

RADIO WORLD

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ILLUSTRATED

EVERY WEEK

Split-Variometer Coupled Radio-Frequency Amplification

By Leroy Western

A SET embodying one stage of tuned radio-frequency amplification, a detector, and two stages of audio-frequency amplification has recently been put on the market by a well-known radio manufacturer, and has

Quite a veil of mystery was drawn around the construction of the variometer used in this particular set at its inception, but upon investigation nothing startling was found.

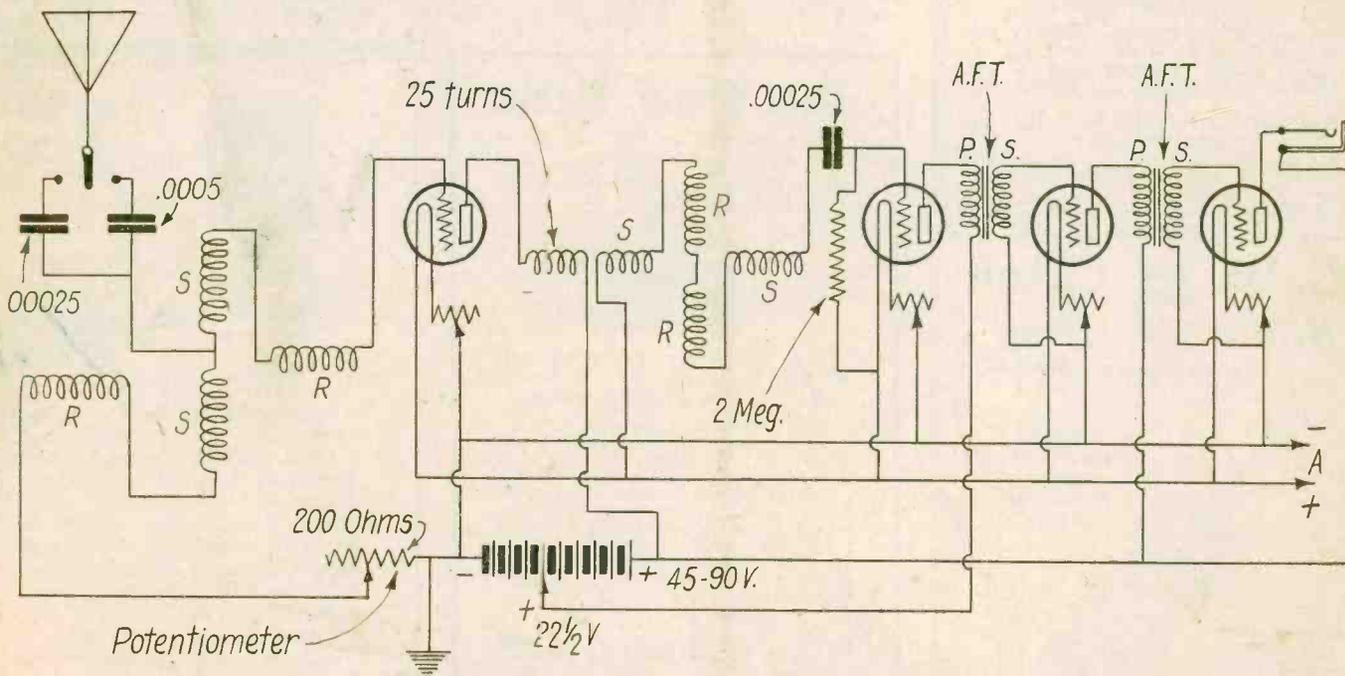


Fig. 1—A four-tube radio-frequency receiver, using split variometers as tuning inductances and radio-frequency couplers. It is possible to operate this receiver on extremely short indoor antennae.

attracted considerable interest for its novelty and simplicity of tuning. Some constructional data on this set may be of interest to the amateur experimenter, and, following the suggestions outlined below, he will be able to obtain some very excellent results.

In constructing such a set the builder must select variometers which have a rather high natural wave length. This readily can be understood when it is seen that only one-half of one of the variometers tunes the antenna
(Concluded on page 8)

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Alexanderson Sends Photos 9,000 Miles by Radio

AS this issue of RADIO WORLD goes to press, it is learned that E. F. W. Alexanderson, chief engineer of the Radio Corporation of America, has completed a long series of successful experiments in sending photographs and drawings by radio.

The demonstrations were made between New York and Warsaw, Poland, at the RCA stations. A "round trip" radio circuit of 9,000 miles was used and the results are said to be highly satisfactory.

The apparatus involves a method of translating radio impulses into light waves (and vice versa) and high speed automatic sending and receiving devices. The new invention will be of especial value to newspapers and in the comparison of signatures.

U. S. Exports Radio Sets

AMERICAN manufacturers of radio apparatus are leading the world in exports, the past eight months' total being valued at \$2,200,000, according to Department of Commerce figures. In August, Argentina led other countries in the purchase of American-made radio equipment, our exports going there amounting to \$99,059. Uruguay stood second with \$40,984 worth of apparatus, while Canada imported \$27,648 worth of American equipment. The total American exports in August amounted to \$307,127, going to 41 countries.

July, however, saw the peak of American radio exports, when a total of \$682,885 worth went abroad, \$443,000 going to Sweden where some large projects were underway. The average monthly value of exports is about \$270,000, but this figure is influenced greatly by the construction of large plants in foreign countries. August exports of \$307,127, it will be seen, are above the average, although less by half than the July figure.

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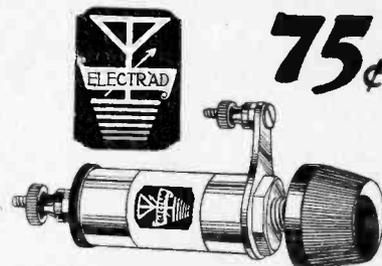
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RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Journal Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Phones: Lackawanna 6976 & 2063.

Vol. IV, No. 7. Whole No. 85

November 10, 1923

15c. per copy, \$6.00 a year

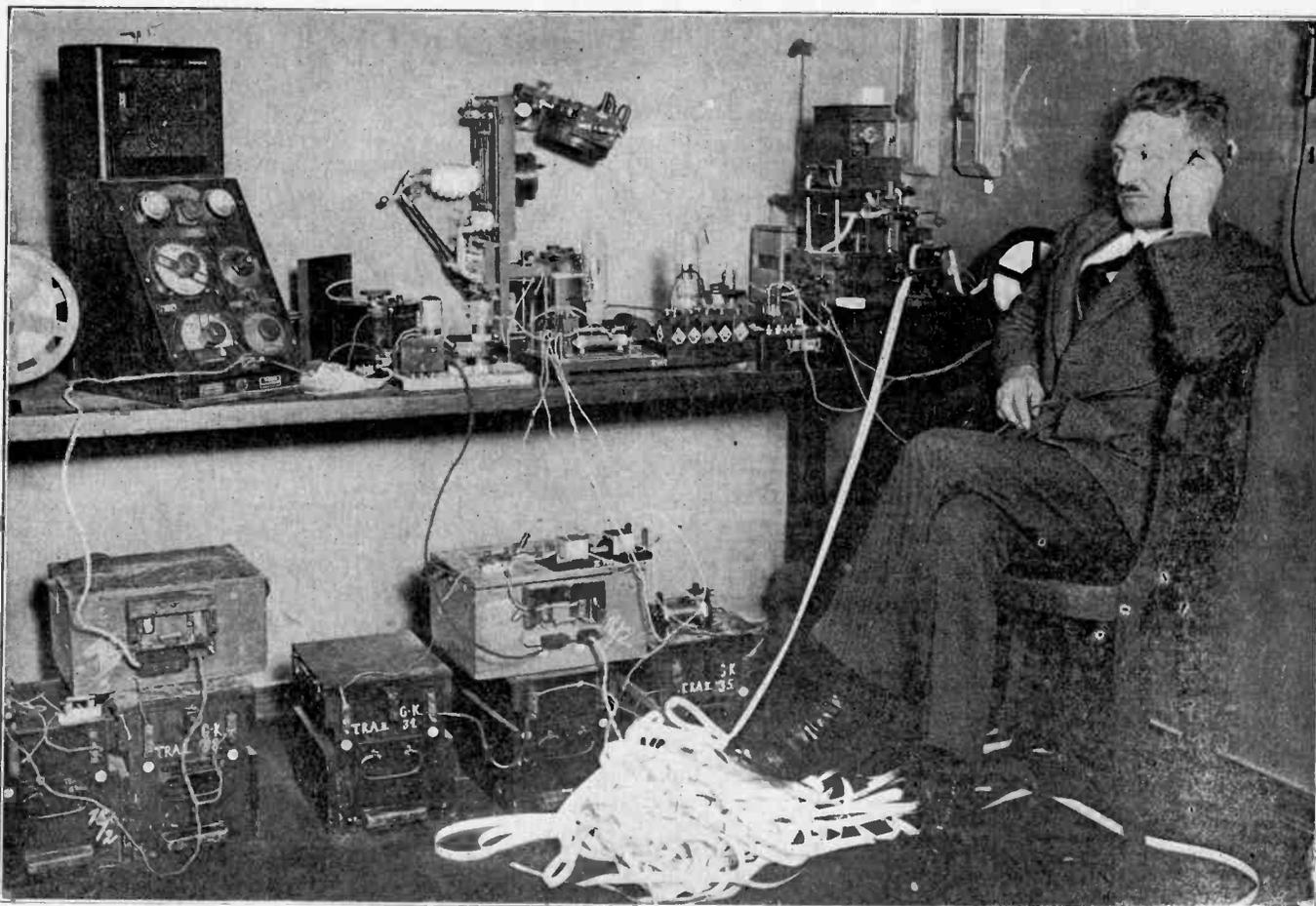
Transatlantic Tests on the Origin of "Atmospherics"

