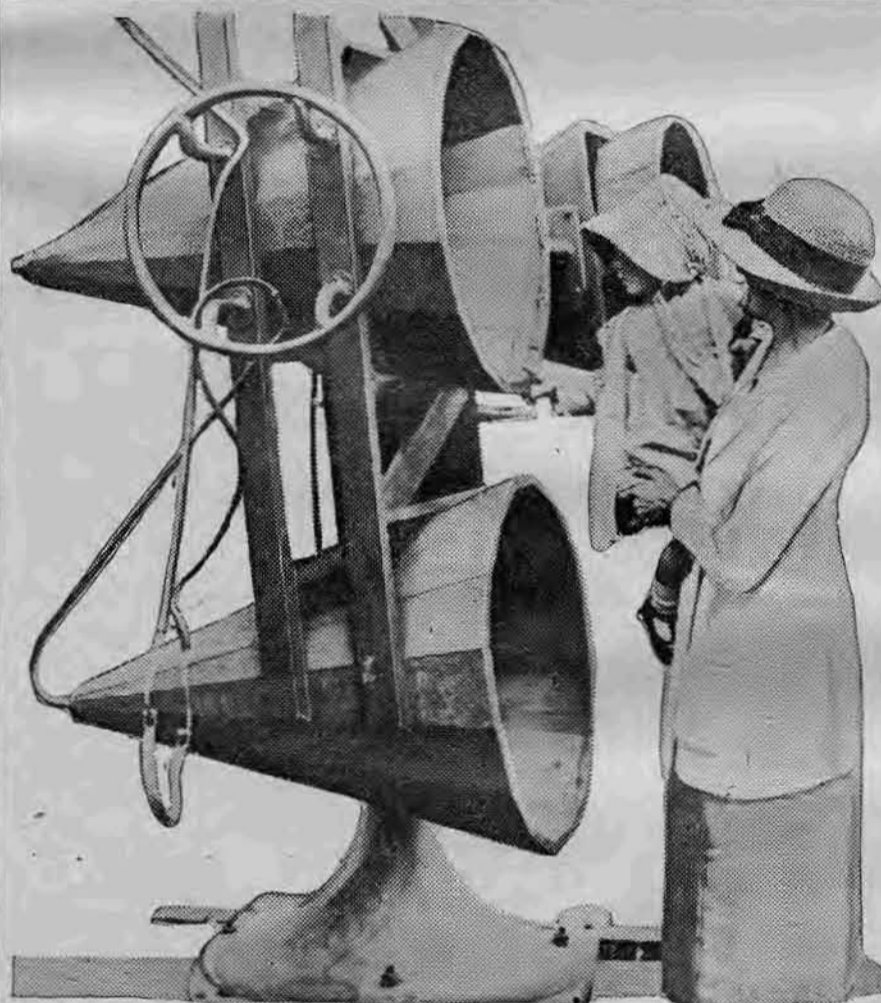
tions: WBZ; KDKA; WJZ; WGY; WGR; WOH; WFI; WWJ; NOF; to say nothing of many local stations. These results are remarkable when it is considered that the energy was intercepted solely by the coils in the circuit.

Mr. Nichols reports very good quality of signals, which, however, were not very QSA at the longer distances. Circuit noises on 360 meters were noticeable and persistent. However, on longer wave lengths, around 475 meters and above, these circuit noises were reduced.

During the recent target practice at the Boston Harbor forts, IIN heard the tugs towing the targets talk back and forth via Radiophone with the gun pointers in the forts, with remarkable clearness and with an absence of any circuit noises.

Experimenters using the new hook-up claim that the circuit is more dependable in its results over any given period of time than the usual circuit. If UV201 tubes are used, the grid bias on each tube should be approximately three volts negative, while for VT2 or Western Electric "E" tubes, a 9-volt grid bias is required.

ENGLISH "LISTENERS" NOW TALK



In England all the old aerial listeners used in London air raids during the war have been converted into Radio loud speaking horns for the public's use. In the photograph such a set is being used to shout forth messages sent from planes flying above © K. & H.

REPLACE OLD ARMY OUTFITS IN ALASKA

Modern Sets to Cut Costs of Operating

SEATTLE, WASH.—Antiquated Radio equipment now in use at Nome and other points in Alaska is being replaced with modern installations in accordance with a plan conceived at a conference of Army officers held last March, when it was pointed out that the Signal Corps Radio systems in Alaska did not include a single transmitter but which has long since been obsolete, demanding an unreasonable expenditure of energy, and consequent high operating cost.

As the Radio system in Alaska was deemed necessary as a feeder and distributing system for the wire system, as well as a reserve channel when the wires fail, it was recommended that available modern equipment be installed in the present stations, and that other stations be provided.

Work during the present summer will begin at Nome. The stations at Norovick, St. Michael, Kotlik, Holy Cross and possibly Nulato, may be completed this summer, and equipment is en route to Fairbanks, making it possible to remodel that station after river navigation has closed this fall.

CAGE AERIAL SPEEDS SUBMARINE'S DIVING

S-49, Equipped With Antenna, Goes Under in 40 Seconds

SAN FRANCISCO.—A photograph of the latest type of American submarine, the S-49, which has just been received in San Francisco, shows that the craft's Radio antenna, of the cage type, runs from stem to stern with its height greatest amidships. Seven years ago Radio antenna were carried on masts on American "subs," and these had to be taken down before the vessel could operate submerged. This system caused considerable delay in the working of the ship, and it also resulted in much loss in efficiency. Some idea of the perfected type of antenna equipped on the S-49 is seen in the fact that she can submerge in forty seconds. In appearance the S-49 is likened to the latest types of German U-boats, which, during the war, were equipped with an over-all cable having a knife edge for use in sawing British anti-submarine harbor nets when the U-boat had become entangled.

England Considers Three Radio Plans for Africa

LONDON, ENGLAND.—Premier Smuts, of the South African Union, made a statement today in the House of Assembly on the outlook for a Radio service in the Union.

The premier said the government was in possession of three schemes, namely, Marconi's, Elwell's and the British postoffice scheme.

Premier Smuts enumerated the many advantages of the Marconi offer, which provided for the formation of a South African Company with capital of £500,000 of which the Marconi Company of England was prepared to subscribe four-fifths, while one-fifth would be subscribed in South Africa. Of the capital of £500,000, £400,000 would be devoted to the erection of a Radio station of the vacuum tube type which was recommended by the British authorities and had already been adopted in Australia. This station would be capable of speaking with every continent.

Locates Distressed Ship By Aid of Radio Compass

(Special to RADIO DIGEST) WASHINGTON.—An interesting story has just reached the Bureau of Lighthouses of the Department of Commerce in connection with the value of Radio compasses in locating a ship in distress.

Recently the British steamer Lord Strathcona lost her propeller in a rough sea and sent out signals of distress. The American steamer W. M. Burton was assigned to her assistance, but upon arriving at her given position no signs of the vessel could be seen. The captain on the disabled ship had no sight for a couple of days and was uncertain of his position. The visibility was very poor, the report states, at the time and nothing could be seen further than a mile. The British ship Cassandra, which had a Radio compass in its Radio equipment, gave the bearing of the two ships from her position and very shortly afterward the steamer Lord Strathcona was sighted.

Radio Digest Illustrated

TRADE MARK
Published Weekly by
RADIO DIGEST PUBLISHING COMPANY
123 West Madison Street, CHICAGO, ILLINOIS

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

Entered as second-class matter April 27, 1922, at the postoffice at Chicago, Illinois, under the Act of March 3, 1879.

Vol. II Chicago, August 12, 1922 No. 5

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Looking Ahead

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

Amplifiers. Peter J. M. Clute will tell about the standard systems of amplification in use today.

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.

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HALTS ETHER WAR FOR JERSEY CHIEF

WJZ TEMPORARILY STOPS JAMMING THE AIR

Conference to Be Held in New York to Discuss Eastern Embroglio

NEWARK, N. J.—The anticipated "Radio war" between station WJZ, the Westinghouse plant in Newark, and the new broadcasting station, WOR, has been postponed temporarily. WJZ announced that out of respect for Governor Edwards of New Jersey, who spoke at the rival station, it would be silent between eight and nine o'clock, when it usually presents its air program.

A conference to be held in New York will determine future battle plans. WJZ has been accused of being a "bully" of the air.

NEW YORK.—War has broken out down east, but there are no casualties yet. The "jamming" of the air by transmitting stations has caused the war. Westinghouse station WJZ at Newark, N. J., refuses to enter into an agreement regarding schedules, thus precipitating the ultimatum.

The Radio Broadcasting Society of America, through its counsel, C. P. Caldwell, a former congressman, announced that it will appeal to Secretary Hoover to revoke the license of station WJZ, one of the largest and most powerful in America.

A threat to take drastic action on behalf of the broadcasting society against the Radio Corporation-Westinghouse station was strongly implied in a formal statement given out by former Congressman Caldwell.

Threatens WJZ

"At the suggestion of Secretary Hoover," said the statement, "the representatives of fifteen Radio broadcasting stations in the metropolitan district, held a conference on the 11th of May, 1922, and in the interests of the public, at the request of Mr. Hoover and his representatives, agreed upon non-conflicting hours for broadcasting.

"All agreed except one. At that meeting the schedule was arranged covering all of the hours of the day from early morning till midnight every day in the week. Certain specified periods were allotted to each broadcasting station, the non-agreeing one getting more than half the time, and so arranged that no conflict of importance would occur, so that in every locality the owner of a receiving set would be sure that at any moment of the day he could find something in the air, uninterrupted, of interest to him and his friends.

Ignore Disturber

"At a meeting of the Radio Broadcasting Society of America on May 15, 1922, thirty days having elapsed which was considered sufficient time for any one to make up his mind, a resolution was passed to which all of the broadcasters except the disturber agreed that the schedule would be put into operation on Monday, July 24, and would be operated continuously thereafter."

Ohio County Courthouse to Have Receiving Set

LONDON, O.—Arrangements are being made by the Madison County Farm Bureau for the immediate erection on the courthouse dome here, of one of the best receiving sets in this part of the state. The outfit will receive the market reports being sent out from the terminal markets and from here the reports will be telephoned to the various villages in the county. The main idea is to aid in the marketing of the live stock of this section.

CANARY ISLES HOME OF WHISTLING TUBES

WASHINGTON.—American Radio manufacturers might just as well pass up the Canary Islands as a market, in the opinion of American Consul F. A. Henry at Tenerife. There is not a chance to compete with the "whistling language" of the natives. The inhabitants of Gomera Island use a system of whistling hundreds of years old.

CARRIER PIGEONS TO GO SAME AS DOBBIN

ANOTHER relic of an older order has passed or is passing with the advent of Radio. The market for carrier pigeons on which premium was so high during the late war, has taken a slump since Radio became popular as a bearer of messages. Just as the automobile replaced old "Dobbin," so is the ether wave making a curiosity of the carrier pigeon.

BEAUTY AS CHARMING PRELUDE



Station WOR, Newark, N. J., boasts of having the only woman broadcast announcer in the country, Miss Jessie E. Koewing (pictured above). Fans who have been nightly hearing a sweet voice penetrating the ethereal waves with "J. E. K. announcing," will now no doubt purchase commutation for the Jersey city.

RADIO WILL FLOOD CAMP CONCESSION CAUSES ROW

Giant Receiving Apparatus Being Installed at Camp Perry

CAMP PERRY, O.—Members of Company C, 166th Infantry, Ohio National Guard, will receive the benefit of the receiving apparatus being installed here when the organization goes into camp on August 9 for a two weeks' summer training. The set is being installed at the Y. M. C. A. hut at the camp and will entertain the guardsmen with concerts, sport news and church sermons. The outfit is equipped with a giant amplifier to magnify the sounds so that they can be heard in all parts of the camp.

Socialists Attack Austrian Government Favoring British Firm

(Special to RADIO DIGEST)
NEW YORK.—Quite a furore has been raised in Austria, it is said, by the action of the government in granting a Radio concession to the British Marconi Company instead of to a German firm which offered the same terms. The Socialist press is reported to have made this concession a new ground for attack upon the government, complaining that Austrian Radio traffic should not be put under control of a company dependent on allied capital.

BIG FELLOWS MEET TO HELP INDUSTRY

ELECT DAVIS PRESIDENT CHAMBER OF COMMERCE

Commander Hopper Urges Ether Development as means of War-time Defense

(Special to RADIO DIGEST)

WASHINGTON.—A two days session of the first annual convention of the National Radio Chamber of Commerce was held in this city on July 26 and 27. W. H. Davis was elected president of the organization. The other officers elected for the ensuing year include: H. J. Powers, vice president; Floyd Marshall, treasurer, and George Lewis, secretary.

Dr. Louis du P. Clement, of Philadelphia, made the opening address in place of Secretary of Commerce Hoover, who was unable to attend because of the coal strike. In part he said:

"Nature has taught us to take advantage of the different stores of energy in its waterfalls, coal, oil, wood, flood and tide. Man-made mechanism has made it possible to apply this energy in a beneficial manner conforming with man-made laws of protection, to the society of mankind.

"Radio is a late revelation of energy," Dr. Clement continued, "and therefore as yet quite untamed. It will be the first duty of this new and important body of men gathered to form this organization, to chain Radio as an industrial activity in the bondage of standardization governed by trade rules and regulations beneficial to producer and consumer alike. Let this chamber be the center of Radio authority co-operating with the legislative branches of the government, thus securing for the public a well applied and controlled utility of vast importance in the public service."

To Aid Country in War

Lieut. Commander S. C. Hopper, chief of the Radio Division of the Bureau of Engineering of the Navy Department, spoke to the convention on "The Live Manufacturing Organization During an Emergency." Commander Hopper emphasized the value of Radio development toward the preparedness of the country and urged that manufacturers co-operate with the government in perfecting this means of defense.

Captain Guy Hill of the Radio section of the Signal Corps of the Army spoke of the army Radio devices. Other speakers included B. L. Moore, of Buffalo; H. J. Powers and Powell Gosley.

The delegates were received at the White House by the President, and were also the guests of Dr. S. W. Stratton, Director of the Bureau of Standards, where they were shown through the experimental laboratories of the bureau.

Before adjournment the convention adopted a constitution and by-laws. The constitution set out the fact that the purposes of the chamber were solely to promote the use of Radio as a public utility and to standardize manufactures by American producers.

On the last night of the convention a banquet was held at which Dr. Stratton was one of the principal speakers. He said that in his opinion some legislation must be enacted regarding Radio traffic and that he hoped that Congress would soon be able to start on the measure before them.

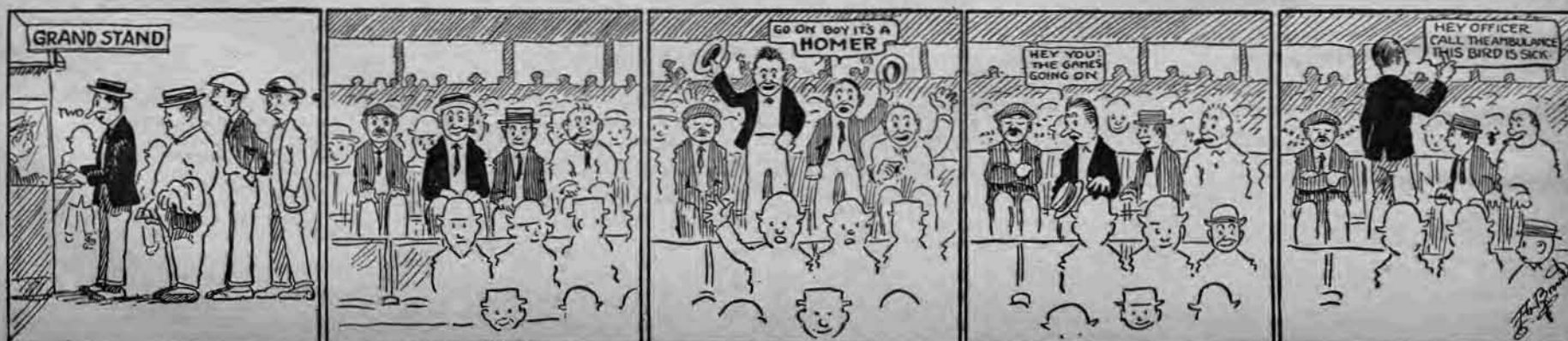
To Airphone Seine Arrivals

PARIS, FRANCE.—The French Government has established Radio stations at Rouen, and pilot boats on the Seine, similarly equipped, will keep the port authorities informed of the arrival of all ships coming up the Seine. This information will be transmitted to the post office, which will in turn instruct the pilot vessels where to berth the ships on their arrival.

THE ANTENNA BROTHERS

Spir L. and Lew P.

A Dead Tube from Philly



GENERAL SQUIER TO HELP IN DEDICATION

SIGNAL CORPS CHIEF WILL TALK ON FARM RADIO

Recognized Leader in Science to Bring Special Message to Grafton, Vermont Celebration

(Special to RADIO DIGEST)

GRAFTON, VT.—Major General George O. Squier, chief of the Signal Service, United States Army, and a world recognized leader in official United States Government activities in Radio, will participate in the Old Home Day celebration here, when a bronze memorial tablet will be dedicated in honor of Grafton's soldiers in the wars for the nation's defense.

General Squier will not only assist at the dedication, but will bring a message of special import on the future development of Radio as it affects the farmer and residents of isolated or country towns. What he will say will prove of direct interest to Vermont, New England, and the entire country in fact. He is declining nearly all other invitations, but has consented to come to Grafton as a tribute to New England and Vermont and the rapid growth of Radio in this section of the country.

Speeding Canadian Trains Get Waves

Successful Experiments Offer New Radio Field in Dominion of Canada

(Special to RADIO DIGEST)

TORONTO, ONT., CAN.—A new field in Radio work in Canada has been opened by the Canadian National Telegraphs. A series of experiments in connection with the transmission by Radio from a central broadcasting station in Toronto to high speed passenger trains operating between Toronto and Ottawa have been carried out and proved very successful. These have proved beyond doubt that it is possible to transmit by Radio to moving trains and that the handicap of train vibrations can be eliminated so far as efficiency in the receipt of concerts, bulletins and other messages is concerned. The new idea in transmission will be developed not only as a convenience to the public, but also in connection with the movements of trains.

Toronto was picked up by the train speeding westward near Brighton, 92 miles east of Toronto. Later Buffalo, station WGR, was heard quite distinctly for a considerable period, and music and conversation were heard in excellent volume.

Air Waves Aid Nabbing of Two Auto Thieves

FORT WORTH, TEX.—Radio as a thief catcher furnished a concrete example of its value to police authorities of this city last week when two automobile thieves and an expensive motor car were nabbed in a town 60 miles away, just four hours after they took the automobile.

The car of Charles Harris was stolen on one of the main streets of Fort Worth between 4 and 5 o'clock in the afternoon. At 5:15 o'clock the fact was carried in the Radio police report of WBAP broadcasting station, owned by The Fort Worth Star Telegram. Police officers at Gainesville, Tex., copied the report which contained a description of the car. Three hours later as the thieves reached Gainesville the car was recognized and all were gathered in by the police.

Claims Invention of Desk Set

CHICAGO.—H. L. Mather of this city has filed an affidavit claiming that he is the inventor of the desk phone set described in the July 29 issue of RADIO DIGEST ILLUSTRATED. The set is said to use no crystal rectifier, but instead a "modulator."

Cincinnati Show in October

CINCINNATI, O.—Arrangements have just been completed for a Radio show in combination with an electrical exhibition in this city from October 2 to 7 inclusive in the Music-Hall. It is expected to draw many thousands of prospective buyers who desire to see the latest products of Radio and electricity.

India to Have Its Own System

ALLAHABAD, INDIA.—The government of India is considering the establishment of an inland system of low power Radio stations.

The system will not include communication with Great Britain.