By Dr. Alfred Gradenwitz

THE origin of atmospheric disturbances, apart from those rattling noises which are attributable to nearby thunderstorms, has so far been unknown. In order to ascertain their nature, those differing at different places had to be dealt with separately from those making themselves felt equally at two or more distant stations, those due to lightning flashes being of course left

results already obtained, the following account based on information received from a leading official of the telegraph department, Mr. M. Bäumlér, who is conducting this research, will prove of interest.

Our problem to be solved at the outset was the necessity of so recording atmospheric disturbances as to enable the simultaneousness of occurrence at distance points of



Recording station for comparing atmospheric disturbances at several receiving stations at the same time. The disturbances are charted on a moving strip of paper, as shown, and then compared. Definite time settings are made and the readings can be taken almost simultaneously. The receiver is a typical German experimental station with the addition of a high power audio-frequency amplifier used to furnish current to operate the sensitive recording relay.

out of account. An extensive series of investigations on this important problem is being carried out by the German State Office of Telegraph Engineering of Berlin, in connection with some more extensive research work on the correlation between the propagation of electric waves and atmospheric phenomena. In view of the most valuable

observation to be ascertained with certainty, while allowing at the same time the character and order of magnitude to be distinctly recognized. Inasmuch as a Morse recorder, in the place of a continuous curve, registers dots and dashes, a syphon recorder as used in cable telegraphy was resorted to, which not only is a very sensitive appa-

ratus, but enables records to be checked continuously in the course of observation.

A combination of oscillation circuits designed by the experimenter or else a Telefunken receiver and heterodyne was used for wireless reception. This was arranged in series with a high frequency amplifier and a two tube arrangement, the first tube being used for amplifying and the second for rectifying. The anode current was supplied to the syphon recorder. Time signals from Lyons, the Eiffel Tower and Nauen were chosen as time marks and observations were made simultaneously at the laboratory of the Telegraph Engineering Office, Berlin, and the Wireless Testing Station of the same office at Strelitz, Germany, i. e., at about 100 kilometers distance.

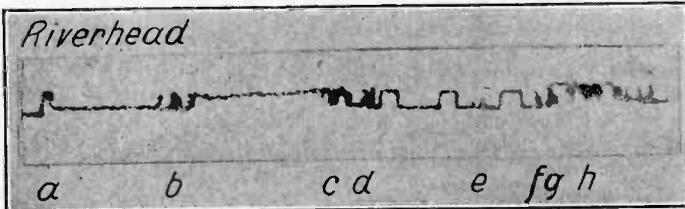


Chart of atmospheric disturbances at the Riverhead, Long Island, radio station. Compare with those below and notice the remarkable resemblance. This was made with an American syphon recorder.

Atmospheric disturbances were recorded during periods of observation along with the time signals, recorders at the two stations being adjusted as far as possible to equal deflections, equal times of observation and equal speeds of working.

These first tests having shown a considerable part of the crackling noises attributable to atmospheric, so far from being of local origin, to come from considerable distances, another series of tests was made between Berlin, Strelitz and Hamburg. The number of atmospheric disturbances recorded in Berlin was found to be considerably in excess of those noted in Strelitz, on account of the electric railway service. While about as many records might have been expected in Hamburg, the loose coupling there adopted was found to reduce this number. The very considerable number of simultaneous records still obtained at the three stations is all the more remarkable.

Inasmuch as these experiments mainly led to a confirmation of previous results another even more comprehensive series was commenced with a view further to elucidate these phenomena. Simultaneous records were taken first, at the Strelitz Wireless Laboratory; second, at the Berlin Laboratory of the Telegraph Engineering Office; third, at the Gräfelting (near Munich) Laboratory for

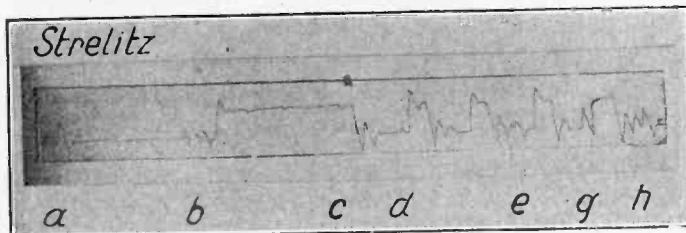


Chart of atmospheric disturbances at Strelitz, Germany, observed at the same time as that above. Made with a pen relay. Note the same time lag exists between the disturbances, with but few differences, these few being nearby disturbances.

Atmospheric Electricity and Wireless Telegraphy; and fourth, by means of a special ink recorder, at the Riverhead, Long Island, receiving station of the Radio Corporation of America through the agency of its director, Mr. Alfred N. Goldsmith. On account of a time difference of six hours between Central Europe and the east coast of America records at the American station had to be taken at 3 and 4 o'clock p. m., i. e., at a time of perfect darkness. The following number of disturbances were recorded on the 15,000 meter wave (Lyons) and the 2800 meter wave (Eiffel Tower) from the middle of July to the middle of December, 1922: Strelitz, 6428 disturb-

ances; Gräfelting, 6391 disturbances; of which, 6308 disturbances were found to be simultaneous. An interesting fact in this connection was that individual disturbances in summer were more numerous than in winter.

Records at the Riverhead radio station were obtained from January 5 to February 10, 1923, and allowed the following number of disturbances to be ascertained: Riverhead, 2280 disturbances; Strelitz, 991 disturbances, of which 959 disturbances were found to be simultaneous. Disturbances recorded at the Strelitz station were thus with a few exceptions nearby, found to occur simultaneously at Riverhead, i. e., at a distance of 6400 kilometers. The character of individual records corresponding to the various Morse signals was found to differ considerably for the two stations, on account of differences in the design of the recorder and the current intensities chosen for reception. Still, simultaneous disturbances are readily ascertained by comparing the paper tapes of the two stations. Most disturbances resulted in small records at Strelitz and larger records at Riverhead.

Atmospheric disturbances were thus found to traverse distances and cover areas much greater than had heretofore been presumed. In the case of Germany and neighboring countries the special kind of disturbances observed, crackling noises, were found to be present everywhere, it being thus useless to ascertain places with a minimum of crackling noise disturbances. Local disturbances by thunderstorms, high tension plants and electric railways are, of course, left out of account. As regards the comparative records at Strelitz and Riverhead respectively, both in America and Europe there were stated disturbances limited to the two continents and their immediate vicinity, while a considerable number of disturbances would occur simultaneously on both continents. Apart from a few cases in which records at Strelitz were exceptionally large and those at the American station exceptionally weak, nothing can be said as to the origin of disturbances. Simultaneous disturbances are no doubt due to a source of energy at least equal to, though probably considerably in excess of, the radiation output of the Lyons antenna.