Dry Cells And B Batteries

By Frank M. Weaver

DRY CELLS first appeared in this country about 1890 but several years elapsed before a reliable cell of American manufacture was placed on the market. From the very start their use increased very rapidly. The present dry cell is the outgrowth of the Lechanché cell which appeared about 1868. Lechanché refers to the depolarizing action as a combustion of hydrogen. The success of the Lechanché cell led numerous attempts to make its electrolyte unspillable. Various absorbent fillers such as sand, sawdust, asbestos fiber, etc., were tried during the experimental stage following. In 1888 Gassner produced the first successful dry cell which consisted of a zinc can serving as the anode and also container of the cell, a carbon rod surrounded by a depolarizing mixture which was wrapped in cloth, and the electrolyte in the form of a jelly constituted the cell. The open circuit voltage was about 1.3 volts and its short-circuit current about 6 amperes. The dry cell of today was developed from this cell of Gassner.

Why They Call It "Dry" Cell

The dry cell has been so named because the electrolyte is contained in absorbent material. The cell, however, is not dry, in fact one of the essential requirements in its makeup is that it is sufficiently wet under all ordinary conditions.

In the modern dry cell, the electrolyte consists principally of a water solution of ammonium chloride (sal ammoniac), manganese dioxide, and zinc chloride, together with other ingredients usually considered as a trade secret by the manufacturer. The ammonium chloride is the active chemical in the electrolyte, the zinc chloride being added to suppress local action when the cell is standing idle.

The depolarizer is a mixture of manganese-dioxide and crushed carbon. The purpose of the manganese-dioxide is to consume the bubbles of hydrogen liberated by chemical action in the cell, which bubbles would increase the internal resistance of the cell and also set up a counter electromotive force opposite in polarity to the useful electromotive force.

The carbon rod merely serves to conduct the current out of the crushed carbon-manganese-dioxide mixture and is the positive terminal of the battery.

Why Amperage Falls Off After Use

When a dry cell (referring more particularly to the No. 6 size), is new, the carbon-manganese-dioxide mixture nearest the zinc may be considered as the surface of the negative electrode or cathode. As the cell continues in use this outer surface of the mixture is reduced to a lower state of oxidation through the action of the depolarizer, and as this takes place the active surface of the mixture gradually travels toward the center of the mass.

New Great Lakes Phone Set in Working Order

CHICAGO.—The superintendent of the ninth naval district has announced that the new broadcasting station at the Great Lakes Naval Training school has been completed and will within the next week be placed in operation. With its opening Chicago telephone subscribers will have a new outlet for long distance communication.

The new station has a range of more than 300 miles. It will operate on a wave length of 507 meters and will be used primarily for postoffice and weather reports.

Regulations are to be forthcoming from Washington shortly, however, that will allow broadcasting of certain classes of private messages—perhaps even musical concerts.

Signal Corps Uses Arlington

WASHINGTON.—Through the co-operation of the naval communications service, the Radio section of the Signal Corps has acquired the use of part of the big Arlington station for its chief sending station out of the capital. Two sets will be used by the army exclusively; one tube set with 10 kilowatts in the antenna and another with 20 kilowatts in the antenna. The latter, used on about 3,000 meter waves, should carry as far west as Omaha. Today the Signal Corps is using a two kilowatt transmitting set at Arlington for regular traffic on 2,650 meters, controlled from the Radio headquarters in the Munitions Building.

"Lee" Predicts Millions

NEW YORK.—Dr. Lee de Forest, Radio pioneer, before leaving for Germany recently, stated that the day of Radio was at hand in a message read at the Boston Radio Exposition. The present published estimate of a Radio public of 1,000,000 Dr. de Forest considers highly conservative; his own figure is that within two years there will be 5,000,000 and by 1927—20,000,000.

or away from the zinc, thus forming a longer path of higher internal resistance. This necessarily reduces the short circuit current test of the battery.

It was at one time thought that this increase of internal resistance was due to escape of moisture from the battery, but this is not usually the cause, although some of the moisture in the cell is used up in the course of the chemical actions taking place within the cell.

Telling the Positive Pole

Within the cell the current flows from the active to the inactive electrode, (zinc to carbon), while in the external circuit it must flow from carbon to zinc to complete the circuit. Therefore, the carbon must be the positive pole of the battery. It is sometimes confusing that the carbon is the negative element or electrode and, also, the positive pole of the battery and that the zinc is the positive element or electrode and negative pole of the battery. When the word element or electrode is used you must associate it with the flow of current within the cell; when the word pole of the battery is used, associate it with the flow of current in the external circuit. If you remember that inside the cell the flow of current is from the active (zinc) to inactive material (carbon) you are safe.

When any metallic impurities are present in the zinc, such metallic impurities, together with the pure zinc they are in contact, and both being exposed to the electrolyte form a short circuited galvanic couple which causes rapid corrosion and destruction of the zinc case. Metallic impurities in the manganese, such as copper and iron, must be guarded against as they form a high resistance internal short circuit which is detrimental to the cell.

Noisy B Batteries

When B batteries were first manufactured it was found that the action of polarization and depolarization in some cases caused momentary minute changes in the internal resistance of the cell which resulted in a sort of a microphone action. When this variation in B battery current was amplified through several stages, a quite noticeable frying and sputtering sound resulted in the phones. While some noisy battery effects may be due to loosely capped battery carbons, to corrosion under the brass caps of the carbons due to creeping salts, or to loose connections, the best B batteries are so constructed that in the course of polarization the bubbles of hydrogen accumulating within the cell are broken up and consumed by the polarizer early in their state of formation.

Whatever zinc is consumed by chemical action it is reasonable to suppose that gas is generated. This gas must escape. In the case of most dry cells of foreign make and a few made in this country, provision for escape of gas from the cell is made by providing a small vent hole in the sealing wax. In practically all dry cells of American manufacturers the gas escapes as follows:

When the hot sealing wax is poured, upon cooling it shrinks slightly, leaving the cell sealed mechanically but not hermetically. The gases, therefore, gradually escape between the sealing wax and the zinc case.

Escape of Gas From B Batteries

When the cells composing a B battery were first sealed up into block form the real trouble started. One B battery manufacturer in the North wraps the individual cells in paper which is crimped or folded over at the top. In this case after the B battery is cast in bloc with sealing wax the gas can still escape inside this paper wrapping to the bottom of the cell.

Another B battery manufacturer in the "Smoky City" says, "Why seal them into block form, but instead leave them as individual cells?"

These units are connected up in series, each being provided with a binding post, thus forming a refillable and variable voltage B battery. In a large number of dry cells it is found in most cases that a cell or two fails long before the others. In case a cell or two fails a new cell can be inserted. Provision in such a battery is made that a new cell can be inserted without soldering.

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 LIST

6,840 Retail Radio Dealers, Price per M... \$7.50
590 Radio Manufacturers, per List... 7.50
705 Radio Supply Jobbers, per List... 7.50
260 Owners of Radio Stations, per List... 4.00

Trade Circular Addressing Co.
166 W. Adams Street Chicago, Ill.
FRANKLIN 1182-1183

BRITISH ARGUMENTS TIE UP BROADCASTS

MANUFACTURERS NOT FOR MONOPOLISTIC PLAN

Eight Stations Costing £20,000 Each May Be Erected—Suggest Larger License Fee

LONDON, ENGLAND.—There is still much uncertainty regarding the conditions under which Radio broadcasting will be carried out in England. Differences have arisen between manufacturers and the Postmaster General, and conferences are now being held, attended by representatives of between 40 and 50 firms, including those which have applied for licenses to broadcast.

The vital question is as to the erection of broadcasting stations, one group wishing to have the construction of all of them handled by one organization, and the other, composed of smaller manufacturers, opposing this office which they characterize as monopolistic.

The scheme as outlined calls for eight stations which are expected to cost approximately £20,000 each. In connection with the cost of the broadcasting program it has been suggested that the Government's "listening in" license fee be increased and that the additional sum thereby obtained be placed in a common fund out of which the programs would be provided. At present it is proposed to charge 10/6 (\$2.44 at par) for registration of receiving sets.

LONGEST WAY 'ROUND SHORTEST WAY HOME

Right Under Fight but Hear Returns by Radio

NEW YORK.—At a prize fight, held recently in Madison Square Garden here, there were several men at work in the cellar underneath the main floor, during the fight. These men were anxious to learn the outcome of the fight upstairs, but had no means of learning the details. One of the men bethought himself of a friend, who, he knew, had a Radio receiving set, and he remembered the fact that the fight returns were being broadcast from Newark, station WJZ.

So he telephoned his friend, who rigged up his set with a loud speaker near the mouthpiece of a telephone connected to the cellar of the Garden, and thus the workman at the receiver of the telephone in the cellar was able to learn the details by Radio of the fight going on right above, within a few feet of the telephone. The complete circuit was as follows: The fight returns were sent from the Garden to Newark by land telephone, broadcast by Radio from Newark, and returned to the cellar of the Garden by land phone again!

"ALL-AMERICAN" PRODUCTS

Radio and Audio Frequency Transformers, Variable Condensers, 50 Watt Tube Sockets, Grid condensers.
Send for illustrated folder
Rauland Manufacturing Co.
35 South Dearborn Street Chicago

Greatest Event in Southern California FIRST ANNUAL

RADIO and Electrical Appliance SHOW

Los Angeles, Calif.

August 14th to 20th

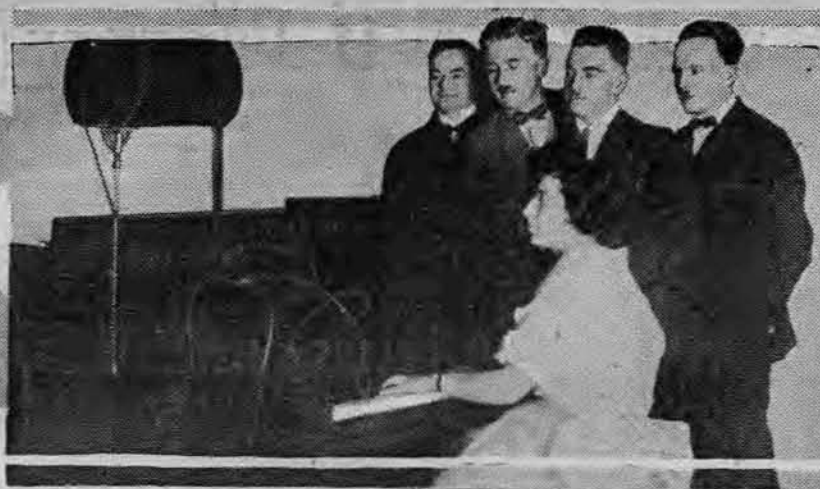
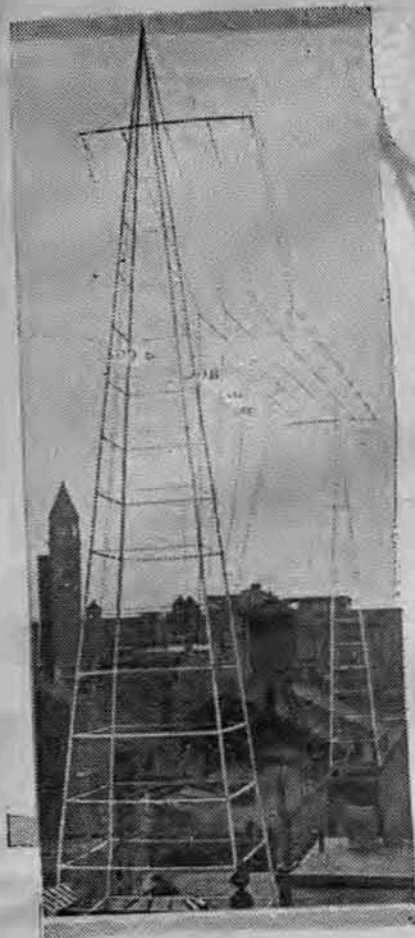
"For the Advancement of Radio Science"
Los Angeles has 19 Broadcasting Stations, more than any other city in the United States. California has more than any state in the East.

PRESIDENT HARDING

will open the show by Radio

Honorary Chairmen
GOV. WM. D. STEPHENS
MAYOR GEORGE E. CRYER
MAYOR J. F. DILLON
Radio Inspector, 6th District

For Space Address
G. P. MILLS, General Manager
536 Mason Building Los Angeles, Calif.
or CHICAGO OFFICE
Room 609 Baltimore Building
Harrison 5060



Eighty feet above the Toronto Star building roof swing the fifteen hundred feet of copper wires forming the antenna of that newspaper's station, CFCA. CFCA's famous male quartet is shown microphoning in the center picture. On the right is Canada's first "concert flivver," equipped by the Star as a surprise for the Toronto public

TORONTO STAR HAS CANADA'S BEST SET

Fifteen Newspapers Boast Stations; More Will Be Installed Soon

(Special to RADIO DIGEST)

TORONTO, ONT., CAN.—Although newspapers and large manufacturing concerns throughout the United States were the first to display a public interest in Radio, Canada has not taken long to follow the new science. No sooner had the first news been broadcast from Stations at New York and other large centers, when several newspapers and large firms in Canada turned their interest to installing stations. At the present time there are fifteen newspapers that can boast of broadcasting stations, and many more have completed arrangements to install plants within the near future. Some of the outfits are small in comparison with those in the United States, but a few are worthy of more than passing notice and are a credit to the general development.

At the present time the Toronto Daily Star has the best equipped Canadian station and one that is advancing the new science in an admirable manner.

First Big Station Success

All previous records in Canada were broken a few weeks ago when the Star station, CFCA, with its latest equipment was formally opened. Reports from various sources indicate that the entire performance was radiated into space with much greater volume and better modulation than in any former instance. Congratulations came from many outside points the following morning, and while the station is not yet completed, the concerts being given are considered by experts as the best ever given in Canada and ones that compare favorably with those in the United States.

The Star station has made a good start. In the first place it has been successful in securing some wonderful speakers and artists who were featured with a distinction. Lord French, on his visit to this country, gave out his official message to the people of Canada and the United States from King George, thanking the soldiers and sailors in the States and Canada for their loyalty during the Great War. He also gave an interesting address on the progress of Radio in England in comparison with that in the States and Canada. He declared that the restrictions in Great Britain are a serious handicap to those interested, and said he is going to emphasize this point on his return to England. Among other well known speakers are Col. Henry Cockshutt, Lieutenant-Governor of Ontario; Captain Albert H. Munday, D. B. Hanna, president of the Canadian National Railway, and General San Yadmum of the Japanese Army, who gave a brilliant speech on conditions in Japan.

Equip Train for Stunt

When President Hanna of the Canadian National Railway spoke, special arrangements were made to equip one of the railway Pullmans. A car was equipped with a receiving outfit and started on its journey and picked up every word while traveling at a fast rate. This was, in a way, an innovation, as it was the first message received by a train in Canada, and President Hanna expressed pleasure and declared that he intends making a special department with the Canadian National for the equipment of all trains with Radio outfits for the convenience of the passengers.

In giving a short address on aviation Captain Albert H. Munday, author of "The Eyes of the Army and Navy," has the distinction of giving the first Radio address on aviation in Canada. Several

amusing experiences across the lines were given, in which some thrilling fights with enemy planes figured. A few moments were spent in giving a few of the sensations in flying over the sea while on anti-zeppelin and anti-submarine patrols.

Fit Out Radio Flivver

Probably the first concert motor car in Canada is the Star's "flivver," fitted with coil antenna and loud speaking horn on its top. The car made its debut recently at Sunnyside beach, Toronto, and entertained the multitudes in bathing. CFCA was, of course, the original source of the concert which was reproduced for the many interested persons who gathered about the car.

The one handicap to the performance was the enthusiasm of some spectators in crowding close to the car and touching the sides. This had the effect of grounding the aerial and cutting the volume down to a whisper. It was corrected, however, by a roped enclosure provided by the courtesy of the Sunnyside management. Some barricade was found necessary because even a watchful policeman couldn't restrain curious small boys who were determined to discover the phonograph they were sure was concealed somewhere within the monster.

CFCA a Broadcast Pioneer

CFCA was one of the first stations to broadcast in Canada. The Star commenced early in March of this year on an outfit loaned by the Canadian Independent Telephone Company, and ever since the first offerings has been commended on the many successful concerts.

The range of the new set is approximately 500 miles. The new call sign is CFCA, having been CKCE at first, and the wave length has been changed from 450 meters to 400 meters. The outfit is equipped with four 500-watt tubes as oscillators with two 250-watt tubes as modulators. The power equipment employs a five horsepower motor to run a 2,000-volt generator for supplying current to the filaments of the tubes. The modulator tubes get their current from an 18-volt storage battery, and the equipment includes apparatus for charging the battery.

KANSAS GETS ONE OF NATION'S STRONGEST

HUTCHINSON, KAN.—The state of Kansas led the country, or at least was in the first van of the dry movement, but the rest of the country until recently appeared to have badly beaten Kansas in Radio. But word comes that one of the four most powerful Radio broadcasting stations in the United States is being erected at Hutchinson, Kan. It is said that the new station will have a sending range of thousands of miles by day and world-wide communication by night.

The antenna is a five-wire T type, supported by two 80-foot steel towers from the roof of the Star building. The length of the antenna is 200 feet with a lead-in of 100 feet, making a total of 1,500 feet of wire in the antenna and lead-in. In tests carried out during the past few days the antenna current has averaged over six amperes.

Drape Studio to Stop Echoes

The broadcasting studio is draped and carpeted in order to prevent echoes and foreign sounds. The motor-generator is housed in a sound-proof vault, and the transmitter itself is in a separate sound-proof room. In the studio itself the only Radio apparatus will be microphones to pick up the sounds.

A long range receiving outfit will be used to enable reception of all the principal high powered stations in Europe and many others on the western hemisphere.

E. J. Bowers has been secured as operator of the Star station. Mr. Bowers was the first president of the Radio Association of Ontario, being elected in 1913, and has, since the foundation of the association, been one of its most active members. He is also a charter member of the Radio Research Club of Canada. He was one of the first to work with amateurs in the United States in the old days.

Basil Lake, who served with distinction as a Radio operator during the war and who has had many years of newspaper work, has been appointed Radio Editor of the Star and is actively engaged in club and research work.

Try This on Your Crystal Set

Sometimes it is very difficult to get a sensitive spot on your crystal. Try the following plan: Take a discarded crystal, and pulverize it, but not very finely. Put some of this inside a metal casing and screw it into the cup of your detector. You will be surprised to note how quickly you can find a good spot.

NEW GOTHAM STATION TO SEND MUSIC DAILY

Noon-Day and Late Afternoon Programs Scheduled

(Special to RADIO DIGEST)

NEW YORK.—A musical program will be given between 11:00 a. m. and 12:00 m. and 4:30 p. m. and 5:30 p. m., eastern standard time, week-days over the new Radio broadcasting station WBAY, which was recently erected on the Walker Street Building of the American Telephone and Telegraph Company. A program will also be given on Thursday evenings from 7:30 p. m. to midnight.

This station, which is intended for commercial broadcasting, has been assigned, for the present, a wave length of 360 meters. This does not permit simultaneous operating with the other broadcasting stations operating on the same wave length in this area. As a consequence the available hours have been assigned to the different stations operating in the vicinity of New York by an agreement between the stations themselves and with the approval of the Department of Commerce. The above schedule of two hours in the day time and four and one-half on Thursday evenings is the temporary schedule which has been assigned to WBAY.

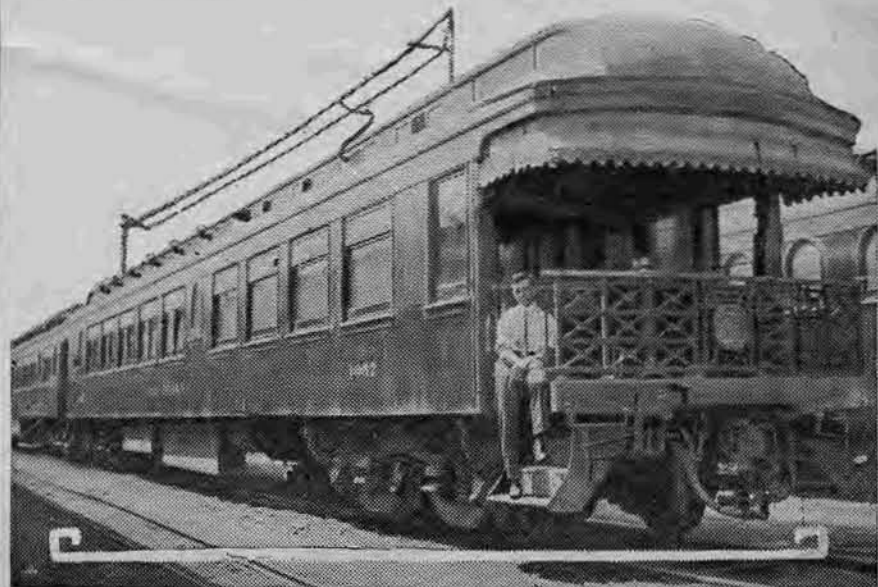
A. W. Drake, general commercial manager, in charge of the station, says that there have been close to 100 applicants for its use and that he has taken steps to arrange with these applicants for the programs which they are to provide.

While Radio advertising has not as yet been prohibited by laws or regulations, it is considered that applicants for the use of the station should provide programs of general interest.

Cooler Weather Brings Jump in Week's Permits

CHICAGO.—Twenty limited commercial licenses were issued to stations erected for public service broadcasting from July 24th to 29th. The number is the largest for several months and is due to the resumption of Radio popularity with cooler weather. The list follows:

WJB, American Radio Co., Lincoln, Nebr.; WIAS, Burlington Hawk Eye Home, Burlington, Ia.; KFAV, Cook & Chapman, Venice, Cal.; KFAW, The Radio Den, Santa Ana, Cal.; KFBE, F. H. Smith, Butte, Mont.; WJAE, Texas Radio Syndicate, San Antonio, Tex.; WIAN, Chronicle & News Pub. Co., Allentown, Pa.; WIAQ, Chronicle Publishing Co., Marion, Ind.; WIAF, Gustav A. DeCortin, New Orleans, La.; KFBE, Reuben H. Horn, San Luis Obispo, Cal.; WJAD, Jackson's Radio Eng. Lab., Waco, Tex.; WIAQ, Matthews Elect. Supply Co., Birmingham, Ala.; WIAQ, Ocean City Yacht Club, Ocean City, N. J.; WHAW, Pierce Elect. Co., Tampa, Fla.; WIAP, Radio Development Corp., Springfield, Mass.; WIAR, J. A. Rudy & Sons, Paducah, Ky.; WIAQ, School of Engineering of Milwaukee, Milwaukee, Wis.; WIAL, Standard Radio Service Co., Norwood, Ohio; WHAV, Wilmington Electrical Specialty Co., Wilmington, Del.; WIAE, Mrs. Robert E. Zimmerman, Venton, Iowa.



First set to be installed in a Canadian Pullman was arranged by the Toronto Star. The feat won the favor of the road's president, whose speech it caught

SUPER FEED-BACK SIMPLY EXPLAINED

W. W. HARPER OF CHICAGO
SHOWS CONSTRUCTION

Attains Success with New Armstrong
Circuit—Gives Values of Apparatus
Constants Used

(See Photo-Diagram, Page 7)

CHICAGO.—W. W. Harper, consulting radio engineer for the Kramer Radio Co., 4713 Sheridan Road, this city, has designed and constructed one of the most efficient Armstrong Super-Regenerators since the announcement of the new circuit. The photo-diagram, page 7, this issue, RADIO DIGEST ILLUSTRATED, is made from Mr. Harper's set on exhibit at the Kramer store. It clearly shows each individual part used, and its relative position, function, and value.

Mr. Harper, member of the Institute of Radio Engineers and the American Physical Society, is a "bug" of old standing, formerly having operated station 9XAD. Concerning the circuit, he has written the following article for RADIO DIGEST:

"The purpose of this article is to bring out in a non-technical manner the essentials and construction of the new Armstrong super-regenerative system for Radiophone reception.

Circuit Explanation

"The circuit shown at the bottom of the photo-diagram page is fundamentally the same circuit as suggested by Armstrong in his paper 'Some Recent Developments in Regenerative Circuits' which he presented before the Institute of Radio Engineers on June 7th. The circuit to which I refer in this paper is circuit 12. A few modifications have been added, namely, the air core choke L4 and the condenser C2, and one stage of audio frequency amplification. The first modification mentioned enables the oscillations in the second tube to be more easily controlled and eliminates the necessity of having coils L5 and L3 inductively related.

"In setting up such a receiver the writer would suggest that no attempts be made to assemble the apparatus in a fixed or permanent manner, otherwise the amateur would find it inconvenient to follow the developments and improvements made on the circuit. It will be noticed that the first part of the circuit is identical to the ordinary feed-back receiving circuit, with the exceptions that no grid condenser or leak is utilized and that the output is not taken from the plate circuit of this tube.

Greater Output Obtained

"The output is taken from the plate circuit of the oscillator tube I1 and led into the transformer T of a regular audio frequency amplifier. By taking the output at this point of the circuit greater amplification is obtained than if the audio frequency amplifier were connected in the circuit of the tube I at point M. It might be advisable when first connecting up the circuit to insert the phones in the usual manner at point M in order to ascertain that the first tube is in proper oscillating condition. The inductance coil L is connected to antenna and ground in the usual manner. The coil L should be quite loosely coupled to L1 of the input circuit of the first tube. In using a loop antenna (approximately 12 turns on a three-foot square) in the place of the regular antenna, the coil L is not used, and the leads from the loop are directly connected to the ends of the coil L1, making a conductive or direct coupled arrangement.

Filter System May Be Inserted

"In this circuit the filter system described by Armstrong at the Radio Club of America has been omitted and shown separately for the sake of simplicity. This filter is illustrated in the lower right-hand corner of the page. It is connected in the leads marked x and y in the circuit diagram. Additional batteries may be inserted at lead O of the amplifier to increase the volume of the sound from the loud speaker (L. S.). The size of this battery and also the size of the battery B depends upon the tubes used. For Radiotron UV201 tubes, approximately 90 volts will suffice in the majority of cases. Where power tubes are used a plate potential corresponding to the tube is used. In all instances hard or non-gaseous tubes are employed. In like manner the grid bias battery for the tubes depends upon the individual tube in question. On many tubes it will be found unnecessary to use bias batteries. This is especially true of the Radiotron UV201. In event the tubes used require bias batteries, these are inserted in the grid leads indicated in the circuit diagram by E, F, and G."

Further Explanation

Further appending Mr. Harper's article and the photo-diagram, page 7, there are several troublesome questions which may occur to the mind of the amateur constructing the super-regenerator.

Coils L3, L4, and L5 are NOT in inductive relation, and in fact should be placed at right angles to one another, shielding if necessary. Another point to remember is that hard tubes or amplifier tubes must be used throughout. No grid leak-condenser

combinations are used on any of the tubes.

Honeycomb or duo-lateral coils are specified because of their ease in setting up the circuit. They are not essential, however. Any coils having similar values in millihenries inductance will serve as well.

For the benefit of the fan who wishes to wind his own coils, the following millihenry values of the specified honeycomb coils are given:

Coil L25 = 0.04 millihenries; L35 = .075; L50 = 0.15; L75 = 0.3; L100 = 0.6; L400 = 1.0; L1250 = 125; L1500 = 175.

Instead of the L, L1, L2 honeycomb coil combination used in tuning the primary, secondary and tickler circuits, a variocoupler with tickler coil, spiderweb coils, or other tuning devices may be used. One point to be remembered, however, is that these tuning devices should have winding values approximating those of the specified honeycomb coils.

When using a loop or coil antenna, an ordinary variocoupler may be used to replace L1 and L2. The primary will be used as L1 and secondary as the tickler coil, L2. The secondary may have to be rewound to contain about twice as many turns as originally.

STATION IN ATHENS NEARS COMPLETION

SXG Will Handle Only Official
Messages

(Special to RADIO DIGEST)

ATHENS, GREECE.—The Radio Telegraph Direction Service of the Hellenian Royal Navy has practically completed a new 60 kilowatt Radio station here to handle official messages. This station, which will be known as SXG, will clear a large number of official messages previously transmitted by Coast Station Athens No. 2, SXB, which is open to general public correspondence. The state of war in Greece has so increased the number of messages as to overburden this station, making it impossible to insure communication for the public. Desiring to improve public Radio communication, especially with ships, the Radio Telegraph Service will open station SXG for official communication, thus permitting SXB to operate for the public exclusively.

SIGNALS POOR; AERIAL TAPPED BY NEIGHBOR

Butt of Joke Innocently "Listens
In" on Pirate-Set

AKRON, O.—R. M. Meier was wondering lately why his receiving set didn't work as good as normally. Signals came in very poorly. He examined his batteries and looked over all connections. Still the trouble could not be found.

Finally he looked over his aerial and found—what do you suppose?—that the fellow upstairs who was supposed to be using a loop in the attic, and was getting good results on his crystal detector set, had tapped his aerial instead! This was why Meier couldn't get good results on his receiver.

The joke of it is, the fellow upstairs had invited Meier to come up and hear his set work recently and it was just about this time that Meier's receiving set had stopped functioning. So he was listening on his own aerial with somebody else's set without knowing it was his own aerial.

Life Speeds Up for Men at NZV Compass Station

CHARLESTOWN, S. C.—The life of the personnel of the naval Radio compass stations is often found slow and monotonous, but during the week of July 4th the men at Folly Island, station NZV, led a strenuous life. Due to their own prowess, they were provided with fresh meat for a week. A number of the men stationed on this island, about 8 miles off North Carolina, indulged in the rare sport of landing a four hundred and ten pound turtle, which contained over three hundred eggs, and at the same time other Radio fishermen caught sixty-five pounds of game bass which obviated the necessity of eating "canned willie" and "gold fish" for that week at least. Immediate results were obvious, as the local Radio baseball team won fifteen out of twenty ball games played.

All Parts for the

ARMSTRONG Super-Regenerative CIRCUIT

Prices Reasonable : Send for Circular

Kramer Radio Company
4713 Sheridan Rd., Chicago, Ill.

Book Reviews

WJW, The Detroit News, is the title of a small book published by the Evening News Association of Detroit. It gives in brief the growth of that newspaper plant from its birth to the present date, and tells about their well-known Radio transmitting station.

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.

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

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, \$5.00.

Radio Communication, Theory and Methods. By John Mills. The fundamental principles and methods upon which recent developments are based are emphasized. The vacuum tube is treated in a simple, fundamental and up-to-date manner. Present methods and tendencies of the art are explained in a chapter which is non-mathematical. Price, \$2.00.

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 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. Book Department, Radio Digest Illustrated, 123 W. Madison St., Chicago, Ill.

SELECT M. P. M. detector crystals mounted in Wood's metal. Nature's finest super-Sensitive highest test. 30c by mail. Midland Electric Manufacturing Company, 2528 South Meridian Street, Indianapolis, Indiana. —Adv.

Sound Collectors Get Church Music

Two and a Half Miles of Wire Connect
Seven Microphones with
Station

PHILADELPHIA, PA.—Hidden in the vistas of the Holy Trinity Memorial Church, at Twenty-second and Spruce streets, are seven standard microphones which merge at the Radio junction of wires in the church with two and a half miles of land wire leading to broadcast station WIP, on the seventh floor of Gimbel Brothers, between Eighth and Ninth on Market street.

Two of the microphones have been placed in apertures behind the panel pipes of the organ, and every malleable tone, from the softest flutes notes, are conveyed in harmonious cadence to the broadcast station. The largest microphone, which is partly concealed, is suspended above the choral gallery, while two small sensitive microphones, one on either side of the pulpit, transmit scripture reading and the sermon. Two super-sensitive microphones, one for solo renditions and the other for the sanctuary service, completes the mechanical listening arrangement.

Need Eleven Aerials in Canon

CAMP CURRY, CAL.—It has required the erection of eleven aerials before Radio could be successfully operated here in the Yosemite valley. Rock walls rear thousands of feet above the valley in which the camp is located.

Books

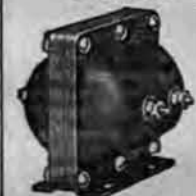
GET secret of how to make practical radio receiving set for less than four dollars. Send one dollar for illustrated book by Lieutenant W. L. Shields, formerly aircraft radio officer in the Pacific Air Force. Write today to Lieutenant Shields, 423-424 Timken Bldg., San Diego, California.—Adv.

Reduced Prices

Send for summer price list on our complete line of standard radio equipment
OAK PARK RADIO COMPANY
110 North Oak Park Ave., Oak Park, Illinois
Telephone O. P. 2417

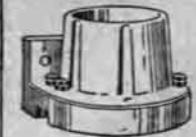
CROSLEY RADIO APPARATUS

Better—Cost Less



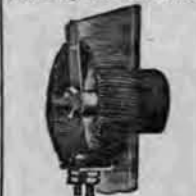
CROSLEY
SHELTRAN

Tests have shown that the design of the Crosley Sheltran is correct to insure maximum efficiency. Completely shielded—9 to 1 ratio. "Better—Cost Less"\$4.00



CROSLEY
V. T. SOCKET

This is the biggest selling socket on the market. It is made in one piece, entirely of porcelain, the ideal dielectric material. Made for base or panel mounting\$0.50



CROSLEY
RHEOSTAT

This Rheostat is smooth running, very selective and controls the brilliancy of the tubes in the Harko Senior and Two-Stage Amplifier. Finished with newly designed tapered knob, pointer, etc. "Better—Cost Less"\$0.50

WRITE FOR
CATALOGUE

THE SIMPLICITY and ease of operation of Crosley Radio Apparatus has created a demand for their products everywhere.

The Crosley prices, lower than any for Radio Apparatus of similar quality, makes the filling of these demands much easier for you.

The large Crosley plants are of capacity to fill all your orders promptly.

The wide-awake dealer and jobber knows that Crosley Radio Apparatus is "Better—Cost Less."



SENIOR NO. V
CROSLEY HARKO

This instrument is a moderately priced combination tuner and Audion detector. Alone, it is recommended for receiving broadcasting stations up to 50 miles, although much better results have been obtained under favorable conditions. In combination with the Crosley Two-Stage Audio Frequency Amplifier, under average conditions, broadcasting stations from a distance up to 250 miles have been brought in loud and clear. Under more favorable conditions much larger records are being made.

Formica panel, Adam brown mahogany finished cabinet, price as shown, without tubes, batteries or phones.....\$20.00

CROSLEY TWO-STAGE AUDIO FREQUENCY AMPLIFIER

Works Well With Any Set
As Well As Harko Senior

With this unit, two stages of audio frequency amplification can be added to any type of radio apparatus. Two amplifier tubes are used with it, each increasing the volume of sound from the detector about ten times, making amplification approximately one hundred times. This unit eliminates the objectional squeals and howls so common with the ordinary type amplifiers. Designed to match up uniformly with Crosley Harko Senior No. V, without tubes, batteries or phones.....\$25.00

Dealers and Jobbers who handle Crosley
Apparatus, handle the best

CROSLEY MFG. COMPANY
DEPT. R. D. I. 3
CINCINNATI, OHIO

Armstrong's Latest Set

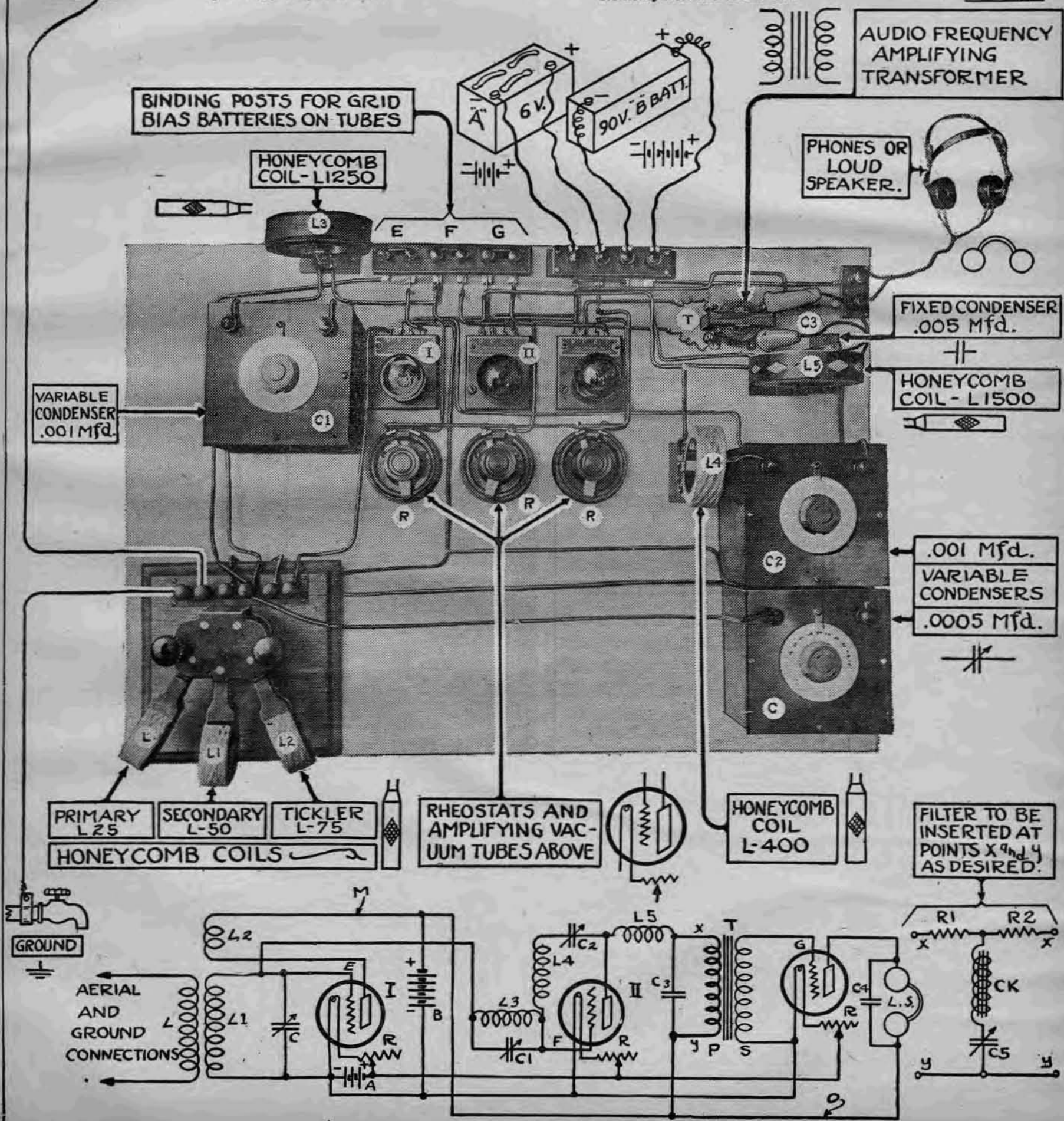
Super-Regenerator Made by Chicagoan

The accompanying photo-diagram and circuit illustrate the Armstrong super-regenerative receiving set designed and built by W. W. Harper of Chicago. Its successful performance has earned for it this page and the description to be found on the facing page. The photograph was taken from above the set and shows the relative position of all pieces of apparatus used. The latter are numbered correspondingly to the circuit diagram at the bottom of the page. The set, when photographed, did not include the filter circuit, the diagram for which is given in the lower right-hand corner. The filter should not be added until the circuit has been set up successfully and operating principles learned.

All coils marked L are honeycomb or duo-lateral coils. L1 may be 25, 35 or 50 turns, determined by experiment; L1 has 50 turns; L2 has 75 or 100 turns, determined by experiment; L3, 1250 turns; L4, 400 turns; L5, 1500 turns.

The variable and fixed condensers used are: C, .0005 Mfd.; C1, .001 Mfd.; C2, .001 Mfd.; C3, .005 Mfd.; C4, .001 Mfd.; C5, .001 Mfd.