A short reference should be made to the recent observations by Marconi recorded during a recent voyage from Europe to America. The fact that during the first half of the trip disturbances seemed to come from Europe and Africa and during the second half from America, agrees very well with the results above summarized, both the European and America stations having been found to record a certain number of disturbances having no counterpart at the other end. At the same time, the opinion enunciated by Marconi that disturbances on account of the considerable distances and the moderate climate of both continents will not pass from one continent to the other, is found to be in evident disagreement with the occurrence of simultaneous disturbances at Strelitz and Riverhead respectively.

Radio Thief Steals \$1,500 Amateur Station

ROLLA, MO.—Radio thieves are active here. The disappearance from this town of the entire apparatus at the amateur station operated by S. P. Stocking, of 610 State street, and licensed by the Government under the call 9AZH, has resulted in a statewide search by local police authorities, while circulars describing the equipment in detail have been sent all over the country.

In two successive visits, probably planned by the same conspirators, every piece of this privately owned set, from a pair of lightweight phones to a 100-watt transmitter, valued in all at nearly \$1,500, has vanished into the night. Stocking is a member of the American Radio Relay League and has asked fellow amateurs to aid him in recovering any part of the missing station.

The Construction of a Wave Trap

By Walt. S. Thompson, Jr., E.E.

THE purpose of a wave trap is to increase the selectivity of a receiving set by making possible the elimination of interference. A wave trap may take any of several forms, one of the simplest and most efficient being shown schematically in Fig. 1. It can be seen that this type consists of a tuned circuit, made up of an inductance and a capacitance in parallel and connected in series with the antenna circuit.

The values for the inductance and the capacitance have been chosen so that this wave may be tuned to any frequency within the band covered by the broadcasting stations with a margin above and below. In fact, due to the interference sometimes caused by commercial stations, this wave trap has been designed so that such stations can be eliminated.

In all sketches and in the following list of apparatus each part is given a designating letter in order to facilitate the construction and wiring of the wave trap: A—composition panel 5¼" x 5"; B—bakelite or cardboard tube 4" diameter x 27/8"; C—75' of D.C.C. wire, No. 24 B & S gage; D—brass brace (use strip 3/8" x 1/16" x 9¾"); E—D-X variable air condenser .0003 mfd; F—two binding posts; G—four brass machine bolts; H—cabinet; connecting wire, copper lugs, varnished cambric tubing, etc.

The first step in the construction of this wave trap is the preparation of the panel A as shown in Fig. 2. After all the holes have been drilled, the panel may be given a dull or satin finish by placing a few drops of oil on the surface and then rubbing it with steel wool. The strokes should all be parallel to the base. After the finish has

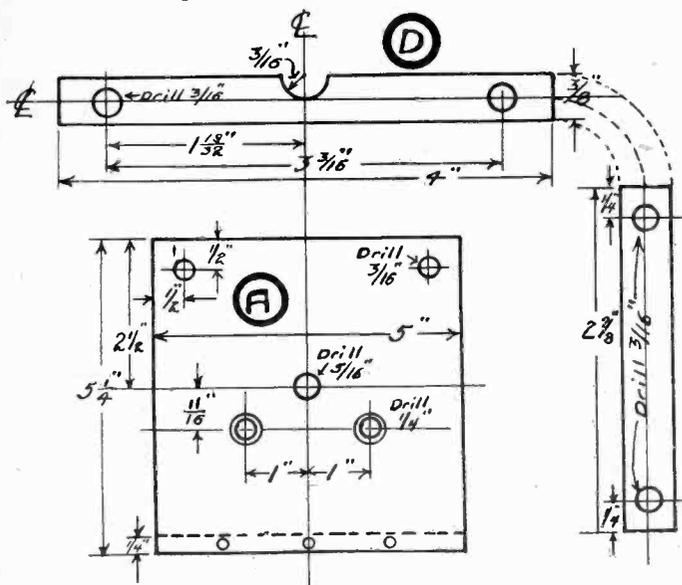


Fig. 2. Panel layout (A) with correct drilling dimensions for all holes. Brass brace (D) to enable the coil to be mounted on the panel without drilling additional holes.

been completed, all excess oil should be wiped from the panel and from the holes with a dry cloth.

The bakelite or cardboard tubing B should next be cut and drilled according to Fig. 3. If cardboard tubing is used it should be shellaced before the winding is started. This winding should consist of 65 turns of No. 24 D.C.C.

wire as indicated. About 4" of wire should be left at the beginning and end of the winding so that the coil may be connected to the bus wire running from the condenser to the binding posts.

The brass brace D may now be drilled and bent as shown by Fig. 2. The semi-circle cut from the middle of the

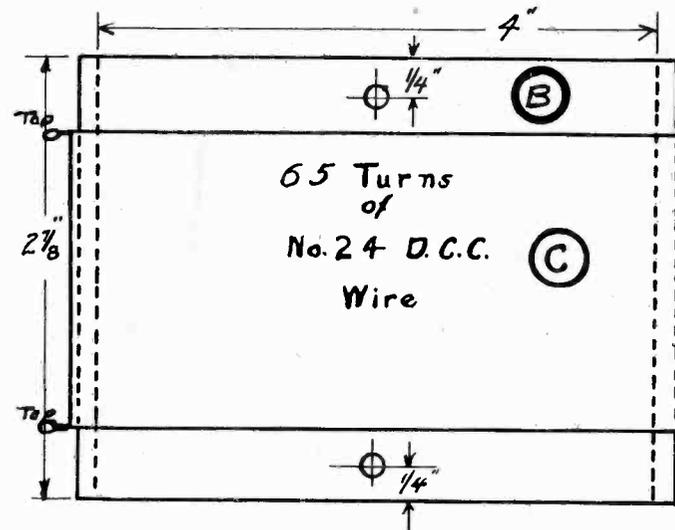


Fig. 3. Dimensions of cardboard or fibre tubing (B). Winding for wave trap (C). This tubing is drilled as shown, according to the dimensions marked.

brace is necessary in order that the brace may clear the shaft of the condenser. A round file will be very convenient in making this hole.

After the winding has been placed on the tube, the brace should be attached to the tube by four small brass

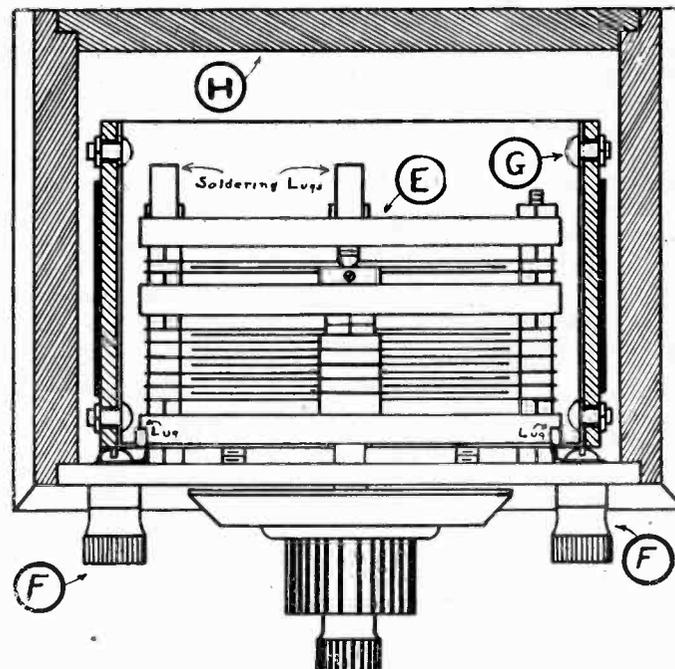


Fig. 4. Horizontal sectional view of the completed wave trap, showing how the coil and condenser are mounted.

machine bolts G in Fig. 4. The brace and the tube should next be mounted on the condenser by removing the nuts from the ends of two of the spacing supports and then sliding the tube over the condenser so that the two ends of the spacing supports will go through the two holes in
(Concluded on next page)

Logging Yanks by Radio Favorite Sport in New Zealand

PALMERSTON SOUTH, New Zealand.—An increase in radio DX work during the past year has made the "logging of Yankee amateurs" one of the favorite sports on the island. Interest in radio is moving forward here to a surprising degree, one amateur having heard many stations in the U. S. A., Canada, Japan, India, South Africa and Egypt. Ever since their successful participation in the first trans-Pacific tests, New Zealand radio fans have gone in solidly for international DX and the game lately has been reduced to a competition in listening for the "Yanks."