The other symbols are: A, 6-volt storage battery; B, 80 to 150-volt B battery (depending on tubes used); T, transformer, audio frequency type with ratio of 4½ or 5 to 1; L. S., loud speaker or head telephones; R, rheostats; R1 and R2, 12,000-ohm non-inductive resistances; CK, 0.1-henry iron core choke coil.



Radiophone 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

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

ACFA, Toronto, Canada. 400 only. 200 mi. Toronto Star. Daily ex Sun, 7:30-9 pm, baseball, stocks, concert. Tues, Fri, 8:30-9:30 pm, concert. address, Eastern.

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

ACFO, Montreal, Can. 440 only. 200 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.

CHCB, 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. City, 7:45-8:45 pm, church service. Mountain.

CHCG, Toronto, Canada. 410 only. 200 mi. Metropolitan Motors Co. Daily ex Sat and Sun, 5:50-8 pm, news, concert. Eastern.

CJCA, Edmonton, Canada. 450 only. 500 mi. Edmonton Journal Ltd. Daily ex Sun, every evening, music, bedtime story, news, weather, markets, etc. Sun, Daily ex Sat and Sun, 4:30-6 pm, concert. Sat 12-12:30 pm, concert. Eastern.

CJCB, Winnipeg, Canada. 410 only. 300 mi. Manitoba Free Press. Every other wk, beginning July 31, Mon, Wed, Fri, 10-10:30 am, news; 12-1 pm, stocks, markets, weather; 8-10, concert. Tues, Thurs, Sat, 3:30-4:30 pm, news; 7-8 pm, stocks, markets, weather; 7-8-9 pm, news; Sun, 8 am on, sacred concert. For full in weeks, Mon, Wed, Fri same as Tues, Thurs, Sat above, and Tues, Thurs, Sat same as Mon, Wed, Fri above. Sun, 8:15 am on, sacred concert. Central.

CJCC, Toronto, Canada. 410 only. 200 mi. C. Eaton news, concert. Thurs, 8:15-9:30 pm, special concert, speech. Mountain.

CJCA, 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, 3-4 pm, concert. Sun, 8:45 am, 3 pm and 7:30, church service. Eastern.

KDM, San Francisco, Cal. 485 also. 250 mi. Leo J. Meyerberg Co. Daily ex Sun, 11-12 am, 1-2 pm, 4:30-5:30, concert; 7-7:15, weather; 8:30-9, concert. Sat, nothing after 5:30 pm. Sun, 10-11 am, sacred concert. Pacific.

KDPT, 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.

KDXX, Honolulu, Hawaii. 750 mi. Star-Bulletin. Daily ex Sun, 12:15-1:15 pm, stocks, markets, business news; 6:30-7:30, concert, lecture. Sun, 1-1:30, 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.

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

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

KFAC, Glendale, Cal. 485 also. 150 mi. Daily News. Mon, Wed, Fri, 3-3:15 pm, baseball, news, Mon, Thurs, 8-9 pm, concert. Sat, 7-8 pm, dance music. Pacific.

KFAD, Phoenix, Ariz. 485 also. 100 mi. Mon, Wed, Fri, 8-9:15 pm, concert, weather, stocks, markets. Sun, morning, church service. Mountain.

KFAE, Pullman, Wash. 200 mi. State College of Wash. Program irregular.

KFAC, Denver, Colo. 1,000 mi. Western Radio Corp. Daily, evening, music, news, sermons, etc.

KFAC, 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, Gridley, Cal. 500 mi. Precision Shop. Mon, Thurs, Sun, 8-9 pm, concert. Sun, 3-4 pm, concert. Pacific.

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

KGB, Tacoma, Wash. 200 mi. Wm. A. Mullins Elec. Co. (Tacoma Ledger.) Daily, 4-5 pm, 7:30-8:30. 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.

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

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

KGO, Altadena, Calif. 300 mi. Altadena Radio Lab. Daily, 1-2 pm, 7-8 pm. Pacific.

KGW, Portland, Ore. 200 mi. Ship Owners Radio Serv. Inc. (Daily Oregonian.) Daily, 3:30-4:30 pm, news etc. Mon, 7:20-8:30 pm, concert. Wed, 8-10 pm, concert. Fri, 8-9 pm, concert. Sun, 7-8 pm, church service. Pacific.

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

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

KHI, 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. Barker Bros. Daily ex Sun, 11:30-12 noon, Mon, 10-11 am, Wed, 9-10 am, Sun, 1-2 pm, 5-6, Pacific.

KJJ, Sunbvalle, Cal. 200 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.

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.

KLN, Monterey, Cal. 150 mi. Noggle Electric Works. Daily, 12-1 pm, weather, markets, news; 7-8 pm, concert. Pacific.

KLP, Los Altos, Cal. 1,500 mi. Collin B. Kennedy Co. Sun, 1:30-2:30 pm, industrial news, concert. Thurs, 5:30-9 pm, concert. Sun, 4-6 pm, concert. Pacific.

KLS, Oakland, Cal. 150 mi. Warner Bros. Daily 12-1 pm, concert. Sat, 7:30-8:15 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.

KMG, Berkeley, 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, 11-1 pm, 6-7, 9:15-10, concert, news, lecture. Pacific.

KNJ, Roswell, N. M. 300 mi. Roswell Public Service Co. Daily, ex Sun, 7-9 pm, weather, industrial, markets, news. Sun, 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, 5-5:30 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. (Telegraph only) Mountain.

KOG, Los Angeles, Calif. 300 mi. Western Radio Elec. Co. (Evening Herald.) Daily, 12:15-12:30 pm, markets; 5-5:30, news. Tues, Wed, Fri, 8:15-9 pm, concert. Pacific.

KOM, Los Angeles, Calif. 200 mi. Holzwarth Inc. Daily ex Sun, 4-5 pm and 8:15-9, concert, news. Sun, 10-11 am, 4-5 pm and 8-10:5, church service. Pacific.

KOP, 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, Pa. 100 mi. Doubleday-Hill Elec. Co. Daily ex Sat and Sun, 12-12:30 pm, 2:30-3 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, 8:15-9 pm, 8:15-9 pm, concert. Pacific.

KQY, Portland, Ore. 100 mi. Stubbis 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. Pacific.

KSS, Long Beach, Calif. 25 mi. Prest & Dean Radio Research Lab. Daily ex Sun, 8:30-4:30 pm, news, concert. Pacific.

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

KUO, San Francisco, Cal. 1,500 mi. San Francisco Examiner. Daily ex Sun, 2-3 pm, news, 5:30-6:45, news, Sun, 5-8 pm, news, etc. Pacific.

KUY, El Monte, Cal. 200 mi. Coast Radio Co., Inc. Daily ex Sun, 4-4:30 pm, music, lectures. Mon, Thurs, 9-10 pm, concert, etc. Pacific.

KVG, Sacramento, Cal. 1,000 mi. J. C. Hobercht (Sacramento Bee). Daily ex Sun, 5:30-8:30 pm, concert, news, markets, weather. Wed and Sat, 8-9, concert. Sun, 6-7 pm, concert. Pacific.

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.

KWJ, Los Angeles, Calif. 300 mi. Examiner. Daily ex Sun, 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, 8-10 pm, concert. Sat, 8-9 pm, concert. Pacific.

KYL, Los Angeles, Cal. 1,000 mi. Leo J. Meyerberg Co. (Hambergers). 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, 5:35 am-1:20 pm, markets, quotations every half hr; 2:15, news, markets; 3, baseball; 4:15 and 6:30, news, final markets and stocks; 7:30, baseball, bedtime story; 7:45, feature; 8-9, concert; 9 news. Sun, 3:30 pm, church service. Central, daylight saving.

KZO, Seattle, Wash. 300 mi. Public Market & Dept. Store Co. Daily ex Sun, 6:45-7:15 pm, prices of foodstuffs. Pacific.

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

KZN, Salt Lake City, 100 mi. Desert 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; 6:45-7 pm, news. Wed, 7:30-8:15 pm, concert. Sat, 8:15-9 pm, concert. Sun, 11-12:15 pm, church service; 1-2 pm, concert. Pacific.

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

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

WAQ, Charleston, W. Va. 10 mi. Radio Service Co. Daily ex Sun, 15-7:45 pm, music, news, weather, baseball, Eastern.

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. 70 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.

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

WAAZ, Emporia, Kan. 250 mi. Hollister-Miller Motor Co. Daily ex Sun, 9:45-1:15 pm, market quotations every half hr; 7-8 pm, concert, weather. Sun, church service, 2 pm. Central.

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

WBAB, Syracuse, N. Y. 150 mi. Andrew J. Potter. Daily ex Sun, 7-8 pm, concert, baseball, weather, news, bedtime story. Sun, 6:30-7:30 pm, church service. Eastern.

WBAD, Minneapolis, Minn. 100 mi. Journal. Mon, Fri, Sat, 9:30 am, markets; 7:50 pm, concert. Central.

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

WBAI, Toledo, O. 50 also. 500 mi. Marshall-Gerken Co. Tues, Thurs, Sat, 6-7:30 pm, news, bedtime story; 8-9 pm, concert. Eastern.

WBAM, New Orleans, La. 100 mi. I. B. Remmyson. 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; 3:45-4, news, road conditions; 5:15-5:30, police; 6:30-6:45, baseball, police news; 8:30-10, news. Sun, 11-12:15 pm, church service; 2-2:50 pm, sermonette; 3:30-4, concert; 6:45-7 baseball, Central.

WBAQ, South Bend, Ind. 100 mi. Myron L. Harmon. Daily, 5:30-6 pm, news, concert; 8 pm, concert, news, police reports. Sun, 5:30 pm, church service. Central.

WBAV, Columbus, O. 200 mi. Erner & Hopkins Co. Daily ex Sun, 5:30-7:30 pm. Central.

WBAX, Wilkes-Barre, Pa. 200 mi. John H. Stenger, Jr. Three nights of week not regular.

WBZ, Richmond, Va. 300 mi. Times-Dispatch. Daily, 4-9 pm, news, concert, markets, etc. Eastern.

WBL, Anthony, Kan. 300 mi. T. & H. Radio Co. Daily ex Sun, 8:50 am, 9:50, 10:50 and 1:15 pm, Kansas City grain markets; 1:15, roads, local markets; 7-8, concert, etc. Sun, 4-5, concert. Central.

WBT, Charlotte, N. C. 485 also. 500 mi. Southern Radio Corp. Daily ex 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, 3 and 8, church service. Eastern.

WBAB, 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. Entekin Elec. Co. Tues, Fri, 7-8 pm, concert, bedtime stories. Sat, 3-4 pm, lecture, music. Central.

WCAK, Houston, Tex. 200 mi. A. P. Daniel. Daily ex Sun, 7-7:15 pm, news, etc. Wed, Sat, 8-9 pm, concert. Sun, 8-4 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, 8, special program. Central.

WCAG, Quincy, Ill. 200 mi. Quincy Elec. Sup. Co. (Quincy Herald.) Daily ex Sun, 8:45 am, markets; 11, markets; 1 pm, markets; 5, music, baseball. Tues, Wed, Thurs, Sat, 8:30-9:45 pm, concert. Sun, 6:30-7:30 pm, religious. Central.

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

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

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

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. Co. Daily, 9-10 pm, concert, etc. Central.

WDAL, Jacksonville, Fla. 485 also. Times-Union. Daily ex Sun, 8:15-8:45, 8:45-9:15, 9:15-9:45, baseball, markets, weather; 8-9:50, 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, 3:15-10 pm, concert. Sun, 8 pm, church service. Eastern.

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

WDAW, Atlanta, Ga. 485 also. 500 mi. Georgia Ry. & Power Co. Daily ex Sun, 6-7 pm; 9-9:55, Sun, 8:30-8:40 pm, Central.

WDAX, Greenville, S. C. 250 mi. First Nat. Bank. Daily ex Sun, 11:30 am, 2:30 pm, markets, news. Mon, Thurs, 7:30-9:30, concert. Central.

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, 8-10 pm, concert, etc. Sun, 12:15 pm, weather. Central.

WDM, Washington, D. C. 50 mi. Church of the Covenant. Sun, 10:30 am, church service; 3 pm, lecture; 7:30, church service. Eastern.

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

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 5:15 to 5:45, news, baseball. Tues, Wed, Thurs, Sat, 7:30-9, concert. Sun, 11 am, church service; 2 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, 9:10, 10:10, 11:40, Sun, 8-9 pm irregular, concert. Central.

WEAK, St. Joseph, Mo. 100 mi. J. B. Abernathie. Daily, 8-11 pm, St. Joseph live stock markets; 7:30-8:45, concert. Central.

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, Rushville, Nebr. 200 mi. Sberlian Elec. Service Co. Wed, Fri, Sun, 8-9 pm, concert, news, etc. Mountain.

WEAZ, Waterloo, Ia. 100 mi. A. C. Sweetman. Mon, Wed, Thurs, 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. Cosrado Co. (Wichita Beacon.) Daily ex Sun, hourly, 8:40 am-12:40 pm, stock markets. Daily, 10:45 am and 4:30 pm, weather; 8-10 pm, baseball, concert, lecture; 10:45 weather. Sun, 8:10 pm, church service, concert. Central.

WFAA, Dallas, Tex. 485 also. 250 mi. News-Journal. Daily ex Sun, 12:30 pm, weather, talk; 2-3:30, baseball, markets, news; 3:30-4:45, markets, news; 6:45-7, baseball final; 8-8:30, concert. Sun, 2-2:30 pm, chapel; 6:30-6:45, 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. 200 mi. Watson-Weldon Motor Supply Co. Daily ex Sun, 8:45 am, 9:45, 10:45, 11:45, 1:15 pm, markets; 4, news. Tues, Thurs, Fri, 8 pm, concert. Sun, 11 am, church service; 8 pm, concert. Central.

WFAM, St. Cloud, Minn. 485 also. 100 mi. Granite City Elec. Co. Daily ex Sun, 3:30-4:00 pm, markets; 7:30-9, entertainment. Central.

WFAN, Hutchinson, Mo. 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.

WFAT, 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, Nebr. 485 also. 300 mi. Univ. of Nebr. Daily ex Sun, 10-10 am, weather, markets. Sat, 9-9:30, 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. Wed, Fri, Sat, 7:30-8:30 pm, concert. Fri, Sat, (alternate weeks) 7:30 pm, concert at 8:50 pm, Sun, 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.

WGAB, Houston, Tex. 485 and 600 also. 250 mi. QRV Radio Co. Daily ex Sun, 8:30-9:30 am, police, news; 12:30-1:30 pm, music, readings; 2-5, baseball, news. Mon, Wed, Fri, 8 pm on, concert. Eastern.

WGAD, Ensenada, Porto Rico. 200 mi. Spanish-American School of Radio Telegraphy. Irregular, 7:30-11:30 pm, entertainment. 60th 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.

WGAM, Orangeburg, S. C. 150 mi. Orangeburg Radio Equipment Co. Daily ex Sun, 10 am, markets, weather; 11:55, time; 4 pm, Radio talk, markets, baseball; 6, music, lecture; 10, time, weather, entertainment. Sun, 11 am, church service; 11:55, time; 10 pm, time, weather, music. Eastern.

WGAQ, Shreveport, La. 300 mi. W. G. Patterson. Daily ex Sun, 7:45 pm, news, sports, music. Sun, 11 am, 7:45 pm, church service. Central.

WGAT, Lincoln, Nebr. 100 mi. Am. Legion, Dept. of Nebr. Mon, Wed, 9 pm, announcements. Fri, 9-10 pm, patriotic program, concert. Sun, 3-5 pm, sermon. Central.

WGAY, Madison, Wis. 100 mi. North Western Radio Co. Daily ex Sun, 9-10 am, financial news; 11:30, news, opening markets; 4 pm, news, closing markets. Mon, Wed, Thurs, Sat, 7:30-8:30 pm, concert. Sun, 10:30-12 am, sermon. Central.

WGAZ, South Bend, Ind. 100 mi. South Bend Tribune. Daily ex Su, 9-9:30 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, Medford Hillside, Mass. 500 mi. Am. Radio & Research. Daily ex Sun, 7:30 am, music; 8 news; 7:30, baseball, news; 7:45 pm, police reports. On Tues and Thurs, 7:30 and 7:45 pm programs at 7:45 and 7:55 pm, respectively. Sun, 8 pm, church service; 8:45 am, sacred concert. Special features every night, 7:30-9 pm. Eastern.

WGL, Philadelphia, Pa. 250 mi. Thos. F. J. Hewlett. Tues, Thurs, Sat, 7:45-11:30 pm, concert. Eastern.

WGR, Buffalo, N. Y. 485 also. 200 mi. Federal Telep. & Telog. Co. Daily ex Sat and Sun, 12m, 5:30 pm, markets, weather; 8, baseball, news, bedtime story; 8:15, concert. Eastern.

WGY, Schenectady, N. Y. 1,000 mi. General Electric Co. Daily ex Sun, 7 pm, markets. Tues, Thurs, Fri, 7:45-9 pm, concert. address. Eastern.

WHA, Madison, Wis. 485 also. 600 mi. Univ. of Wis. Daily ex Sun, 12:30-1 pm, weather, markets, Tues, Thurs, Fri, Sat, 12-1 pm, weather, markets, time. Tues, 8-8 pm, concert. Fri, 8-9:15 pm, news, concert. Sat, 1-1:30 pm, instruction. Central.

WHA, Philadelphia, Pa. 150 mi. State Univ. of Ia. Daily ex Sun, 7-7:30 pm, news, music. Sun, 10:45-12 am, church service. Central.

WHAB, Galveston, Tex. 485 also. 500 mi. C. W. Thompson Co. Daily ex Sun, 2:30 am, police news; 6:45, weather; 10, markets; 12 m, markets; 3 pm, markets; 7-8 pm, entertainment. Sun, 10 am, church service. Central.

WHAE, Sioux City, Ia. 300 mi. Automotive Elec. Service Co. Daily ex Sun, 12:30-5:30 pm on half hour news. Thurs, 8:30 pm, concert. Central.

WHAG, Cincinnati, O. 100 mi. Univ. of Cincinnati. No regular schedule.

WHAI, Davenport, Ia. 30 mi. Radio Equip. & Mfg. Co. Daily ex Sat and Sun, 2-2:30 pm, 4:30-5:30, 10-11, Sat, 10-11 am, 2-2-30 pm, 5-5:30, 11-11:30, Central.

WHAJ, Bluefield, W. Va. 200 mi. Daily Telegraph. Daily, 5-5:30 pm, baseball. Mon, Thurs, 7:45-9 pm, concert, lecture. Sun, 11 am, 7:30 pm, church service. Eastern.

WHAL, Lansing, Mich. 100 mi. Phillips Jefferys & Derby. Daily ex Sun, 8-9 am, 10:30-11:45, 1-2 pm, 4, 6:30-8, Eastern.

WHB, Kansas City, Mo. 485 also. 1,000 mi. Sweeney Auto & Tractor School. Daily, 10 am, 3 pm, 5, weather. Daily ex Sun, 2 pm, lecture, hour; 7, bedtime stories. Tues, Thurs, Sun, 8-10 pm, concert. Central.

WHC, Morgantown, W. Va. 100 mi. W. Va. University. Daily, 4-6, 7-7:30, news, etc. Eastern.

WHK, Cleveland, O. 100 mi. Warren R. Cox (The Radiobox Co.) Daily, 1:30-2 pm, 3:30-4, miscellaneous. Tues, Thurs, Sun, 8-9:30 pm, concert. Eastern.

WHQ, Rochester, N. Y. 485 also. 50 mi. Times-Union. Inq. Daily ex Sun, 12-12:15 pm, news, concert; 7:30-8, markets, bedtime story, lecture; 8-8:30, concert. Sun, 2 and 7:30 pm, church service. Eastern.

WHW, East Lansing, Mich. 485 only. 150 mi. Stuart Wm. Seeley. Daily ex Sun, 11:30 am and 12:30 pm, weather and markets. Eastern.

WIAC, Galveston, Tex. 485 also. 100 mi. Galveston Tribune. Tues, Thurs, Sat, 7 pm on, bedtime story, evening prayer, concert. Central.

WIK, McKeesport, Pa. 500 mi. K. & L. Elec. Co. Daily ex Sun, 9:30-7 pm, news, Thurs, 8:30-10:30 pm, Sun, 1:30-2:30 pm and 6:30-7 pm, Eastern.

WIAC, University Place, Nebr. 485 also. 150 mi. Nebr. Wesleyan Univ. Daily ex Sat and Sun, 12 m, weather; 4 pm, markets. Sat, 12 m, markets, weather. Thurs, 9:30 pm, concert. Central.

WID, Granville, O. 100 mi. Denison University. Daily, 5-6 pm, concert, lecture. Central.

WIJ, Washington, D. C. 250 mi. White & Boyer Co. Tues, 7:30-10 pm, concert, address, lecture. Eastern.

WJK, Toledo, O. 300 mi. Service Radio Equipment Co. Daily ex Sun, 3-4 pm, concert. Mon, Wed, Fri, 7:30-9 pm, concert, lecture, etc. Sun, 7:30-9 pm, church service. Eastern.

WJF, Erie, Penna. 1,000 mi. Elec. Equipment Co. Daily ex Sun, 7:30 pm, baseball, markets, weather, police reports. Mon, Wed, Fri, 8, bedtime stories; 8:15, concert, lecture. Sun, 7:45 pm, church service. Eastern, daylight saving.

WJZ, Newark, N. J. 1,500 mi. Westinghouse Elec. & Mfg. Co. Daily ex Sun, 15 minutes hourly from 9 am to 6 pm; 12-12:30 pm; 7-10:15 pm. Miscellaneous program of highly varied nature. Sun, 8-10:15 pm, misc. Eastern, daylight saving. M. Zamolski Co. Tues, Thurs, Sat, 7:30-9:30 pm. Eastern, daylight saving.

WKY, Oklahoma City, Okla. 485 also. 500 mi. Oklahoma Radio Shop. (Daily Oklahoman.) Daily, 12 m, weather; 7

10:15, financial, markets; 1-2 pm, music; 1:30, markets; 4-5 pm, music; 4:15, police notes; 4:30, baseball. Mon, Wed, Sat, 8:30-10 pm, Concert, Central.

(News-Scimitar.) Daily, 7-9 pm, concert, news. Central. WKH, Hamilton, O. 1,000 mi. Doron Bros. Elec. Co. Mon, Wed, Sat, 8:30-10:30 pm, concert, news. Fri, 7:30-9:30, concert. Sun, 10:45 am and 7:30 pm, church service. Central.

Daily ex Sun, 2:30 pm, markets, stocks; 8, concert, Sun, 8 pm, chapel. Central. WTG, Manhattan, Kan. 485 only. 75 mi. Kan. State Agri. College. Daily ex Sun, 9:55 am, weather (code). Central.

WDAK-1,220-R. Hastings, Atchinson, Kan. WDAK-1,500-M. M. Cardwell, Republic, Kan. WDT-1,150-R. Hastings, Atchinson, Kan.

State, City, Call Alabama: Birmingham, WIAG, WSY Mobile, WEAP Montgomery, WGH Arizona: Phoenix, KDYV, KFAD Tucson, KDZA Arkansas: Fort Smith, WCAC Little Rock, WCAV, WEAX, WSV Pine Bluff, WOK California: Altadena, KGO Bakersfield, KDZB, KYI Berkeley, KQI, KRE El Monte, KUY Eureka, KNI Fresno, KDZH, KMJ Glendale, KFAC Gridley, KFU Hanford, KFBD Hollywood, KFAR, KGC Long Beach, KSS Los Altos, KLP Los Angeles, KDZD, KDZF, KDZP, KFL, KHI, KJC, KJS, KNN, KNE, KNV, KNX, KOG, KON, KQL, KUS, KWH, KXS, KYJ, KZI Modesto, KOQ, KXD Monterey, KLN Oakland, KLS, KLX, KZM, KZY Pasadena, KDYR, KLB Pomona, KGF Reedley, KMC Redwood City, KDYN Sacramento, KVV San Diego, KDPT, KDYM, KDYO, KFBC, KYF San Francisco, AGI, KDN, KDZG, KDZW, KDZX, KPO, KSL, KUO San Jose, KPAQ, KQW, KSC Santa Ana, KFAW Stockton, KJQ, KWG Sunnyvale, KJJ Venice, KFAV Colorado: Boulder, KFAJ Colorado Springs, KHD Denver, DD5, KDYS, KDZU, KLZ, KOA Connecticut: Greenwich, WAAQ Hartford, WDAK New Haven, WCJ, WGAH Delaware: Wilmington, WHAV District of Columbia: Washington, WDM WEAS, WHAQ, WIL, WJH, WMU, WPN, WWX, 3YN Florida: Jacksonville, WCAN, WDAL Miami, WFAW Pensacola, WGAN Tampa, WDAE, WEAT, WHAW Georgia: Atlanta, WAAS, WDAW, WSB, 4CD College Park, WDAJ Fort Smith, WGAR Savannah, WGAV, WHAO Idaho: Boise City, KFAU Lewiston, KFBA Moscow, KLAN Illinois: Chicago, KYW, WAAF, WBE, WDAF, WGAS, WGU Decatur, WBAO, WCAP, WHAP Peoria, WBAE, WFAP Quincy, WCAW, WCAZ Rockford, WLAB Springfield, WDAE Tuscola, WDW Urbana, WRM Indiana: Anderson, WMA Fort Wayne, WFAS Huntington, WHAY Indianapolis, WLK, WOH Marion, WIAQ Richmond, WOZ South Bend, WBAQ, WGAZ Terre Haute, WEAC West Lafayette, WBAA Iowa: Ames, WOI Burlington, WIAS Centerville, WDAX Davenport, WHAI, WOC Des Moines, WGF Fort Dodge, WEAB Iowa City, WHAA Newton, WIAH Shenandoah, WGAJ Sioux City, WEAU, WHAE Venton, WIAE Waterloo, WEAZ, WHAC Kansas: Anthony, WBL Atwood, WEAD Eldorado, WAH Emporia, WAAZ

State, City, Call Independence, WFAY Lindsborg, WDAK Manhattan, WTG Salina, WFAD Wichita, WAAP, WEAH, WEY, WHAN Kentucky: Louisville, WHAS, 9ARU Paducah, WIAR Louisiana: New Orleans, WAAB, WAAC, WBAM, WCAG, WGV, WIAF, WWL Shreveport, WAAG, WDAN, WGAQ Maine: Auburn, WMR Sanford, WPAR Maryland: Baltimore, WCAO, WEAR, WKC Massachusetts: Boston, WAAJ, WFAU Holyoke, WHAX Medford Hill-side, WGI New Bedford, WDAU Springfield, WBZ, WIAP Worcester, WCN, WDA5, WDAT Michigan: Bay City, WTP Dearborn, WWI Detroit, KOP, WCX, WWJ East Lansing, WHW Flint, WEAA Lansing, WHAL Minnesota: Hutchinson, WFAN Minneapolis, WAAL, WBAD, WBAH, WCAS, WCE, WLB Redfield, WCAL St. Cloud, WFAM St. Paul, WAAH Mississippi: Corinth, WHAU Missouri: Brentwood, WFAK Cameron, WFAQ Columbia, WAAN Jefferson City, WOS Joplin, WHAH Kansas City, WDAF, WHB, WQG, WPE St. Joseph, WEAK St. Louis, KSD, WAAE, WCK, WEB, WEW Springfield, WIAI Montana: Butte, KFAP, KFBB Great Falls, KDYS Havre, KFBB Nebraska: Lincoln, WCAJ, WFAV, WGAT, WJAB Omaha, WAAW, WIAK, WOU, WOV Rushville, WEAV Nevada: Reno, KDZK, KFAS, KOJ New Hampshire: Berlin, WEAQ New Jersey: Atlantic City, WHAR Camden, WRP Deal Beach, 2XJ Jersey City, WAAJ Moorestown, WBAF Newark, WAAM, WBS, WJX, WJZ, WOR, 2XAI N. Plainfield, WEAM Ocean City, WIAD Paterson, WBAN New Mexico: Roswell, KNJ State College, KOB New York: Albany, WNJ Binghamton, WFAX Brooklyn, WGAC Buffalo, WGR, WWT Canton, WCAD Ithaca, WEAI Newburgh, WCAB New York, KDOW, WBAY, WDM, WDT, WVP, WWZ Poughkeepsie, WFAF Rochester, WHAM, WHQ Ridgewood, WHN Schenectady, WGY, WRL Syracuse, WBAB, WDAI, WFAE Tarrytown, WRW Troy, WHAZ Utica, WSL Waterford, WFAG North Carolina: Asheville, WFAJ Charlotte, WBT North Dakota: Fargo, WDAY Ohio: Akron, WOE Athens, WAAV Canton, WWB Cincinnati, WAAD, WHAG, WIZ, WLW, WMH Cleveland, KDPM, WHK Columbus, WBAY, WEAO Dayton, WAI, WFO Defiance, WCAQ Fairfield, WL-2 Granville, WJD

State, City, Call Hamilton, WBAU, WRK Lebanon, WPG Marietta, WBAW Norwood, WIAL Portsmouth, WDAB Toledo, WBAJ, WHU, WJK Wooster, WGAU Youngstown, WAAY, WMC Zanesville, WPL Oklahoma: Muskogee, WDAV Oklahoma City, WKY, 5XT Tulsa, WGAF Yale, WHAT Oregon: Eugene, KDZJ, KFAT Hood River, KQP Klamath Falls, KDYU Portland, KDYQ, KFAB, KGG, KGN, KGW, KQY, KYG Pennsylvania: Allentown, WIAN Bridgeport, WBAQ Brownsville, WDAQ Clearfield, WPI Erie, WJT, WSX Harrisburg, WBAK Lancaster, WGAL McKeesport, WIK Philadelphia, WCAU, WDAK, WFI, WGAW, WGL, WIP, WOO Pittsburgh, KDKA, KQV, WAAK, WCAE, WHAF Villanova, WCAM Wilkes-Barre, WBAX Rhode Island: Edgewood, WEAG Pawtucket, IOJ, IXAD Providence, WEAN South Carolina: Charleston, WFAZ Orangeburg, WGAM South Dakota: Rapid City, WCAT Sioux Falls, WFAT Tennessee: Memphis, WKN, WPO Nashville, WDA4 Texas: Amarillo, WDAK Austin, WCM Dallas, WDAO, WFAA, WRR El Paso, WDAH Fort Worth, WBAP, WPA Galveston, WHAB, WIAC Houston, WCAK, WEAV, WVEV, WFAL, WGAB Paris, WTK Port Arthur, WCAH San Antonio, WCAR, WJAE Waco, WJAD Utah: Ogden, KDZL Salt Lake City, KDYL, KDZV, KZN Vermont: Burlington, WCAX Virginia: Norfolk, WSN Richmond, WBAZ Washington: Aberdeen, KNT Bellingham, KDZR Centralia, KDZM Everett, KDZZ Lacey, KGY Pullman, KFAE Seattle, KDZE, KFC, KHQ, KJR, KTW, KZC Spokane, KFZ, KOE Tacoma, KGB, KMO Wenatchee, KDZI, KZV Yakima, KPV, KQT West Virginia: Bluefield, WHAJ Charleston, WAAO Clarksburg, WHAK Huntington, WAAR Morgantown, WHD Wisconsin: Madison, WGAY, WHA Milwaukee, WAAK, WCAV, WHAD, WIAO Neenah, WIAJ Superior, WFAC Waupaca, WIAA Hawaii: Honolulu, KDYX, KGU Porto Rico: Ensenada, WGAD Canada: Calgary, CHBC, CHCQ, CFAC Edmonton, CJCA Fort Frances, CFPC Halifax, CFCE Hamilton, CKOC London, CJGC Montreal, CFCE, CHYC, CJBC, CKAC Ottawa, CHXC Regina, CKCK St. John, CJCI Toronto, CFCA, CHCB, CHCZ, CHVC, CJCD, CJCN, CJSC, CKCE Vancouver, CFBC, CFYC, CHCA, CJCE, CKCD Winnipeg, CHCF, CJCG, CJNC, CKZC

RECEIVING RECORDS? SEND THEM IN-

The next complete list of receiving records will appear in the August 19 number of RADIO DIGEST. Amateurs who have beaten old records or made new ones will have their names listed each week. To be considered, the records sent in must have the number of miles given.—Broadcast Editor.

- Station, Miles Record, and By Whom Heard. CFCA-250-S. W. Farmer, Buffalo, N. Y. CHXC-150-S. W. Farmer, Buffalo, N. Y. DN4-375-I. M. Hart, Prosser, Nebr. DX4-1,000-D. McQuaid, Vacaville, Cal. KDYS-1,000-D. McQuaid, Vacaville, Cal. KDZI-145-A. West, Junction City, Wash. KFAC-500-D. McQuaid, Vacaville, Cal. KPAD-800-D. McQuaid, Vacaville, Cal. KFI-500-D. McQuaid, Vacaville, Cal. KPV-600-D. McQuaid, Vacaville, Cal. KGW-270-Wm. F. Paine, Lakeview, Ore. KHJ-600-Wm. F. Paine, Lakeview, Ore. KJS-600-Wm. F. Paine, Lakeview, Ore. KUY-610-Wm. F. Paine, Lakeview, Ore. KWH-600-Wm. F. Paine, Lakeview, Ore. KYE-710-Wm. F. Paine, Lakeview, Ore. KYG-550-D. McQuaid, Vacaville, Cal. KYI-500-Wm. F. Paine, Lakeview, Ore. KZV-380-Wm. F. Paine, Lakeview, Ore. WAAJ-690-A. E. Taylor, Coldwater, Mich. WCAG-1,460-K. McNeil, Ottawa, Ont., Can.

Length of Aerial

The length of the aerial wires is often increased above that best adapted to the wave length of the station to be received. A single horizontal wire 100 to 150 feet long is sufficient for the reception of signals from 300 meter broadcasting stations and a longer aerial will necessitate the use of series condensers. More selective tuning can be accomplished with a short aerial wire, using additional turns in the inductance coil if necessary to reach the desired wave length.

In erecting the aerial wire it is necessary to keep as far as possible from all other electrical circuits such as power lines, telephone wires, etc. Where the aerial must be erected in close proximity to such wires the aerial should be placed at right angles to the other wires so as to reduce the inductive effect to a minimum. Directional effects of small aeriels of comparatively low value should be taken advantage of by pointing the aerial in the direction of the station from which signals are to be received. The coil antenna, of course, is the most directional device and if sufficient amplification is available it is the most selective device for receiving signals from a particular station.

Mounting Transformers

To obtain the best results from a two-step outfit it is necessary to have the transformers mounted at right angles to each other. In this way a great deal of the howling noises are done away with and clearer reception is assured.—John Davidson, Cleveland, O.

Federal No. 18 RHEOSTATS EMBODY THE LATEST THOUGHT IN APPARATUS DESIGN. No. 16 V. T. SOCKET. Federal VACUUM TUBE SOCKETS ARE REMARKABLY RUGGED AND STURDILY BUILT. Federal Telephone & Telegraph Company BUFFALO, NEW YORK CHICAGO OFFICE: 805 STEGER BUILDING, CHICAGO, ILL.

Radio Digest Illustrated

TRADE-MARK

Published by the Radio Digest Publishing Company, Inc.

123 West Madison Street
Telephone State 4844-4845

Chicago, Illinois

E. C. RAYNER, Publisher

New York Office
Detroit Office2126 Broadway
28 Rowland Building58
PUBLISHED WEEKLY

SUBSCRIPTION RATES

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

Vol. II Chicago, Saturday, August 12, 1922 No. 5

Ye Ed Asks 'imself

Question.—There is considerable difference of opinion in regard to the necessity of a storage battery in connection with the operation of a tube receiving set. It has been stated that it would be satisfactory to use a transformer on the ordinary lighting circuit for this purpose. Would this be a good plan?

Answer.—The Bureau of Standards, after carrying on a considerable number of tests, have determined that it is practical to use the ordinary lighting circuit for this purpose, and have issued a bulletin covering the tests they have made that can be obtained from Washington for ten cents a copy.

The results of these tests are particularly interesting because it has been possible to entirely remove the hum of the alternating current of the lighting circuit. It may be in some localities that the phase lag of the current is of such a nature that some experimental work may be necessary to apply the apparatus which the Bureau of Standards specifies. Ordinarily the phase lag of alternating current in large cities is not of sufficient amount to change the results of the Bureau of Standards' tests.

Question.—Will it improve the receiving qualities of a head set provided the proper polarity of the circuit in which they are used is applied to either one of the receivers of the set?

Answer.—It has been determined by a large number of experiments covering three or four well-known makes that the application of the proper polarity of the circuit to the head set will improve its receiving qualities. It is difficult to give a well-defined rule covering the application of this feature but a sample test of reversing the leads as connected in the circuit of the set will readily demonstrate whether efficiency of both receivers is greater in one direction than in the other.

Question.—Do patent office records show the original inventor of an electrolytic Radio detector?

Answer.—In the year 1902, Professor Michael Pupin, of Columbia University, invented an electrolytic detector which was not only suitable for rectifying high frequency currents in multiple wire telegraphy, but also in the reception of Hertzian telegraph waves. This invention covers the use of an electrolytic non-cumulative battery cell in series with an ordinary storage battery, using two platinum electrodes, which do not generate current in the cell. When an outside source of alternating current is applied to a cell of this kind it has that property which prevents the current from flowing in both directions due to its polarization and has an instantaneous electromotive force of 2-volts.

In 1905, Dr. Fleming, of England, invented the present vacuum tube detector and in his patent specifications refers to the possible success of an electrolytic cell but mentions that tests using carbon and aluminum electrodes were not successful.

Question.—What is the real value of the DeForest patent grid tube, which expires in 1924?

Answer.—The principal value of the DeForest invention consists in the possibility of amplifying the small signal current in the circuit by means of the grid control of the tube. This feature of his invention brings about minute control of the circuit for all purposes of signalling either in wire telephony or Radiophony, and is one reason why this patent was purchased for long distance telephony. The United States Appellate Court has, however, determined that the use of this invention as a detector or rectifier in Radio telephony would be an infringement on the Fleming patent, which expires in November of this year.

Question.—What is the principal value of a vacuum type of arrester as used with receiving sets in Radio reception?

Answer.—In addition to its value as a lightning arrester a vacuum type of arrester has been approved by the Underwriters principally because of its feature of permitting a gradual leakage to ground of any decided amount of static charge that may accumulate in the wires of the antenna. When using the ordinary lighting switch without a vacuum tube arrester a considerable static charge is permitted to accumulate on the wires of the antenna. This condition may be brought about especially during the summer months, even though a thunder-storm may not be in the immediate vicinity.

Question.—Do you consider a standard multiple loop or coil antenna as efficient as a parallel type of outside wire aerial?

Answer.—There has been considerable discussion as to the efficiency of loop or coil antenna compared to a standard aerial. It is generally agreed that a loop antenna in the summer months has less static capacity than an exposed wire aerial and it is also agreed that a loop antenna avoids considerable neighborhood interference because of its adjustable directive reception effect. It is, however, generally agreed that for long distance work a long single wire antenna of sufficient height is more efficient than a loop or coil antenna.

Question.—What is the difference between Radio frequency and audio frequency amplification?

Answer.—Radio frequency is that electromotive force which is sent out by the Radio transmitter and is considered to be greater than 10,000 cycles per second. In some types of receiving sets this Radio frequency current is amplified before it is reduced to audio frequency. In other sets this Radio frequency current is reduced to audio frequency and is then amplified for the telephone receiver. It is generally known that the human ear will not detect notes of 18,500 vibrations per second, but will hear audio frequencies, which are below this figure.

W. N. Furthman.

RADIO INDI-GEST

Shaved and Ether Waved

The barbers have evidently talked themselves out and are now resorting to Radio so that their customers may feel at home. The wave with the shave.