It has been emphasized frequently by ship operators that receiving conditions in this vicinity are as good, if not better, than anywhere in the world and this appears to have been proved by the experience of F. D. Bell of this place who states that he often hears ama-

teurs in all U. S. districts, and as the evening advances, one district after another will fade out as daylight sweeps slowly across the continent.

With fifteen amateur stations already installed and others rapidly going on the air for the purpose of entering the present transpacific tests under auspices of the Radio Journal, the American Radio Relay League and the Southern California Radio Association, it is confidently expected that before the tests close early in November the New Zealanders will have established two-way communication with American hams.

The conditions for radiophone work are equally good and Mr. Bell's speech has been heard in New South Wales, Victoria and Tasmania, while CW signals have been reported in Samoa, 2,000 miles, with about 1.7 amperes in the aerial. This is about half way to Honolulu.

German Radio Restrictions Modified

RECOGNIZING that radio telephony in Germany has now become an important economic institution, valuable as an agent of communication with foreign countries and within Germany itself, the Federal Ministry of Posts and Telegraphs, which has hitherto exercised a restrictive monopolistic control over all wireless operations, is contemplating an early relaxation of existing restrictions for the benefit of the general public, Consul Richardson reports from Berlin.

Broadcasting has been meagre in Germany. The Eildienst Gesellschaft at Berlin has been disseminating financial and commercial news to a clientele of subscribers. The company secured a lease from the government of the wireless station at Koenigswusterhausen in the Province of Brandenburg whence it distributes bulletins received periodically from the higher power installation at Nauen. This was a strictly business proposition. The general broadcasting of music, lectures, information and features prominent among radio activities in the United States and elsewhere has never been done in Germany.

A club, comprising principally amateurs interested in wireless, was formed in Berlin in the early months

of this year. One of its declared objects was to induce the government to sanction the free installation of private receiving sets and encourage radio progress. Apparently good results have followed.

It is now understood that a public organization will combine and circulate a program of political, scientific and popular lectures of all sorts as well as music, etc. The Federal Telegraph Administration will probably establish a number of sending stations. Any individual who secures a permit at his postoffice will be authorized to receive this service. The permit, which may be had at a small annual fee, will entitle the holder to use a receiver. Unauthorized "listening in" will be considered an offense against the Post and Telegraph Regulations and will be punishable. Receiving apparatus will be procurable by license holders at specially designated shops. Manufacturers are to be allowed to deliver receiving sets only to such persons as possess the required permits. The sets must correspond with all the technical conditions of the Telegraph Administration, and the selling firms must declare their readiness to pay the government a certain proportion of the profits of each sale.

(Concluded from preceding page)

the brace. The nuts being replaced and tightened, the tuner assembly is completed. The condenser being mounted on the panel in the usual manner, the binding posts F should next be mounted. Soldering lugs attached to the binding posts as shown in Fig. 4 will simplify the soldering of the bus wire to them.

Before enclosing the coil and the condenser in the cabinet H, all connections should be made. Two bus connections are necessary, one from the left hand terminal of the condenser to the left hand binding post and the second between the other two condenser terminal and binding posts, these directions referring to Fig. 4. The coil should then be connected between these two busses, making use of the long ends left when winding.

The operation of the wave trap is very simple as will be noted from the following examples. Let us suppose that a certain radio fan is continuously troubled by hear-

ing station XYZ and station ZYX at the same time and is not able to separate them. The wave trap being connected in the antenna circuit, the fan should tune in the undesired station with his set. Then by slowly turning the wave trap condenser dial he will find a setting at which the undesired station fades out. Leaving the wave trap at this setting, he should proceed to tune in the desired station as if there were no wave trap and he will find that the interference has been eliminated.

Another method would be to tune in the desired station as sharply as possible and then turn the wave trap condenser dial until that setting has been found which eliminates the undesired station.

The experimenter should be warned that the wave trap will avail nothing if the two interfering stations are sending at exactly the same frequency. In such a case, to the writer's knowledge, there is no way in which the two stations can be separated.

Fan Who Talks With WNP Once Used "Hat-Pin" Detector

PRINCE RUPERT, B. C.—Starting off with a queerly constructed home-made radio receiver that would be the laughing stock of the most uninitiated present day radio fan, Jack Barnsley of this place now has a high power amateur station that has made a connecting link between the Arctic explorer, Captain Donald D. MacMillan, and the civilized world.

Beside being peculiarly well situated to receive messages from the little schooner "Bowdoin," in winter quarters at Refuge Harbor, he has a radio receiving set and antenna installation that compares favorably with some of the best stations in the United States.

It was sometime in 1910 that Barnsley thanked his lucky stars for the good fortune that had brought him a Bell telephone receiver, a dry battery, a couple of carbons and a "hat-pin" with which to build his first radio apparatus. He made his coil from some stray wire, head phones from the single receiver, a detector from the carbons and the steel needle, sharpened to a fine point, for the movable part.

A few years later and Barnsley was working for the Marconi Company as a wireless operator on coastwise steamers, finally on board the "Empress of Russia" when he visited Japan, China and Manila. A

recruiting sign for the Royal Air Force attracted his attention in 1917 and there followed a "hitch" as instructor in the British army.

Since he established communication recently with the Arctic vessel after weeks of complete silence, he has received scores of messages from members of MacMillan's crew and sent them on to relatives and friends in the States by means of



(C. International Newsreel Photo)
Jack Barnsley, a radio link for the MacMillan party between the long Arctic nights and civilization.

the traffic system of the American Radio Relay League of which he is a member. He uses an improved type of regenerative receiver with two-step audio amplifier.

"Farmrad" Clubs Use Transmitters

HARTFORD, CONN.—Radio not only answers the question set forth in that erstwhile popular song, "How You Going to Keep 'Em Down on the Farm?" but it has also proved to be of great practical benefit to the farmer in the business of making his farming pay. "Farmrad" clubs are the thing and there are now scores of them from little hamlets in New Jersey to places like Thunder Hawk in South Dakota.

A peculiar feature of these clubs is the fact that they promise to restore confidence in the famous party telephone lines. With but one radio receiving set in a community hooked up to a telephone circuit throughout the section, dozens of farmers can obtain the very latest information direct from the Department of Agriculture.

The term "Farmrad" is the name selected for a club which has the sole purpose of providing rural dwellers an opportunity for studying present day radio problems as they are applied to farming. When there is only one complete radio installation for a community, the market reports are received and relayed to the individual members of the club by means of a regular form of amateur telegraph code transmitter.

The popularity of radio may be reaching its peak as it concerns the city man, but the "backwash" on the farming sections has begun already presenting many interesting sidelights that may be of inestimable importance to individual communities. The "Farmrad" clubs are another evidence of the grip that radio has on the public.

A number of these clubs have so advanced in the experimental side of the radio science that they have obtained a great deal of benefit and solidity by becoming affiliated with the American Radio Relay League.

A good example of the serious light in which these farms clubs are regarded is the fact that many of the country farm agents have installed sets in their offices for both service and instruction. Among these are the agents at Linn County, Missouri; Freemont County, Iowa; Wilson County, Kansas, and Cedar County, Iowa.

This movement is greatly stimulating the interest of radio throughout the rural districts, and when it is brought home to the farmers in this manner more attention is paid to it than through all the other agencies because the farmers from all these districts "get together."

Radio Ousts Barkers at State Fairs

DALLAS, TEXAS.—Not only in farm machinery is the rural dweller being brought up to date, but he is also being introduced to many other lines of activity at the annual state fairs which are fast growing beyond the loud-toned barker and "wild man" stage.

At several of the big fairs this season, it was demonstrated that a radio barker could do all the shouting that was needed to draw a crowd and what is more a whole lot longer and noisier. Loud speakers switched in and out at the fair headquarters direct crowds from one point of attraction to another with the same ease that a modern movie director shifts the scenery from a great mob picture.

A great many visitors were surprised at the State Fair of Texas when they discovered that by visiting an amateur radio station at one of the regular booths they could send a radiogram without cost to any point in the United States. Permission to establish the station was obtained from the Department of

Commerce at Washington and the station is now in official working order and "delivering" messages.

The sending of private messages by any one at the ground without cost was made possible through local officers of the American Radio Relay League, which has a network of relay stations for handling radio code traffic all over the North American continent. Hundreds of persons were agreeably surprised to receive a radio from a friend at the fair.

In addition, the chief radio supervisor of the Department of Commerce granted a thirty-day limited commercial broadcast license to operate on 268 meters under the call KFLG. Musical programs were broadcast from the station every night without any local interference.