A Disadvantage of the Radiophone

By M. J. Fletcher

I met some smart guy salesman
Just two, three weeks ago,
And he sold me a contraption
Where I could talk by Radio.
He gave me a big flock of books,
Some wire and some kind of a tool,
So I starts to put things together
Just 'cause I'm a durn old fool.



That thing they calls the antenna
I didn't quite understand;
But I managed to get the darn thing up
With the help of the hired man.
Hooked one end of it up to a tree;
Hitched the other end on to the fence.
I was wrong, I know, but I wouldn't bought it
If I'd just had horse sense.

Then I got some wires in the house
And tangled up with that box machine;
Got all the gadgets mixed with the ground,
And crossed with—you know what I mean.
Got them ear flappers all tied up
To that little box with the light.
I done everything it said in the book,
So I knew that it must be right.

So then I starts to listen in,
An' some of the darndest things I heard;
Some lady singing Chinese opery, I guess,
'Cause I couldn't understand a word.
Some politician up in Boston
Was telling 'bout the things he'd do;
So I just hollers right out loud, says I,
"The things he'll do will be you."

Then byme-by I hears a lady's voice,
Just as plain and sweet as could be.
By gosh! says I, that's pretty good,
And I guess it's you fer me.
She was talking a lot about meter.
So nothing else would do—
Says I, "Meet me at city hall,
'Bout half past one or two."

So I meanders up to the city hall,
But I guess my wave length was wrong.
She met me at city hall all right,
But she brought her husband along.
Right away he jumped my spark gap,
Kicked me in the rheostat;
Why, he knocked the Radio outa me—
Done a pretty darn good job at that.



So I'm offa this Radiophony stuff,
So help me Bob, 'tis true;
'Cause hereafter when I do any talking
I want to see who I'm talking to.
These new-fangled notions 'll never work.
I knew that darn thing of mine would fail.
But hereafter I'll just write a letter
And wait six months for the mail.

Bring on the Perfumed Crystals!

The climax of Radio hove into view when a Radiette invented and perfected a set which she encloses in her vanity case. Can you beat it? It will be no uncommon sight in the future to see some dainty "miss" park beside some downtown fire hydrant, set up her portable camp stool hastily extracted from her skirt pocket, attach her wire to the fire plug and sit in on the latest fashion reports from Longchamps.

Extensive Service Benefits Farmer

Ruralist Gets Tips as Soon as Pit Man

THE VALUES of raw materials for foodstuffs fluctuate to some extent with weather conditions. If general conditions are right to make a bumper crop in a locality wherein one cereal is grown the prices decline proportionately. The great centers where futures for the various commodities are sold are kept informed as to weather conditions and operators watch the reports closely. The various rates of exchange have a great deal to do with the stock markets. All of the news pertaining to this trading was at one time very slow. Those on the "inside" made fortunes in past years. The "inside" traders were persons who had private telegraph and telephone lines to obtain information first hand about conditions that control or have an effect on the market. In recent years the margin of profit decreased rapidly on account of the great numbers of "insiders."

Today the gap is getting more close, thanks to the Radiophone. The "insider" of today barely hangs up the receiver of the private telephone when the farmer a thousand miles away hears the same thing. This is how it is done: From 9:25 a. m. until 1:30 p. m. each weekday, the station KYW, for example, is occupied with the dissemination of quotations from the Chicago board of trade. This work is carried on in the most efficient manner by means of a telephone line leading from the wheat pit directly to the transmitting set at the station. At certain intervals, definitely set forth in the daily schedule, a trained market announcer reads the quotations into the telephone at the pit, from where, after traveling along the phone line and through the set, they are hurled from the aerials into space.

This breaking down of the barriers, which previously had left the farmer somewhat in the dark, is considered one of the most significant advances made by man in his effort to expedite crop production. No longer does the crop grower have to submit to costly delays because he was uninformed concerning the markets. Science has solved his problem. It has brought the markets to him home.

Future Beckons to the Amateur

Only the Surfaced Scratched in Radio Development

WHAT WILL the amateur of tomorrow contribute to Radio? This question was asked of a well known inventor and the reply was, "The man that will earn the everlasting gratitude of the Radio fraternity and at the same time reach the top in the Radio field will be the one who will make a crystal detector that will amplify." This inventor made a few suggestions that may be good for the experimenter to try out, or at least give some attention.

Has any person tried a good crystal detector in a high vacuum under experimental conditions? Has a crystal detector been tried in various gases? Has a crystal detector been subjected to high compressed air experiments? The questions are only a small portion that could be asked; however, they may lead to other ideas which will be of great value to some one who likes to experiment. It appears as if only the surface has been scratched in Radio development and that the amateur who is ever curious to know more and to do things differently will be the one who will contribute much to the Radio future.

Measuring the Depth of the Sea

Another Element of Safety Added to Sea Travel

LITTLE by little new uses for the sensitive parts of the receiving set are made use of in other lines outside of the realm of pure Radio. Recently while a ship was crossing the Atlantic from Newport to Gibraltar the depth of the ocean was recorded all the way and by one of these adaptations. The device measures the time it takes for a sound sent from the ship to reach the bed of the ocean and return. The sound is sent by an oscillator placed in the after part of the ship and the rebound or echo is received forward. The elapsed time between the sending and receiving is recorded automatically. The device is so arranged that a glance at the record shows the depth under the ship at any time.

This device will make it possible to chart the sea routes with ease. With such a chart the approximate position of a vessel may be determined at any time and the seas made safer to travel.

Radio Telephony for Amateurs and Beginners

Part X—Vacuum Tube Receiving Sets, Section II

By Peter J. M. Clute

To Explain—

The following article by Peter J. M. Clute is a continuation of his series. Articles to come are:

- XI. Amplifiers.
- XII. Useful Information.

IN THE previous discussion there have been considered representative "hook-ups" of the simpler types of vacuum tube receivers, namely, the single-circuit and the two-circuit varieties. In these circuits no regenerative action is made use of, which greatly simplifies the tuning operation, although it makes the set less sensitive. The operation of tuning to the wave length of the incoming oscillations generally resolves itself into one or two simple adjustments. In the circuits thus far analyzed the energy of the incoming

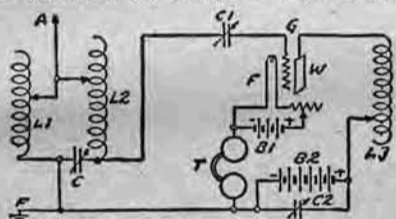


FIG. 16 ORIGINAL ARMSTRONG REGENERATIVE HOOK-UP.

oscillations of Radio frequency is impressed directly upon the vacuum tube detector, rectified and then conducted to the 'phones. If part of this latter energy is fed back again into the grid circuit of the detector tube, the potential on the grid is greatly increased. This regenerative effect produces an increased value of plate current, allowing a greater amount of energy to flow through the telephone receivers, resulting in much louder signals.

The Regenerative Circuit

It may be proper at this point to mention, briefly the regenerative circuit as it was originally conceived. Figure 16 shows this "hook-up." In this original Armstrong circuit, current from the plate battery, B2, is "fed back" inductively from the coil L3 ("tickler"), through coil L2 to the grid circuit, augmenting, or "regener-

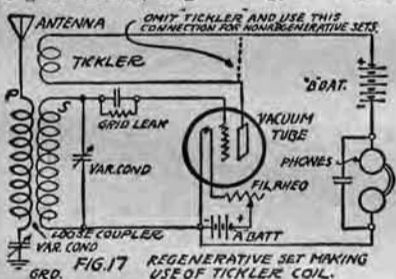


FIG. 17 REGENERATIVE SET MAKING USE OF TICKLER COIL.

ating" the current from the aerial. Every amateur who has passed beyond the novice stage in Radio has heard of the "feed-back" system, which enables a local battery to impart energy for the amplification of signals received. This regenerative action not only greatly increases the sensitivity of the vacuum tube, but it also causes it to operate as a combined detector and amplifier.

Single-circuit and double-circuit vacuum tube receiving sets can be made regenerative by the addition of the so-called "tickler" coil, connected in the plate circuit and mounted near the tuning coil so as to feed back into the grid circuit. Figure 17 shows a regenerative receiver making use of a "tickler" coil. The dotted line shows the connection for an ordinary non-regenerative set. Careful adjustment of the "tickler" coil is quite essential in order to steer clear of distortion of the incom-

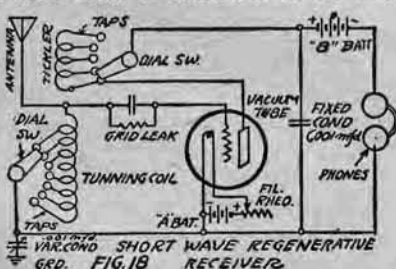


FIG. 18 SHORT WAVE REGENERATIVE RECEIVER.

ing oscillations. This latter condition arises when the coupling between the grid and plate circuits is too great.

Two Methods of Feed-Back

There are two methods of "feed-back" reception in common use for producing the

regenerative effect, namely, the circuit making use of a "tickler" coil and the so-called "tuned plate" circuit.

The diagram shown in Figure 17 gives a feed back circuit using a "tickler" coil. The "tickler" coil is merely a coil of wire connected in series in the plate circuit and

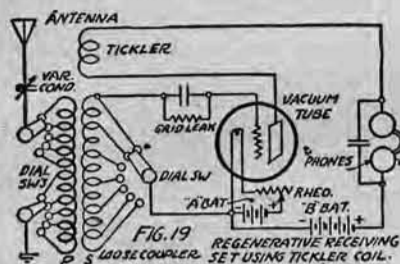


FIG. 19 REGENERATIVE RECEIVING SET USING TICKLER COIL.

so arranged as to be in inductive relation to the secondary coil of the two-circuit receiver. In the case of a single-circuit receiver, the "tickler" coil is in inductive relation to the single tuning, or inductance, coil. Referring to the diagram, the primary winding of the coupler is inserted in the antenna and ground circuit, the secondary is connected to the vacuum tube, and the "tickler" is connected in the plate circuit. Of great importance is the adjustment between the "tickler" and the secondary coil, inasmuch as regulation is often necessary to obtain the best regenerative effect.

Radio Frequency Oscillations

In receivers employing the "tickler" coil, when the incoming oscillations are impressed upon the circuit, the current flowing in the plate circuit is composed of pulsations of both audio and Radio frequency. Inasmuch as the secondary and the "tickler" coils are coupled, the Radio frequent component of this current flowing through the "tickler" coil causes Radio frequency oscillations to be induced in the secondary. This induced potential causes an increased oscillation in the grid circuit,

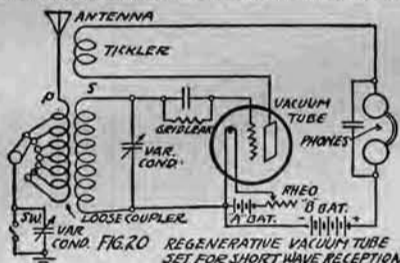


FIG. 20 REGENERATIVE VACUUM TUBE SET FOR SHORT WAVE RECEPTION.

which is then amplified in the detector tube. The resultant increase in Radio-frequency current through the "tickler" produces increased strength of oscillation in the grid circuit. As a result of the additive effect of this regeneration, the signal audible in the 'phones is greatly increased in strength.

Receiving sets of the regenerative type possess the attribute of not only amplifying the damped wave transmitter signals, but by increasing the degree of coupling between the grid and the plate circuits beyond the place of maximum amplification, an oscillating condition will be obtained in the circuit. Thus the set will operate as a receiver of undamped or continuous wave signals working upon the heterodyne principle. The three functions of the audion, detection, amplification and gen-

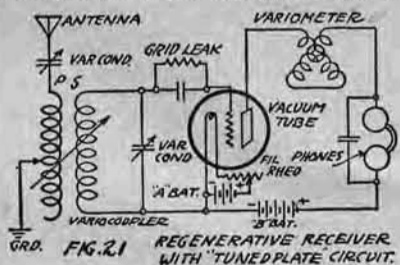


FIG. 21 REGENERATIVE RECEIVER WITH "TUNED PLATE" CIRCUIT.

eration are thus made use of in a regenerative receiver.

Short Wave Regenerative Receiver

Figure 18 shows the connections for a simple short-wave regenerative receiver. The set consists of a tapped inductance coil for tuning, a tapped "feed-back" plate inductance wound on the same form and adjacent to the tuning coil, a short-wave tuning condenser, vacuum tube equipment, etc.

Figures 19 and 20 show other methods of obtaining regenerative operation. Referring to Figure 19, tuning is effected by means of a variable condenser and a loose-coupler with tapped primary and secondary. Coupling is varied by changing the relative position of the two windings, and the intensity of the signals is regulated by careful adjustment of the "tickler" coil.

Figure 20 gives the diagram of a regenerative circuit for short-wave reception. The primary of the loose-coupler is tapped to a multi-point switch for cutting in or

out more or less turns, the fine adjustments being made by means of the variable condenser shown connected in the antenna-ground circuit. The secondary circuit may be tuned by changing the setting of the variable condenser connected across the secondary winding of the coupler. Continuous variation of inductance is obtained by using the loose coupler. The coupling is varied from maximum to minimum by changes in the relative position of the coils. The "tickler" coil is inductively coupled to the secondary of the coupler.

Variocouplers

Variocouplers may be substituted for the loose couplers in the diagrams shown in Figures 17, 19 and 20. The variocoupler consists essentially of two coils, one revolving within the other, the energy transfer being caused by induction. Its operating convenience is of the highest order since all adjustments are of the rotary type. The degree of coupling may be adjusted by rotating the ring carrying the fixed secondary winding. The primary inductance may be varied through the

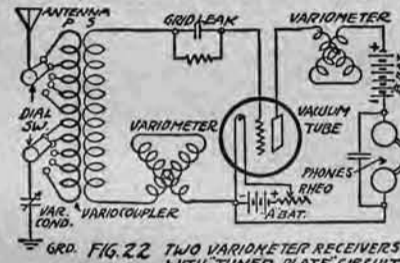


FIG. 22 TWO VARIOMETER RECEIVERS WITH "TUNED PLATE" CIRCUIT.

medium of taps from the winding brought out to multi-point switches. Secondary variation in wave length is accomplished by means of multi-point switches and a variable condenser in parallel with the secondary winding. The usual method of obtaining inductance variation in the secondary circuit of a receiver containing variocoupler is by means of a variometer.

Too much regeneration causes distortion of the incoming signals, even to such an extent as to render them unintelligible. By properly adjusting the coupling between the plate and the grid circuits, an adjustment may be found where good amplification may be had with negligible distortion. If too much coupling is used, the adjustment becomes critical and the tube will finally oscillate and become a generator of high frequency, which is radiated on the receiving antenna. This radiation will then be heard by other receiving sets in the vicinity and cause great interference in the reception of distant signals.

Tuned Plate Circuit

In addition to receivers with a "tickler" coil in the plate circuit, regeneration can

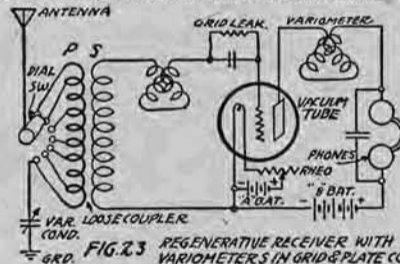


FIG. 23 REGENERATIVE RECEIVER WITH VARIOMETER IN GRID & PLATE C.

also be effected by means of the "tuned plate" circuit. Figure 21 shows a circuit of this type. Substituted in place of the "tickler" coil is a variometer, which having an adjustable and continuously variable inductance, needs not to be coupled inductively to the secondary coil. This variometer serves the purpose of tuning and feeding back into the grid circuit the added potential of the plate circuit. In this case the capacity between the grid and plate is utilized for coupling purposes. Interference can be more readily reduced with this type of receiver than with the single-circuit receiver and many types of two-circuit receivers. The amount of regeneration may be varied by regulating the plate variometer only, fine tuning being accomplished with the primary and secondary variable condensers.

Two Variometer Regenerative Receiver

Figure 22 shows a two variometer regen-

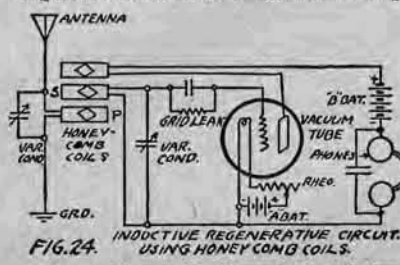


FIG. 24 INDUCTIVE REGENERATIVE CIRCUIT USING HONEY COMB COILS.

erative receiver with "tuned plate" circuit. Tuning is accomplished by means of a variocoupler, a variable condenser in the antenna-ground circuit and a variometer

for fine adjustments in the secondary circuit. The variometer offers a simple way of varying the inductance of a circuit, allowing close tuning within a small range of wave length variation.

The diagram of a regenerative receiver having variometers in both the grid and

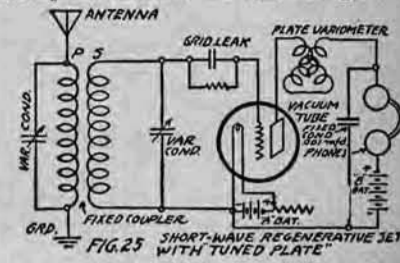


FIG. 25 SHORT WAVE REGENERATIVE SET WITH TUNED PLATE.

the plate circuits is represented in Figure 23. The loose coupler is tuned approximately to the wave length, with the taps and the variable condenser placed in the antenna circuit. The grid and plate variometers are varied together until a "plucking" sound is heard, which indicates that the circuits are in resonance. A slight "howling" indicates that the set is oscillating; this can be eliminated by careful adjustment of the filament rheostat, regulation of the plate voltage and careful tuning of the circuits.

Use of Honeycomb Coils

A very flexible regenerative receiver may be effected by using three honeycomb coils in a special adjustable mounting stand. Figure 24 shows the diagram of such a circuit. One of the honeycomb coils is connected as the primary and another as the secondary of a variocoupler, while the third coil is connected in the plate circuit as a "tickler." Inductive regenerative couplings is thus made use of between the grid and plate circuits. Tuning and coupling is regulated by swinging the primary coil, and the signal strength is adjusted

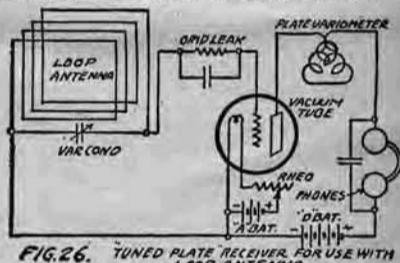


FIG. 26 TUNED PLATE RECEIVER FOR USE WITH LOOP ANTENNA.

by moving the "tickler" and changing its position relative to the secondary coil. The set is easily adjusted to any desired wave-length by proper selection of other combinations of coils containing different numbers of turns.

Figure 25 shows how a variometer may

(Continued on page 12)

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Honeycomb coils are still used by quite a number of Radio operators and owners of receiving sets, and they work fine. I have made a study of the QRM situation and find that most of it is due to broadly tuned receiving sets, although I will admit some is caused by transmitters. For

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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spark reception I have always been in favor of the three-coil regenerative sets using honeycomb coils. The circuit I refer to is the one using one as a primary coil, one as a secondary and one as a tickler. This arrangement is fine for the spark, but does not work so well on a phone. After a carrier wave is picked up the real trick is breaking the wave and getting the voice in clear. Most sets on the market today are very hard to keep steady just before the oscillating point is reached, and this is very necessary in phone reception.

The set I am about to describe is as follows: By referring to the diagram it will be seen that three coils are used, two of which are in the aerial or primary circuit, and the third of which is used as a tickler coil. The coil No. 1 is known as a wave trap and has 25 turns of wire; coil No. 2 is the tuning coil and has 25 turns; coil No. 3 is the tickler coil and has 50 turns of wire. Condenser No. 1 is the wave trap condenser and has two plates; Condenser No. 2 is the series condenser and should have 43 plates; Condenser No. 3 is the tuning condenser and has 23 plates.

The tuning of this set is as follows: Set coil No. 1 at zero; coil No. 2 at about 90 degrees, and coil No. 3 at 180 degrees. Swing the coil No. 1 about 45 degrees from coil No. 2, then swing coil No. 3 until the set starts to oscillate. Move the dial of condenser No. 3 slowly over the scale, keeping the set oscillating with the coil No. 3 until you pick up the carrier wave of the sending or phone station. The real tuning is now to be accomplished. Tune the whistle, which is the carrier wave, in by using coil No. 2 and coil No. 3 until you get a low pitch whistle—that is, where the whistle gets rough as though someone was trying to talk with a mouth full of water, or you hear a gurgling sound, then go back to coil No. 3 and condenser No. 3, and swing the coil No. 3 toward coil No. 2 until the oscillation stops. Then turn back into the oscillation. If the coil No. 3 is very carefully adjusted the voice will be heard. After using this set for a while it will be much easier to operate than at first supposed.—John H. Boos, Jr., St. Louis, Mo.

Miscellaneous Tips

A single wire aerial 100 to 150 feet long is sufficient for local and long distance reception of broadcasting stations. Do not string aerials across the street or across electric wires. Keep antenna wires off electric light and telephone poles. Stranded copper or solid copper wire

TUBE DETECTORS

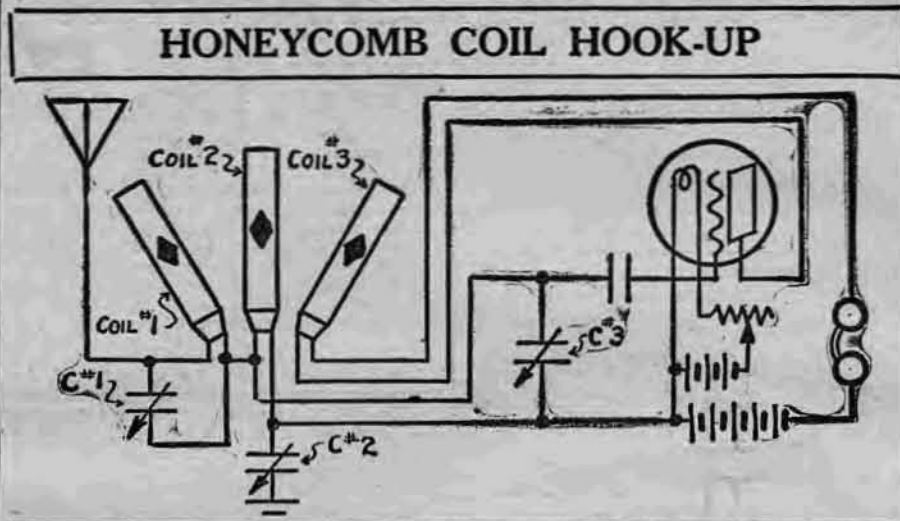
(Continued from page 11)

be used with a fixed coupler to make the set regenerative on the short wavelengths.

The Loop Aerial

In the "hook-up" shown in Figure 26, the loop takes the place of antenna and ground connections. As will be noted, the loop is connected in the circuit in the same way as would be the secondary of a coupler. The variable condenser placed across the loop is used for wave-length variation, and the variometer in the plate circuit gives the desired regenerative effect.

A vacuum tube set with a loop antenna will receive well over short distances, but for best results a Radio-frequency amplifier should be used to build up the energy of the intercepted waves. The loop antenna is a directional receiver, and reception is best when the loop is pointed with its end toward the sending station. The loop intercepts only a small amount of the energy usually received by a good



should be used. Phosphor bronze wire if obtainable is stronger but not superior to copper.

Good contact with a piece of mineral like galena can be had by wrapping it in tinfoil. Of course, the top of the crystal is left exposed.

Fired .22 gauge rifle shells make good switch points for tuning coils and receiving transformers.

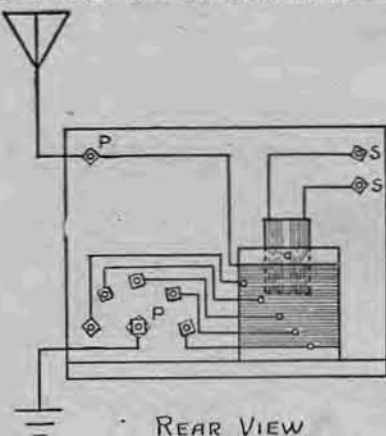
The brass ends of large cartridge shells make splendid crystal detector cups. They should be cleaned out thoroughly before they are used.

The winding of cardboard tubes from oatmeal boxes may be improved greatly if the tube is first heated in an oven for about 15 minutes to take out the moisture and then wound; or better still shellac it while it is warm and allow the shellac to soak in.

In winding tuning coils with bare wire a thread should be wound on with the wire. This will separate each turn. When the coil is finished the thread can be taken off. Shellac should be applied immediately. When the shellac is dry the copper wire will stay in place.—Phillip Myers, Chicago, Ill.

Connections to Variometers

With my home constructed regenerative set I have experienced some difficulty in making proper connection to my variometers and vario-coupler. As most other amateurs do I started out by twisting the leads. This is not very efficient and it is difficult to change hook-ups, which most amateurs want to do not less than twice a week. This twisting and untwisting



of the wires soon breaks them. I overcame this difficulty in the following manner.

Seven small binding posts were purchased and they were mounted on the panel in the manner shown. This makes it very handy for changing the hook-ups. This may have been tried before but it is new to me.—Howard Robertson.

antenna, but it is safe from lightning since it can be used indoors. It does not pick up static like the regular antenna because it does not make use of a ground connection.

Resume

The use of the regenerative arrangement complicates the operation of a set quite a little, but at the same time louder signals will be heard than would be obtained from a simple receiving circuit. The regenerative effect gives rise to all kinds of noises in the telephone receivers. Oftentimes in tuning there will be a "fading" of the signals when the hand is brought near the dial. To overcome this "capacity effect" of the body it is found necessary to line the inside of the panel with a metallic shield. Inasmuch as the capacity of the body materially affects the delicate adjustments of the regenerative set, the dials of some instruments are made of metal and are grounded to act as shields.

Once adjusted, a regenerative receiver will keep its adjustment fairly well, except

Improved Variable Condenser

Recently I was in need of a variable condenser and as all the shops were closed at the time I made use of a makeshift condenser. I used an old loose coupler by connecting to one of the primary binding posts as one terminal and one of the secondary binding posts as the other. Sliding the secondary in and out of the primary gave the variations. Of course, the slider and taps had no effect on the working of the instrument as a condenser, but I received very good results.—Milton Matthews, Omaha, Neb.

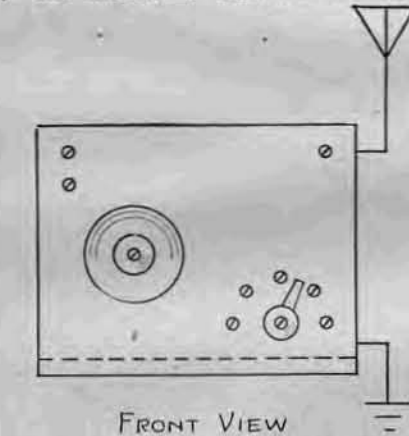
Operating Detector Tubes

Detector tubes do not operate on all "B" battery voltages equally well. Tubes of the same make even do not operate best on the same value of "B" battery voltage. After the best "B" battery voltage is found it is not necessary to change it often.

The detector tube is very critical and its filament should be heated to the proper temperature to give best results. It is well to use a vernier rheostat for the detector so that very fine adjustment can be made.

The amplifier tubes are not so critical and it will be found that the tube will operate just as well with its filament not heated to the highest temperature. It is well to keep the temperature down so that the life of the tube may be prolonged.

The amplifying transformers must be



connected properly or the tubes will not amplify. The outside of the secondary winding should always be connected to the grid of the tube and the inside of the primary winding to the plate of the tube before. Some transformers have their terminals marked, but others do not. The above rule holds in all cases, however.—Raymond Norton, Detroit, Mich.

for an occasional regulation of the filament rheostat. Two- and three-circuit regenerative receivers have an advantage over single-circuit receivers in the matter of eliminating troublesome interference.

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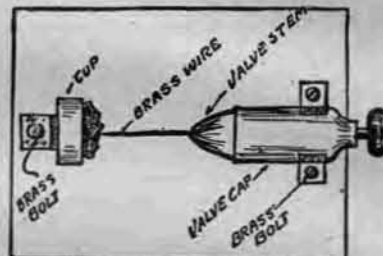
Silvertone Talker Co.
1432-34 Dime Bank Bldg., Detroit, Mich.

Dealers Attention

Valve of Tire Used In This Crystal Detector

One of the most practical crystal detectors I have found is the one shown in the illustration. It can be used on a panel mounting and it is not expensive to make. The materials required are an old valve stem and cap, crystal cup, two brass bolts, old dry cell binding post, a stiff piece of wire, or cat whisker if galena is to be used. The end of the valve stem cap is cut off about 1/2 inch from the end and mounted on the base by means of a brass strip. A brass bolt was used to hold one end and it extends through and used both as a fastener and a binding post on the inside of the panel.

The crystal cup was mounted at the lower part of the base and fastened with a brass bolt which also served as a binding post on the inside of the panel. A stiff wire from a safety pin was soldered



to the large end of the valve stem, or a cat whisker may be used in the case of galena. The binding post is soldered to the small end so as to fasten on the knob. The point is raised or lowered by turning the knob.—Clarence Johnson, Courtland, Kansas.

Aerials and Trees

Place your aerial, if possible, at right angles with the power lines. Trees near the aerial but not touching it, especially during the growing season, hamper the efficiency of a transmitter but have little or no effect on a receiving set.—Robert Snyder, Atlanta, Ga.

Connection of Phone Cords

If it becomes necessary to remove the phone cords, the wires should be connected as they were found, respecting as to color of cord, because permanent magnets will be partially demagnetized and the sensitivity of the phone will be impaired.—Edwin Young, Seattle, Wash.

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Simple Instructions for the Beginner

By Harry J. Marx

Alternating Current Rectifiers

AT THE present time there are about one million Radio receiving sets in use and one of the most persistent problems is that of recharging the storage batteries. Although much has been said about transformers and rectifiers for both the filament and plate circuits, still the present inclination runs towards batteries—due principally to the difficulty in eliminating the commutator hum, which is always more or less present when the power and lighting current is used.

The difficulty of carrying about a heavy storage battery makes recharging quite a problem and naturally the amateur is interested in devices which will enable him to utilize the available lighting current. Numerous devices have been placed on the market and will give very satisfactory results. In addition, rectifiers can be homemade with a saving of considerable expense to the amateur.

Vacuum Tube Rectifier

The first vacuum tube used in Radio work was the two element tube containing only the filament and plate. This type of tube is primarily a rectifier, and as such, can be used in battery charging devices. In the same sense, the modern tube can be substituted using only the filament and plate.

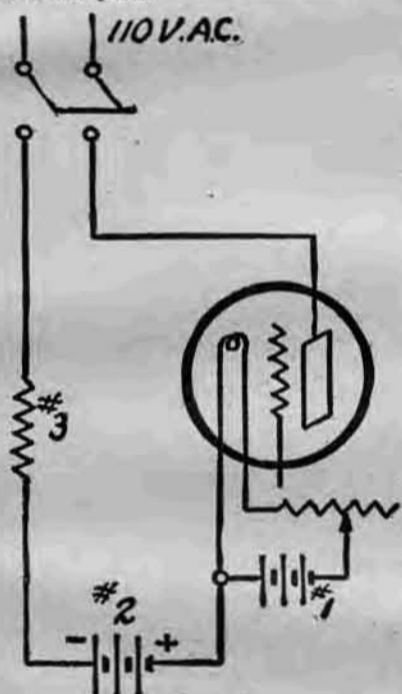


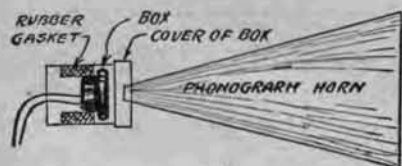
Figure 1

If the vacuum tube is connected as shown in Figure 1 it can be used as a charging device. Battery No. 1 furnishes the filament lighting current. Battery No. 2 is the one being recharged and a calculated resistance No. 3 is connected in series to control the required charging current. The trouble with this method is that battery No. 1 is being discharged while battery No. 2 is being recharged. To remedy this a transformer is used—eliminating the resistance No. 3. A special winding is added to furnish the required filament current. In this way battery No. 1 is eliminated also. The tubes used in the commercial type rectifier have no grid, and vary for different charging rates.

Homemade Loud Speaker

An old phonograph horn or a megaphone, a baking powder tin with cover, some rubber for a gasket (which may be taken from a discarded inner tube of an automobile tire), scissors, or tin snips, and a soldering torch with solder and flux are all that is needed to make this loud speaker.

Cut a hole in the cover or the baking powder tin to fit over the small end of the



horn and solder it to the horn. Cut off the open end of the baking powder tin so that a rubber gasket and receiver will fit snugly. Bore a hole in the bottom or side of the can for the receiver cord and the attachment is finished. This will not take over 15 minutes. When the loud speaker is given a little paint it will not only be strong but will present a good appearance.—Dr. Arthur R. Garvey, Waltham, Mass.

Get Proper Size Tubes

When purchasing one of these charges it is well to remember the size of your battery. For a battery of not more than 40-ampere hours capacity the 2-ampere tube will do the work. For any larger size battery the 5-ampere tube should be used as it will charge the battery in a much shorter period.

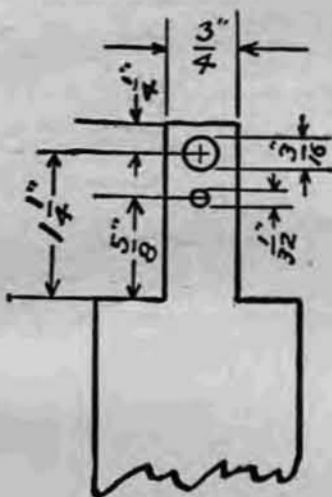


Figure 2

Another fact that should be considered is the duty, or "load" as it is called, put on the battery, that is, the rate of discharge when operating the receiving set. If a single tube is used, the discharge rate will be approximately one ampere. If the receiver is in operation an average of three hours a day the total discharge will be three ampere hours. In this case the two-ampere lamp will be sufficiently large for recharging the battery regardless of its size. Operating the rectifier for about two hours a day will keep the battery in prime condition.

Discharge Greater With More Tubes

However, if a three-tube receiving unit is used, the total discharge over the same period will be nine ampere hours. To keep the battery fully charged with a two-ampere lamp under this heavy load would mean recharging of at least five hours daily, whereas a five-ampere tube would do the work in two hours.

A battery should never be allowed to run down completely before recharging. It has two very distinct disadvantages from the operating standpoint, first, that it invariably chooses to become inoperative just in the middle of some interesting program, and second, during the period of complete recharging the station is out of operation.

The advantages of putting back the energy consumed at regular intervals of time are obvious.

Homemade Chemical Rectifier

It is not at all a difficult matter to make a rectifier for recharging the storage batteries by means of an alternating current lighting circuit.

Get two ordinary battery jars used for sal ammoniac wet cells or even mason jars. Cut two pieces each of lead and aluminum, 8 inches long, 2 1/2 inches wide and 1/2 inch thick. Cut the ends of these plates as shown in Figure 2 and drill the two holes as indicated. Turn or cut two

blocks of wood or hard rubber 5/8 inch thick to fit in the top of the jars. Two slots, 1/2 inch by 1/4 inch, are cut in each. These slots are spaced as far apart as possible. The ends of the plates (one lead and one aluminum) are forced through these slots and held in place by a short piece of 1/32 inch wire passed through the small hole as illustrated in Figure 3. Binding posts are then fastened through the holes on the top of the plates.

Solution or Electrolyte

The solution or electrolyte used in the jars is made by adding about one pound of borax (20 Mule Team) to a quart of hot water. The borax should be thoroughly dissolved. In fact it is advisable to add borax up to the saturation point. The clear solution should be poured into the jars to within 3/4 inch of the top.

The top and the plates are then inserted. The lead plates correspond to the negative side and the aluminum to the positive of a battery. Before use the plates should be "formed" by passing a current through them. The two negative or lead plates are connected to one side of the alternating lighting current. The two positive or aluminum plates are connected to the other side of a 100-watt lamp, the other side of which goes to the other end of the alternating current supply. The current then must pass through the rectifier before going to the lamp. The current is left flowing three or four hours, or overnight if desired. The plates are then "formed," and the rectifier is ready for use.

Charging the Battery

Figure 5 shows how the rectifiers are connected for use in charging the battery. Two brass straps can be used to connect the two sets of plates. The two negative plates are connected to the one terminal of the source of current. The two positive plates are connected to the positive side of the battery. Between the other terminal of the source of alternating current and the negative side of the battery, a 100-watt lamp is inserted in series. If the battery is discharged very low, it will take a long time to recharge it, as only a very small current will pass through the rectifier, in fact the charging rate will be about 2 amperes. In order to avoid long charging periods it is advisable to recharge the batteries regularly every day or two, depending upon the current drawn from it. If possible, it is advisable to use voltmeters and ammeters to keep track of the rate of charge and discharge of the battery.

In addition to recharging, the storage battery must also be kept filled with dis-

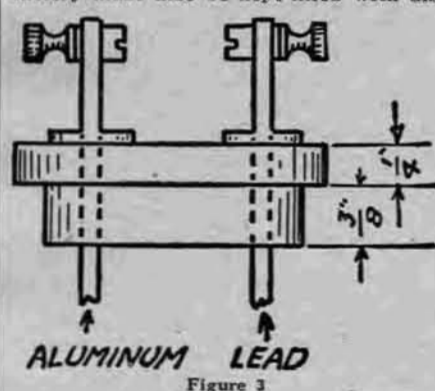


Figure 3

tilled water to just cover the plates which are visible. Use nothing but clean water in refilling the rectifier jars when the solution evaporates. After considerable use, the aluminum plates will

become thin and eaten away and must be replaced by new strips. Of course, if direct current is available it is only necessary to insert sufficient re-

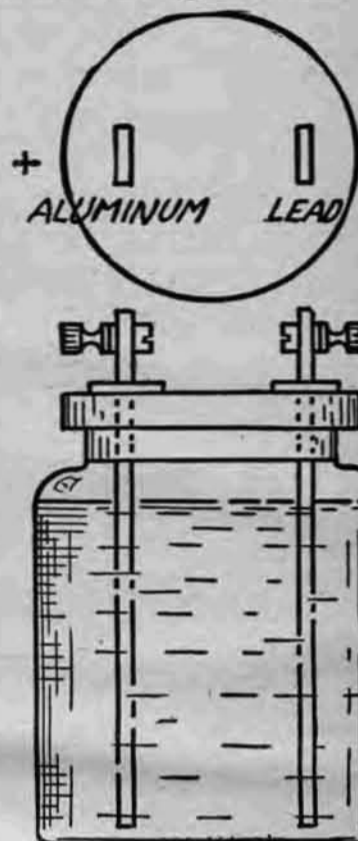


Figure 4

sistance in the circuit to cut down the outage. Otherwise battery will be charged too fast and the plates will be buckled and warped. The necessary resistance can

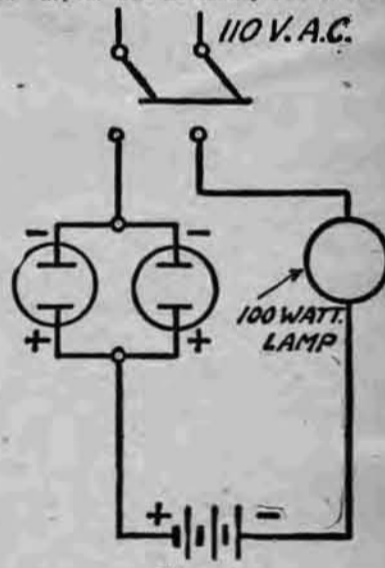


Figure 5

be figured by using Ohm's law: $E = RI$. Some experimenters have found an electric flat iron about the proper resistance to use.