Hundreds of amateurs have called and registered at "5LR," which is the code call assigned. Since the fair has been in progress, the inside walls of the operating room have been papered with cards.

Split Variometer R-F Amplification

(Concluded from page 1)

circuit. It was found that certain types of moulded variometers, while their distributive capacity was said to be rather high, gave very good results in this circuit. The new Atwater Kent type worked very well, and, in fact, was found to be the most adaptable to this circuit as its rotor and stator are already connected in the manner prescribed by the developers of the circuit. Referring to the schematic circuit diagram given herewith, we see that a lead is taken from one side of one-half of the rotor, goes to the stator, the two coils of which are connected together and thence to the other half of the rotor. It was found that very little difference was made when the two sections of the rotor were connected in series with the two sections of the stator connected on either side. In referring to sections of the rotors and stators it must be understood that reference is made to the part of the windings on either side of the shaft. If none of the mentioned types of variometers are at hand standard variometers may be employed by disconnecting the halves of the stators and rotors and connecting them as illustrated.

The antenna and secondary tuning variometer has no

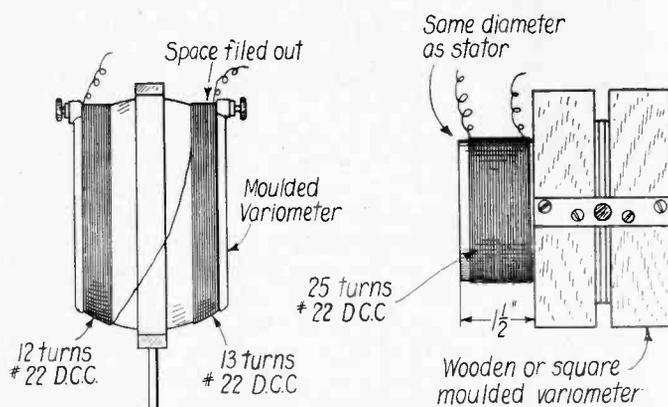


Fig. 2—Two methods of adapting regular variometers for use in this circuit. On the left is the moulded type. The coupling coil is wound on the outside of the moulded composition. On the right the conventional wooden form, adapted to the purpose. The coupling is tight and is fixed.

changes whatsoever from the Atwater Kent type except that a lead is brought out from the connection between the two halves of the stator or rotor, as the case may be. This connection goes to the antenna through one or the other of two small fixed condensers. These condensers are to be selected by means of a two-point switch so as to respond to various wave lengths.

The variometer used for coupling between the radio-frequency amplifier and the detector is the only one which

differs from the ordinary. A small inductance coil must be used to couple the R. F. amplifier to the variometer, and this may be wound in any convenient way. With the moulded types of variometers, such as illustrated, the winding may be made on the outside of the stator form. In the Atwater Kent type it was found advisable to file out a section of the binding post supports on the rear of the variometer so that the winding would not slip off. Thirteen turns on one side and twelve turns on the other were found to give excellent results. These two sections were merely connected in series and placed in series with the plate and "B" battery. The winding of this coil must run in the same direction as the winding of the stator of the variometer. If a wooden type of variometer is used this extra inductance may be wound and mounted as shown. In any case as tight coupling as possible must be maintained between the plate coil and the variometer stator winding. In the case of the wooden variometer the extra coil may be held to the frame by means of brass angles.

As will be noticed, a potentiometer with a resistance in the neighborhood of 200 ohms is used in series with the tuner and the ground lead so as to reduce the tendency of the radio-frequency amplifier tube to oscillate. When this tube goes into oscillation the potentiometer must be varied until it stops, for when the radio-frequency tube is oscillating reception is very poor, and, in some cases, impossible.

Nothing need be said in connection with the two stages of audio-frequency amplification used in this circuit as they are connected to the detector in the standard manner, and a jack is provided in the last stage for the connection of a loud-speaker or a pair of phones.

In the manufactured set there are several complicated anti-capacity switches employed, but we have eliminated them in the circuit given herewith as it is impossible to purchase them and they would present great difficulties to the amateur constructor.

With regard to the layout of the apparatus used, if it is desired to mount it in a cabinet we would advise that the two variometers be placed with approximately 5" space between them and with the radio-frequency amplifier located in that space. To the right of this layout may then be placed the detector and audio-frequency amplifier tubes. Such an arrangement will give the shortest possible wiring and prevent inter-action between the two variometers. Such inter-action would tend to produce regeneration and oscillation, an undesirable feature in this set. When the instruments are mounted on a panel the two variometers should be carefully shielded so as to reduce body capacity to a minimum. In this circuit the negative side of the filament circuit is already grounded, and, therefore, no other precaution need be taken in this matter for the reduction of body capacity other than is outlined above.

Don't Tempt Fate!

MANY people use storage battery chargers on their sets, but do not like to charge the batteries during the evenings. Tubes have been blown because the owner of the set has been negligent in charging his battery and finds in the evening when he wants to use his set that the storage battery is so low that it is impossible to operate it. Consequently, he has placed the battery on charge and at the same time tried to operate the receiver, with the result that the tubes "went west." If your battery needs charging, charge it, and do not try to operate the set while it is on charge—unless from a spare battery kept for that purpose.

New Broadcasters

LIST of Class A broadcasting stations licensed during week ending October 27th:

Call	Station	Frequency Kcys	Wave Length Meters	Power Watts
KFLH	Erickson Radio Co. Inc., Salt Lake City, Utah...	1150	261	50
KFLP	Everett M. Foster, Cedar Rapids, Iowa....	1250	240	20
WTAZ	Thomas J. McGuire, Lambertville, N. J.....	1060	283	15

Death of Dr. Charles P. Steinmetz

Life and Career of the Eminent Electrical Scientist

AS announced briefly in last week's issue of **RADIO WORLD**, Dr. Charles Proteus Steinmetz, chief consulting engineer of the General Electric Company, died suddenly of chronic myocarditis at his home in Schenectady, N. Y., on October 26.

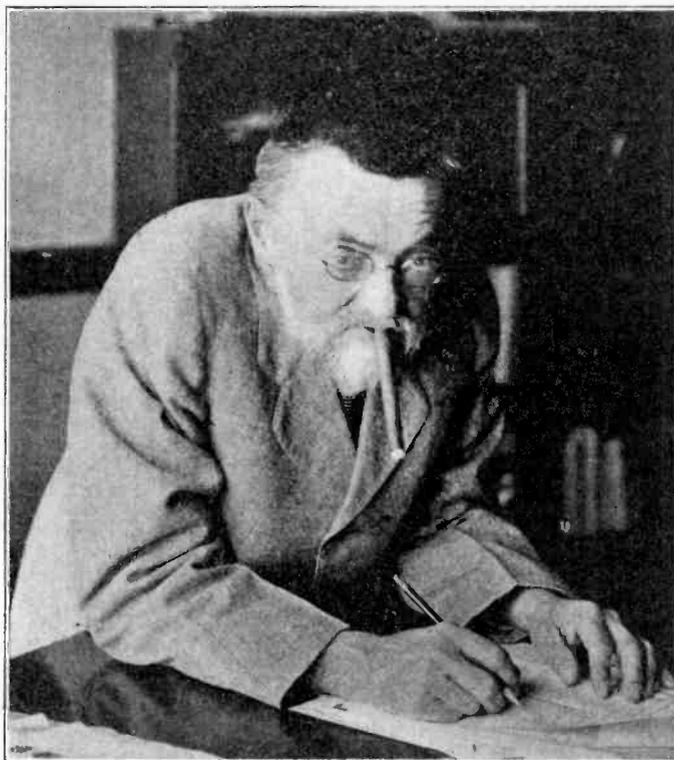
Dr. Steinmetz left Schenectady the first of September, intending to take a rest. He wanted to see the Pacific Coast, which he had never visited. Word of his trip sped ahead of him, and requests that he speak at various places immediately resulted. His speaking arrangements were carefully made, but so many wished to hear him that in trying to comply he overtaxed himself. That this was the cause of his death is not certain, however, owing to the nature of his malady.

He returned home September 13th and, an examination by his physician disclosing the fact that his heart action was unsteady, a complete rest was advised. During the first part of the week in which he died, his condition seemed to be improving. He had been about the house and on Thursday night declared he was beginning to feel like himself again. The night before he died he was dressed and passed the evening in his library, discussing with his adopted son, J. Le Roy Hayden, and some friends, a scientific book, "The Physics of the Air."