Dry Cellar for Radio

Be sure, before moving into or setting up a Radio set in a cellar, that it is a dry cellar, because moisture is sure to form on the windings of the coils of your set.—William Hunt, Denver, Colo.

Metallic Arsenic Detector

If you are using a crystal detector with the familiar fiddle string or cat whisker adjustment, the crystal's sensitivity may be decidedly enhanced by simply attaching a small fragment of metallic arsenic to the cat whisker and then readjusting to the usual light contact. Experiment has shown that this combination not only increases the range of the receiving station, but is an advanced step towards stability of adjustments, a feature not to be overlooked in Radio reception.

When used in conjunction with carborundum or other crystals requiring a comparatively rigid and firm contact, care should be exercised in avoiding pressure sufficient to crush the arsenic crystal, which is quite fragile. With a sensitive spot once found, this combination, carborundum and arsenic, will hold its adjustment for days, and sometimes weeks, without further attention.

The experimenter should not forget, however, that carborundum alone or in

combination with any other crystal is always used with a potentiometer, pole changing switch and two or three dry cell batteries.—S. K. Culbertson, South Chicago, Ill.

Testing Receivers

To test receivers for sensitivity place a piece of wet newspaper between a nickel and a penny. Next touch the tips of the receiver wires to the coins. Place one tip on the nickel and the other on the penny. The loudness of the click to be heard in the receivers denotes the sensitivity.—Walter Hoffmann, Milwaukee, Wis.

Holding Tap Loops

The writer has found from experience that satisfactory taps can be made in the form of small untwisted loops about 1/4-inch long without the wire loosening on the tube. The small loop is formed with a pair of long-nosed pliers and a paper fastener slipped over it to prevent the loop from opening up when the winding is completed. The sharp edge of the paper fastener hole will grip or chuck the wire so that it may be drawn taut and the winding process continued.

The paper fasteners are left in place until after the insulation has been removed from the wire, which can be best done with an old safety razor blade. The

loops are next tinned and soldered. The paper fasteners can then be removed with a pair of diagonal nosed cutting pliers, or, if the worker prefers, they can be soldered to the loops.—H. E. Jameson, Milwaukee, Wis.

A Powdered Galena Detector

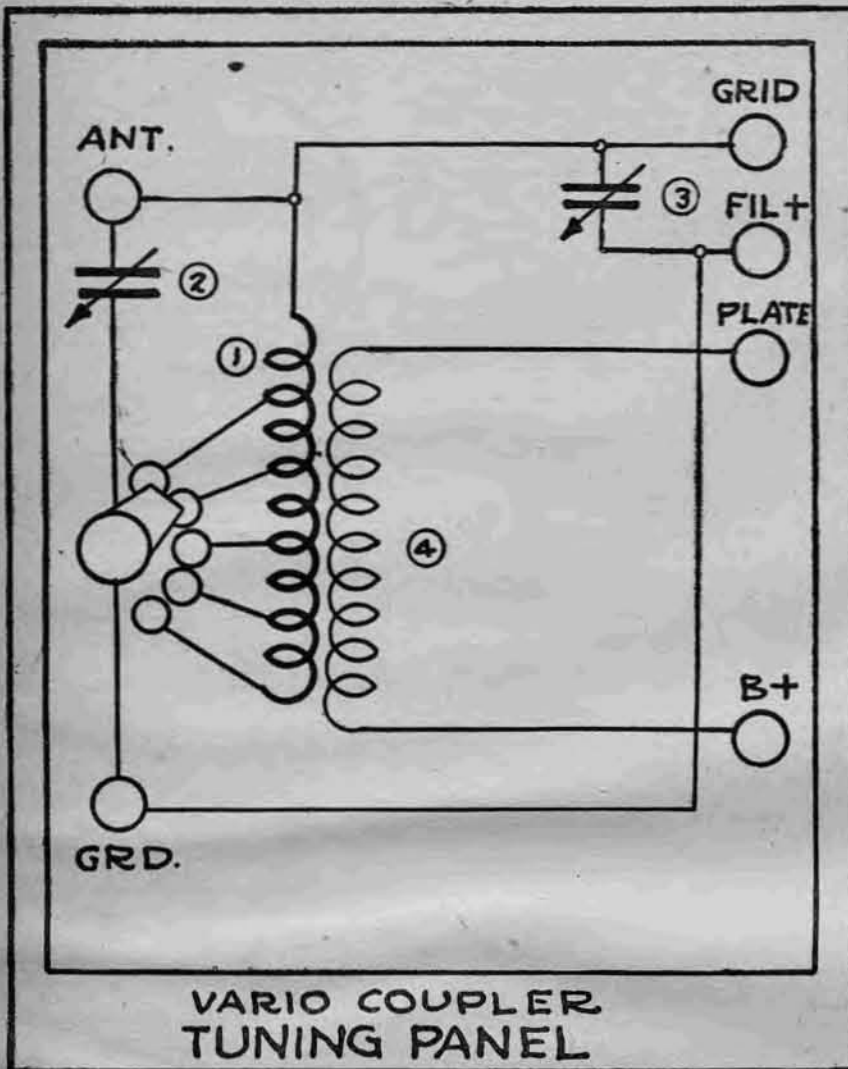
The parts necessary for making this detector are two copper electrodes, one large burned-out electric fuse, two binding posts, a hardwood base, one knob and some powdered galena. The ends of the fuse are removed and the powdered galena poured in, then a copper or brass



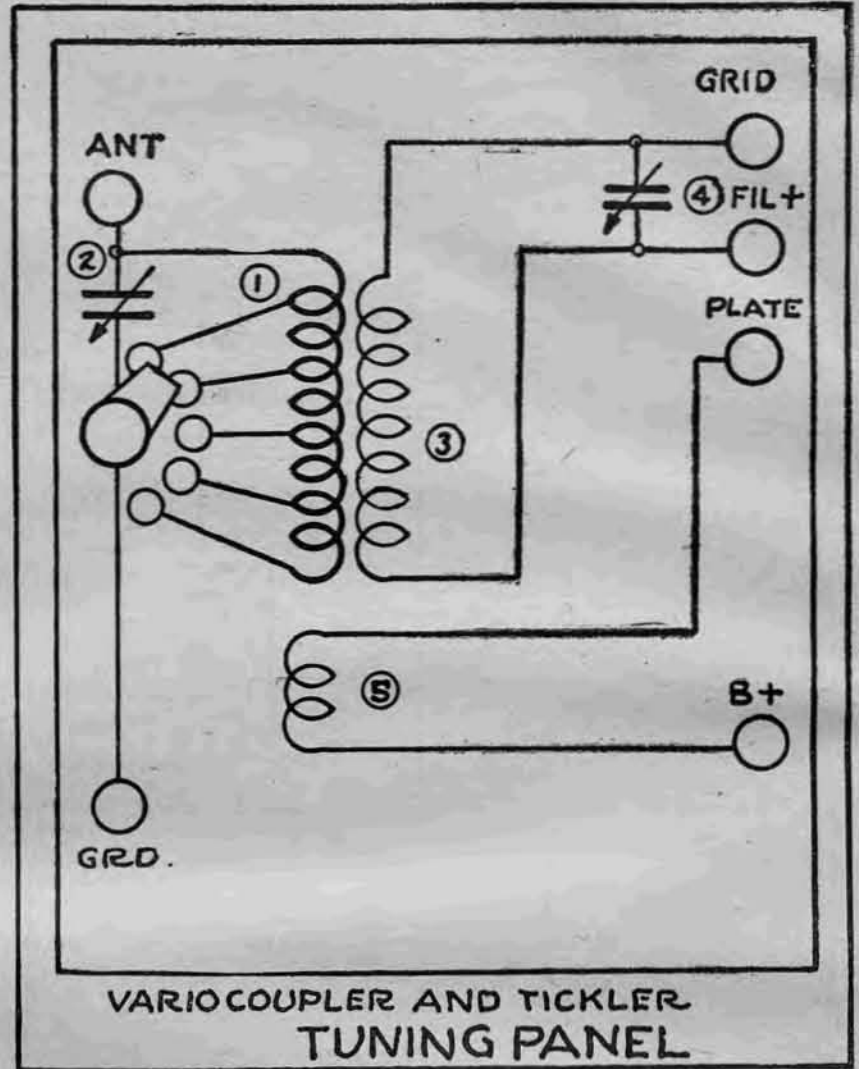
rod soldered to each electrode passes through the fuse ends. A knob is attached to one of the protruding ends of the rods. In turning the knob the whole fuse turns, thus changing the position of the galena and adjusting it to a sensitive point. Galena may be powdered by hammering it on a piece of clean iron or steel.—Lavell D. Winchlin, Richfield, Utah.

Panel Units for Your Receiving Sets

By Harry J. Marx



S-18



S-19

PARTS REQUIRED FOR VARIOCOUPLER TUNING PANEL

- 1 Panel 8"x10"x 1/4"
- 6 Binding Posts
- 1 Tapped Switch

- No. 1—Primary winding of variocoupler
- No. 2—Primary condenser .001 Mfd.
- No. 3—Secondary condenser .0005 Mfd.
- No. 4—Secondary winding of variocoupler

The two binding posts on the left-hand side are for the aerial and ground connections. The primary winding of the variocoupler is used for both the antenna and secondary circuits. The secondary winding is used as a tickler, making the panel regenerative. The two binding posts in the upper right-hand corner marked "GRID" and "FIL +" are for connection to the vacuum tube detector unit directly to the grid and the positive side of the filament battery. The two binding posts below marked "PLATE" and "B +" are for the regenerative plate circuit, and connect the tickler coil in series between the plate and the "B" battery.

PARTS REQUIRED FOR VARIOCOUPLER AND TICKLER TUNING PANEL

- 1 Panel 8"x10"x 1/4"
- 6 Binding Posts
- 1 Tapped Switch

- No. 1—Primary winding of variocoupler
- No. 2—Primary variable condenser .001 Mfd.
- No. 3—Secondary winding of variocoupler
- No. 4—Secondary variable condenser .0005 Mfd.
- No. 5—Tickler coil of variocoupler

The variocoupler has a primary wound on a tube with a secondary at one end and a tickler at the other end. The two binding posts on the left-hand side are for the aerial and ground connections. The two binding posts in the upper right-hand corner marked "GRID" and "FIL +" are for connection of the secondary circuit to the grid and the positive side of the filament battery. The two binding posts below marked "PLATE" and "B +" are for the regenerative hook-up and connect the tickler coil in series between the plate and the "B" battery.

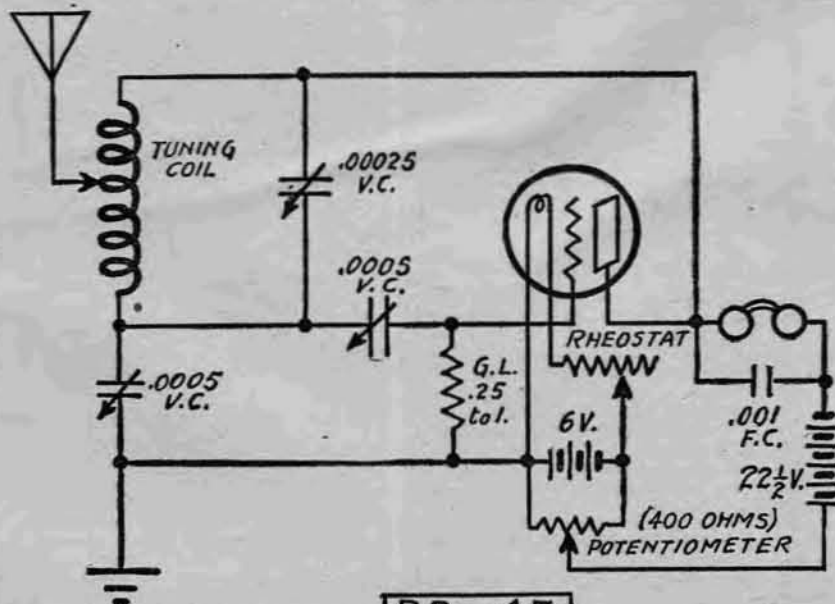
HOOK-UP RD-45

The hook-up shown is given because of its simplicity of operation, little apparatus required, and the rather unusual form of circuit. The tuning coil is of the usual single- or double-slide commercial type manufactured to cover the normal broadcasting range. The slider is connected directly to the antenna. The usual coil terminal connects directly to the grid circuit with 0.25 to 1 megohm grid leak and variable grid condenser. The grid leak should be of the mounted type so that variation can be obtained by inserting different grid leaks. The other end of the coil winding leads directly to the plate circuit with a small .00025 variable condenser shunted across the coil. A .0005 mfd. variable condenser is inserted in the series in the ground circuit. A connection is made from this ground circuit to the negative side of the "A" battery. The slider on the potentiometer is connected to the negative side of the 22 1/2-volt "B" battery.

This circuit by means of the numerous variable condensers permits an extremely accurate and sensitive control.

About Lightning

The use of lightning arresters is advisable because occasionally they do protect delicate Radio receiving instruments and



R.D.-45

because, in some localities, they are required by law. Hysterical fears in regard to lightning, unfounded in most cases, and greatly exaggerated in others. Lightning is the result of a discharge

of electricity between a cloud and the earth. This discharge often amounts to millions of volts, which sounds very dangerous, but isn't, if it strikes somewhere else. Be assured that the lightning is

not going to follow you around and seek you out for a little light diversion. It seeks the fastest way out and the shortest way down. Now if your aerial is properly erected and grounded, it will tend to equalize the electrical strain between the charged clouds over your roof and the earth beneath you in very much the same way as a lightning protector, or lightning rod.

In other words, a properly erected aerial is a lightning protector, and is therefore a safeguard, if anything, against lightning. The possibilities of a single wire aerial as an equalizer between the charged cloud and the charged earth may not be very great, but it certainly can not by any stretch of the imagination be termed an attraction to lightning. Assume that the electrical energy in a cloud decides to come to earth. A single No. 14 wire, strung as an aerial over your roof is not going to affect the going or coming of the lightning flash in the least. The entire mass of wire in your aerial won't move a million-volt lightning flash one iota of an inch. It is like trying to use a one-inch horseshoe magnet to draw a locomotive off its iron track when it is speeding at sixty miles an hour.

Lightning arresters are of value mainly to protect instruments from the extra heavy current charges caused by excessive static and from high potential current induced by lightning discharges taking place at a distance. But they offer no protection from a direct bolt of lightning, at least, no more protection than the mistaken idea that an aerial offers attraction.

Questions and Answers

Long Distance Receiving Set

(463) PWM
As a regular reader of your paper, I take the liberty of asking you the following questions:

1. What is the best hook-up for a set to contain two steps Radio, one detector tube and two steps of audio frequency amplification?

2. What is the best method of tuning this set?

- A-1. See page 13, issue 12, July 1.
- 2. See issue 3, page 13, July 8.

Receiving Troubles

(455) ENO
I have been a reader of the RADIO DIGEST since it came in circulation around Boston and as I have been having quite a lot of trouble in constructing some apparatus for Radiophone reception I thought I would take advantage of your question department as you may be able to give me some advice and instructions.

First I will describe as clearly as possible the set which I built. I live about twelve miles from the Amrad station (WGI) but have been unable to hear them. My set is built as follows:

Primary, wound with 160 turns of No. 22 enameled wire with 7 taps of 20 turns, one tap of ten turns and ten taps of single turns each wound on a tube 3 1/2 inches in diameter.

Secondary is wound with 3 1/2 inches of No. 28 enameled wire with taps taken off every 3/8 inch. This tube is 2 3/4 inches in diameter. My primary tube has a 1/4-inch wail. Completing the circuit, I have a 27-plate variable condenser, crystal detector, phone condenser, and 2,000 ohm receivers. My aerial consists of a flat top, 60 feet long, 2 wires 3 feet apart, and about 40 feet high on the far end and 25 feet high on the near end. I have buried two 3x1-foot metal plates two feet deep and also a one-inch iron pipe four feet in the ground. I will give a diagram of my hook-up. This is all inside of a panel.

The use of the four pole double throw switch is to enable me to use my condenser on either the primary or secondary circuit, for long waves when across the primary and closer tuning on the secondary. Now if this set is not wound correct or if other combinations of wire are better, please let me know. Is there any rule to go by in winding certain size tubes? For example, what size wire on primary and secondary would give greatest inductance on tubes 3 1/2 inches for primary and 3 inches for secondary?

A-From data given we cannot determine your trouble in receiving. Your hook-up is O. K. I believe your wave length may be too high. See Page 13, Issues 9 and 10, June 10 and 17, for coil data.

Symbols Wanted.

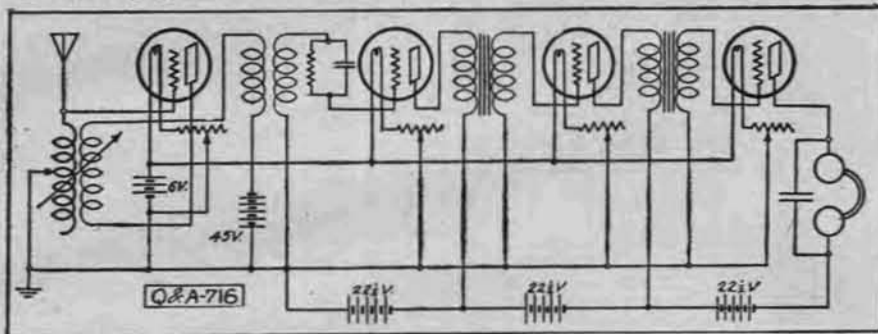
(446) WML
Will you kindly send me a hook-up for a 2-slide tuning coil, also explain the symbols of the different parts such as, variocoupler, audio bulb, loose coupler, 2-slide tuning coil, and variometer?

I cannot read your hook-ups because I do not know the meaning of the different parts by symbols.

A-See Issue No. 1 and 2, April 15 and 22, for Symbols. See RADIO DIGEST No. 5, May 13, Page No. 13 for hook-up.

RD-12 Amplified

(716) WAC
Kindly send diagram of RD-12, on sheet number five, for one stage Radio frequency, and two stage audio frequency.
A-Hook-up Q&A-716 is shown.



Rectified Wave Forms.

(449) VP
Noticing your invitation in RADIO DIGEST I am taking the liberty of asking you the following questions:

1. I understand a damped wave detector only permits half of the alternating, that is only the current flowing in one direction

to pass. If this is the case how is it that it is possible to receive voice over such a detector. I should think the variation of the other half of the current caused by the variations of the voice would not be received.

2. Could you inform me what the wave length and schedule is of the government station (telegraph) at North Head, Washington?

A-1. The rectified current is in the form of pulsating current which is satisfactory for operation. The receiver diaphragm operates on the same pulsation as

sent out by the transmitter.
2. NPE-600, 975, 2400, 2700 meters. Naval and public business, other program unknown.

Filament Control Jacks.

(453) JDP
I am making a regenerative receiver and two-step amplifier, and would like to know how to install automatic filament control jacks. The detector and two-step are to be separate from the regenerative circuit, and are to be of the audio frequency type hook-up. I wish to arrange jacks so that only the tubes in actual use will be lit. For instance, when the detector jack is plugged, signals will be heard without switching on current or changing connections on binding posts. When the first step jack is plugged, the detector and first step will both be lit, and without further connections being made, signals received to be amplified. When the second step jack is plugged, signals will be received with maximum amplification.

Thanking you in advance, and wishing great success to the Question Department, I remain

A-See Hook-up Issue 9 and 10, June 10 and 17, Page 15 for hook-up. These diagrams should enable you to wire your jacks in the circuit as desired.

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A new broom sweeps clean, but how about an old one? Use it for an Aerial, says Betty Francisco, beautiful film star, as she listens to the waves. What waves? Radio or the ocean? She must have a vest pocket outfit or one for the belt.

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