Word of his death was immediately sent to the General Electric offices and the news spread throughout the city, causing great sorrow, for, in addition to their admiration for his scientific attainments, his fellow citizens held him in high personal esteem. Flags at the General Electric plant and in the city were half-masted, the latter by order of the acting mayor.

The Steinmetz home was open Sunday afternoon from 4 to 8 for those who wished to pay their tribute of respect and affection, and hundreds passed the casket, which was surrounded by a profusion of flowers.

The funeral was private and held at the home Monday afternoon, Rev. Ernest Caldecott, pastor of the Uni-



(Photo from General Electric Co.)

THE LATE DR. CHARLES PROTEUS STEINMETZ
Chief Consulting Engineer, General Electric Co.

tarian Church, assisted by Rev. A. W. Clark, a former pastor of the church, officiating. The honorary pall bearers were: Owen D. Young, Chairman of the Board of Directors, General Electric Company; Gerard Swope, President of the General Electric Company; E. W. Rice, Jr., Honorary Chairman of the Board of Directors, General Electric Company; F. C. Pratt, Vice-President, General Electric Company; A. G. Davis, Vice-President, General Electric Company; Ernest Berg, consulting engineer, General Electric Company and member of the faculty of Union College, and George R. Lunn, Lieutenant-Governor of the State of New York. The burial was in Vale Cemetery, Schenectady.

Dr. Steinmetz is survived by a sister, Miss Clara Steinmetz, of New York City, and his adopted son, J. Le Roy Hayden, and the latter's family.

Charles Proteus Steinmetz, A.M., Ph.D., was born April 9, 1865, at Breslau, Germany. He was educated at the gymnasium (high school) and then at the University of Breslau, where he studied mathematics and astronomy, then physics and chemistry, and finally, for a short time, medicine and national economy.

Involved in the social democratic agitation against the government, he escaped to Switzerland in 1888, and there studied mechanical engineering at the Polytechnium.

In 1889 he emigrated to America, and found a position with the Osterheld & Eickemeyer Manufacturing Company, Yonkers, N. Y., first as draftsman, then as electrical engineer and designer, and finally on research work in charge of the Eickemeyer Laboratory, in New York.

With the absorption of the Eickemeyer-Field interests by the General Electric Company, Dr. Steinmetz joining the latter, was attached to H. F. Parshall's calculating department in Lynn, Mass. With the trans-

Gone!

CHARLES P. STEINMETZ

Died October 26, 1923

GONE—though his work, still fresh in mind,
Gives hope to faltering mankind.
Weak as a reed that's blown by gales,
Yet swift as a thought all set with sails.
Nature decreed him short and bent,
Yet beauty of mind on him she spent.
Some might have cursed what fate had done—
He only smiled, with his face to the sun.

Feeble the flesh of that gnarled form,
Grappling the problem of lull or storm.
To him all science, no accidents.
He tore the truth from the elements.
Ever and ever for facts he strove,
Hurled bolts of truth with the hand of Jove.
Gone—brave little man! He heard the call.
Gone—to the One who can tell him All.

Roland Burke Hennessy.

fer of the company's headquarters to Schenectady in the Spring of 1894, Dr. Steinmetz organized and took charge of the calculation and design of the company's apparatus and of the research and development work.

For a number of years Dr. Steinmetz was professor of electrical engineering at Union College, and at his death was professor of electro-physics at Union University, at the same time retaining his connection with the General Electric Company as chief consulting engineer.

Some of the more important of his publications and articles are: A series of mathematical papers on polydimensional involuntary correspondence; a series of investigations on the magnetic circuit and the law of hysteresis; a series of investigations on dielectric and electro-static phenomena; a series of papers on "The Design and Performance of Electrical Apparatus," such as transformers, induction machines, synchronous machines, commutating machines, etc.; a series of papers on "High Frequency Oscillations and Surges in Electric Circuits"; a series of papers on "Radiation, Light and Illumination"; a series of papers on "Mechanical Thermodynamics and Steam Turbines."

Most of his papers on electrical subjects are published in the transactions of the A. I. E. E.

The following books have been published by Dr. Steinmetz: A popular work on "Astronomy and Meteorology," in the German language, first edition 1889.

"Theory and Calculation of Alternating Current Phenomena," 1st edition 1897, 5th edition 1916; "Theoretical Elements of Electrical Engineering," 1st edition 1901, 4th edition 1916; "General Lectures on Electrical Engineering" 1st edition 1908, 5th edition 1911; "Theory and Calculation of Transient Electric Phenomena and Oscillations," 1909, 3rd edition 1919; "Radiation, Light and Illumination," 1st edition 1911, 2nd edition 1915; "Electric Discharges, Waves and Impulses," 1st edition 1911, 2nd edition 1914; "Electrical Engineering Mathematics," 1st edition 1911, 2nd edition 1915; "Theory and Calculation of Electric Circuits," 1917; "Theory and Calculation of Electrical Apparatus," 1917.

In 1902, Dr. Steinmetz received the honorary A.M. degree from Harvard University, and in 1903 the honorary Ph.D. degree from Union College.

Dr. Steinmetz was a past president of the National Association of Corporation Schools, vice-president of the International Association of Municipal Electricians, past president of the American Institute of Electrical Engineers, honorary member of the National Electric Light Association, past president of the Illuminating Engineering Society, fellow of the American Association for the Advancement of Science, member of the (British) Institution of Electrical Engineers, member of the American Mathematical Society, the Quaternion Society, the American Society of Mechanical Engineers, the Electrochemical Society, the Illuminating Engineering Society, the Physical Society, etc., etc. He was president of the Common Council and vice-president of the Board of Education of the city of Schenectady.

The following tribute to Dr. Steinmetz was written by E. W. Rice, Jr., Honorary Chairman of the Board of Directors of the General Electric Company:

"The sudden death of Dr. Steinmetz comes as a great shock to his friends in the General Electric organization, including the directors, officers and every employe. He joined our ranks some thirty years ago and during all this time has rendered services of the most conspicuous character and extraordinary value. He had a world wide reputation as a scientist, electrical engineer, author and teacher. He was as well known in Europe, South America, Africa, Australia and the Orient as here in his adopted America. Universally acknowledged as one of the world's greatest scientists, he was, if possible, a greater teacher. He was the author of many scientific papers and of a large number of electrical books which have long been the accepted standard text books in colleges, laboratories and workshops everywhere. He possessed marvelous insight into all scientific phenomena and unequalled ability to explain in simple language the most difficult and abstruse problems. Countless electrical engineers now occupying positions of great importance in our company and elsewhere in the world, will gladly give testimony of their debt to him. All those who knew him mourn the loss not only of a great teacher and an inspiring personality, but a cheerful and ever helpful friend."

A Simple Reflex Receiver

By Laurence M. Cockaday

THE reflex mode of reception has gained quite wide usage among radio fans who desire a circuit that will work on dry-cell tubes—a circuit for a portable set. Even now there is a demand for a single-tube or two-tube reflex receiver for use by the beginner who wants to make the tubes perform double or triple duty as a radio-frequency amplifier, an audio-frequency amplifier, and sometimes also as a detector.

Most of the simple reflex circuits, however, have made use of the crystal rather than the vacuum tube as a detector. This, of course simplifies things enormously. There is one less tube used, there is also less drain on the "A" and "B" batteries and the circuit is also less complicated. And yet, there is not any appreciable loss in signal strength because the radio-frequency signal has been amplified to such an extent that the sensitivity of the crystal does not make very much difference.

There is one serious drawback to the use of a crystal as a detector in one of these single tube reflex sets, nevertheless. This is in the matter of adjustment. The operator has to be forever fooling with the "cat-whisker" and eventually he becomes tired of it and gives up in disgust. This is not so when more than one stage of radio-frequency amplification is used, because the radio-frequency signal then becomes so strong that the crystal adjustment makes relatively

Another drawback with the crystal detector in a simple single-tube-crystal reflex receiver is the fact

that such a simple set seldom makes use of a potentiometer for controlling regeneration. *It is all done with the crystal adjustment.*

Our readers will recognize that this is true (if they are using such a set) because they will remember that they have to readjust their crystal for any considerable change in wave length.

In other words, they may have the set working very nicely, receiving signals from WHN, and they may wish to change to another wave length, say to listen to WJZ on a higher wave length. Immediately they tune to WJZ, they find him surrounded by a peculiar whistle, and they have to change the adjustment of the crystal before they have the signals coming in "pretty" again. A change back to the original wave length again necessitates a change in crystal adjustment to take out the "squeak."

This idiosyncrasy of the crystal circuit some people do not mind at all, taking it as "part of the works," but some people do mind and it is for them this article is written.

A Fleming valve or diode tube, as it is called by one manufacturer, is one of the original vacuum tubes, having two elements, a filament and a plate. The tube when used as a detector alone, without any radio-frequency amplification, is a steady reliable detector, but, it is not very sensitive. It is not quite as good as a fine piece of crystal. However, when the radio-frequency signal has been amplified as in a reflex set,

surprising results have been obtained. This is because the radio-frequency voltages applied to the plate and filament path of the tube have been sufficiently increased to produce the proper response through the tube.

The tube used in this way has two distinct advantages. In the reflex set, it produces just as good a signal as the crystal, but it needs no adjustment for sensitivity, and it needs no further adjustment for wave length changes. Just set the filament rheostat to the most sensitive point and the set is ready at all times. A small portable set designed by the writer has been giving satisfactory signals from a loud speak-

exactly, connecting the two fixed condensers, one across the primary of the audio-frequency transformer and the other across the phones and the "B" battery. Keep all the wires as short as you are able to and keep the grid connections isolated from the other parts of the wiring as much as possible.

If you already have a one, two, or three tube reflex set with a crystal detector you may use one of these tubes obtaining an extra rheostat, a dry-cell of 1½ volts and connect it directly to your present crystal detector stand as indicated in Fig. 2. This will enable you to compare the two methods of detection for yourself.

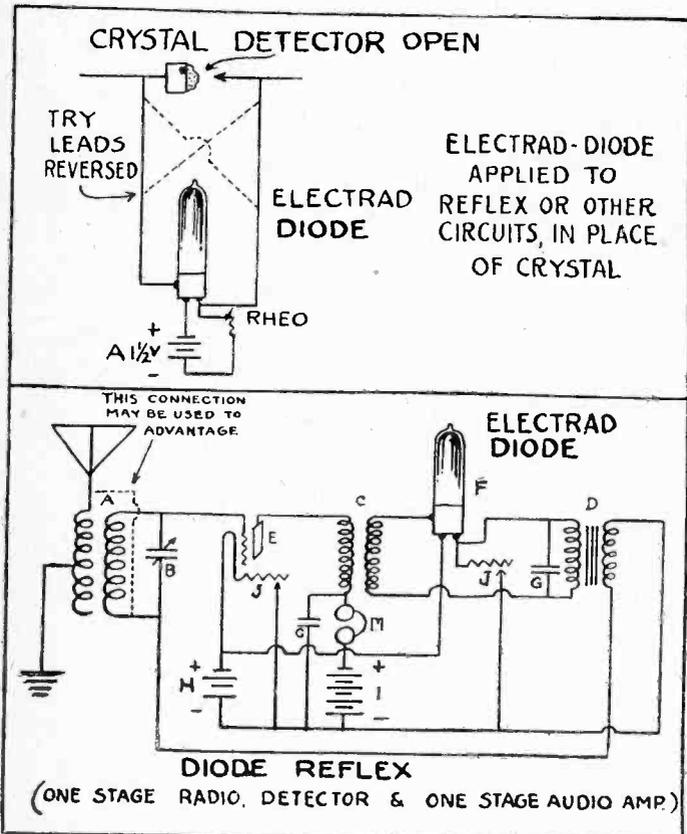
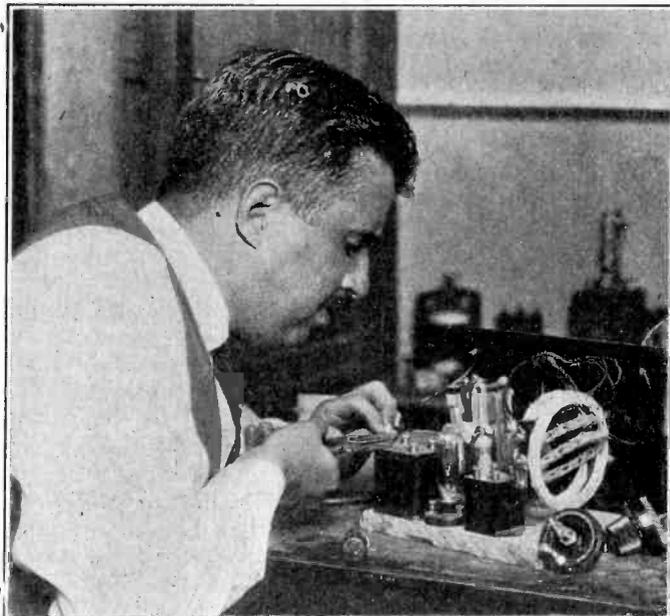


Fig. 1 (below) and Fig. 2 (above) showing the use of the diode tube in a reflex circuit and how it is connected in place of a crystal detector.



Laurence M. Cockaday, Radio Engineer, developing the new diode-reflex circuit.

You will be pleasantly surprised by the quality of the signals received on this little set and will find that you have been amply repaid by trying out the circuit.

RADIOGRAMS

Newcomb Carlton, president of the Western Union Telegraph Company, sailed for Europe last week on a business trip, chiefly in connection with the development of new cables, especially the German-American, which is now under construction.

* * *

The radio storm created by WGY in the production of "Peg o' My Heart" as a radio drama was so realistic, according to Martin L. Wyman, Jr., of Gaysville, Vt., that his father took off his headphones, saying that he didn't care to listen-in during a thunderstorm.

* * *

John Reinartz, of South Manchester, Conn., father of the famous Reinartz circuit; Cyril A. Jansky, Jr., of the University of Minnesota, and W. D. Terrell, chief radio supervisor for Uncle Sam, will be three distinguished figures of the radio world to attend the Southeast's first radio convention in Atlanta, Ga., next December. The meeting covers the Fourth United States radio district and the East Gulf district of the American Radio Relay League.

* * *

Several hundred banks and business houses in the vicinity of Cleveland, Ohio, have installed receiving sets to intercept the financial reports and news broadcast daily by Station WJAX at Cleveland. Requests have been received to broadcast about 500 different stock issues and their quotations. Letters received at WJAX tell of unusual enthusiasm among the farmers and their appreciation for accurate knowledge of prices. Banks scattered throughout a wide area equipped with receiving sets supply data to their rural trade on request or through bulletin boards.

er on local signals and has been picking up DX quite consistently on the phones.

The circuit diagram for this set is shown in Fig. 1. The parts for simple reflex receivers are as follows: 1 variocoupler and 3" dial; 1 nine-point multiple inductance switch; 1 Amsco variable condenser .0005; 1 3" dial; 1 Cardwell radio-frequency transformer; 1 Cardwell audio-frequency transformer (for first stage); 1 W. D. vacuum tube; 1 electrad diode tube; 2 Mica-don fixed condensers, .001 mfd.; 1 1½-volt dry cell; 1 small B battery, 45 volts; 2 rheostats, 6 ohms, and 2 knobs or dials for same; 1 regular vacuum tube socket; 1 diode tube socket; 1 pair N & K phones; 1 panel 7"x12"; cabinet, 7"x12"; 4' connecting wire and 4' of bus wire; 6 binding posts; wire; solder. Your dealer can supply alternative parts at his discretion.

In building the set, the best procedure would be to mount the variocoupler on the left end of the panel (looking from the front) with the variable condenser beside it. The two rheostats should be mounted next beside the condenser with the WD-12 and the diode tube directly in back of them, respectively. Then mount the two transformers on the base in such a manner that the connection will be as short as possible.

In wiring up the set, follow the diagram in Fig. 1

Ideas for Broadcast Fans

By A. Knight Owl

THERE are many types of broadcast fans. One kind is the fan who takes his or her broadcasting programs seriously, listening in night after night, anticipating the programs, looking at the papers and, in fact, doing everything but sleeping with the phones on. Then there is the fan who is only mildly interested in certain types of programs, such as classical or semi-classical music, jazz and comedians and listens only to these. Verily, they are as the sands of the desert in make-up. Then there is the rabid DX fan—the person who doesn't give a hang if there is a good program at one of the local stations if he can get a chance to log a dozen or so distant calls meanwhile.

To the DX fan the card index file of stations will form a most convenient reminder. Get a cheap cardboard index and some index cards; print the call of the station on the top. Then under the call print the following: Date: Dial setting (one setting for each dial—so if you have three tuning dials make three narrow columns for the settings.) Time heard. Local conditions. (Under this heading you will log as follows): S, static bad. SF, static and fading. C, clear. CI, clear but interference. CIF, clear with interference and fading.

When you get on for the evening place a clean sheet of paper in front of you, with the divisions roughly marked, and as you get each station, mark it down on the paper, and then later transfer it to the cards, keeping the cards in alphabetical order. Under A, you will keep all the A stations such as KAF or WAAM or other stations whose first letters are K or W with an A following, leaving the last two letters to follow in each particular section in alphabetical order.

By this means you have a ready reference file for all the calls you log, and will not have to paw through long lists of calls to find any particular station, and you will also know just where and how to locate each separate station by means of the dial settings.

Another little kink which will be of value to the real fan is a means of getting vernier control on a receiver which was not planned for such, and that the builder does not want to rebuild, or place new apparatus on. Alongside of each dial, and slightly overlapping the periphery drill a small indentation, large enough to accommodate the rubber end of a common lead pencil. Do not drill it too deep, only deep enough to afford a holding surface for the pencil. Then when absolute

vernier control is wanted, insert the rubber end of a lead pencil in the indentation and rotate the pencil. This gives real fine control, at the same time keeping the hands away from the front of the set, affording relief from possible body capacity effect.

If your set is a purchased set, and does not have vernier rheostats, and yet you feel that vernier control on that piece of apparatus is necessary, this kink will be of value. In series with the filament line that runs from the battery to the battery terminals of the set insert an auxiliary vernier rheostat made as follows: On a board lay six inches of No. 20 gauge German silver wire, either in a semi-circle or a straight line, making a slider for it, so that the slider can be moved over the entire surface a small distance at a time. Attach one end of the filament circuit to the slider, and one end of the wire to the filament terminal of the set. Then you can obtain absolute vernier control of the detector, even though the amplifiers are fed by the same battery, because the amplifiers are not critical, and can be turned up a turn or two more on the amplifier rheostat when operating, which will take care of the added resistance introduced into the circuit when the vernier is brought into play. This last idea has been used on a set operating four tubes, and the added work was more than compensated by absolute control of regeneration when doing distant work, because the "spill" point could be controlled to a "fineness" that is as good as any of the vernier rheostats now on the market, and lots better and steadier than most of them operating under the principle of a second slider with a piece of resistance wire around the periphery of the rheostat.

Tubes sometimes give great trouble due to the fact that the terminals are not always making absolute contact with the socket. This last can be corrected by obtaining a piece of heavy lead or tin foil such as comes on certain brands of tea and which is almost as heavy as thin sheet lead. Cut small pieces off it, and very carefully wrap a piece around each lug of the tube, taking care that it cannot short circuit through any means when taking the tube in or out of the socket. If a pair of pliers is handy, just pinch each terminal lightly after putting the foil on and you will find that it holds tightly. This makes positive contact, and you will not have to use match sticks or pieces of cardboard to hold the tube rigidly against the contact springs, which many fans do at present.

Here's a New One—"Radio Ear"

By Washington R. Service

A NEW affection of the ear is being reported by some radio fans who sit for long periods at their receiving sets. It is called "radio ear" and is accompanied by noticeable pains in the auditory appendages even when not listening in. Sometimes it takes the form of sharp shooting pains in the head near the ears which cause thoughts of possible serious afflictions.

Upon consultation, ear specialists usually say that the remedy is easy and fairly sure. "You are a radio fan?" they ask. "You spend a good portion of your time with your head phones on?" Upon receiving replies in the affirmative, they say, "Well, when you go home loosen up on your head phones; the spring is

too tight and presses on some of the nerves of your ear." "Just like some forms of spectacles," they will tell you. "Your head set is undoubtedly causing the pains; relieve the pressure and they will disappear."

One assurance is given of a benefit from radio head sets, however. Youths of this generation will never have as protruding ears as some of their older brothers. All youngsters who sit for as much as three hours a day with their head phones clamped over their ears will grow up with close-fitting ears, most experts believe. Mothers who formerly tied back their offspring's ears to prevent their protruding will be saved that worry and trouble if they provide them with radio receiving sets and head phones.

The Construction of Selective One-Tube Loop Receivers

By
Leroy Western

WITH the long winter nights coming on and good radio reception weather right with us, the thoughts of those in large cities turn to the problem of eliminating interference and still having good reception. The most frequent advice given to those in congested districts is, "Use a loop." Upon investigation the inquirers find that the consensus of opinion is that several stages of radio frequency amplification must be used with a loop in order to get good reception. This is true, if DX work is desired, but for the average city reception, a single tube may be made to function with a loop aerial and give exceptional results. Therefore, the circuit diagram shown in Fig. 1 was first decided upon.

This circuit was chosen for its simplicity, as only two tuning controls were necessary. The tuning is accomplished with the variable condenser shunted across the loop and the grid and plate circuits were balanced up and the circuit caused to regenerate by means of the variometer in series with the plate. Selectivity was very high with this circuit. Stations 20 miles distant came in with great

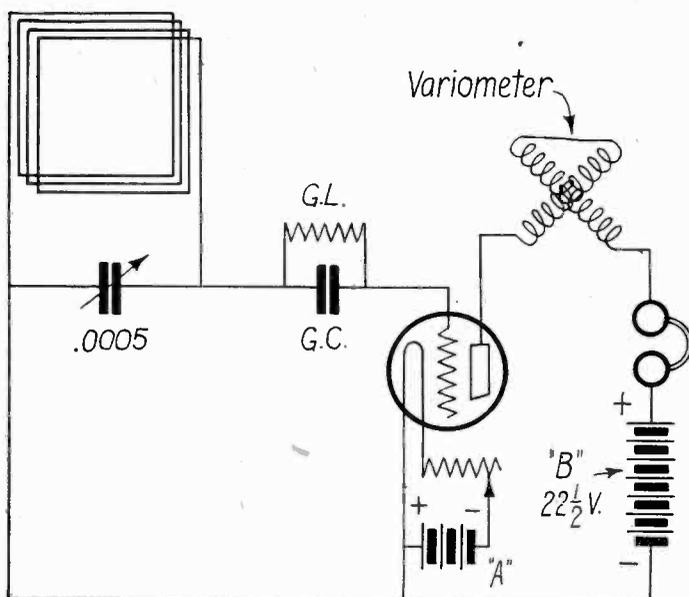


Fig. 1. A loop receiver for one tube designed for local work, or where the listener does not desire to operate a loud speaker. Good for 25 or 30 miles under ordinary conditions.

distinctness and practically no static. The interference from outside stations was at a minimum. The razor-sharp tuning eliminated everything but the desired station.

Regeneration can be carried to quite a great extent with the resulting amplification. The value of the grid leak was not found to be critical but certain values would give somewhat better results than others. A variable leak is advised in order to obtain best results. The grid condenser should have a value of .0005 and should be of the mica type so that losses will be as low as possible. A high grade variable condenser should be used and the variometer should be of the best possible material because in a set of this type, even very minute losses reduce the efficiency considerably.

Another circuit was then tried with correspondingly good results as far as volume and distance went, but a slight decrease in selectivity. This circuit is illustrated in Fig. 2 and is an ordinary single circuit tuner adapted to loop reception.

The tuning unit in Fig. 2 consists of a standard variocoupler with a .0005 mfd. variable condenser across the

stator, in order to facilitate tuning. The rotor is used as the feed-back coil as illustrated.

In either of these circuits, the loop should be made with the view of greatest efficiency. The solenoid type of loop was found to give excellent results. The spacers should be of hard rubber or bakelite with slots cut therein to hold the wire firmly in place. A loop 4' square wound with 10 turns of No. 14 stranded rubber covered single conductor electric light wire was used in the experiments described above. The turns of the loop were tapped so that any number from one to the total could be used. This was found to give added flexibility.

The UV199 tube was used in both of the above circuits with a plate voltage of 22 1/2 and using a three cell flashlight battery for the filament power. A vernier on this rheostat was found to be of great assistance.

One more hint on the circuit shown in Fig. 2. If at first difficulty is found in causing the set to oscillate and regenerate, the leads to the tickler coil or rotor of the variocoupler should be reversed whereupon it will, undoubtedly,

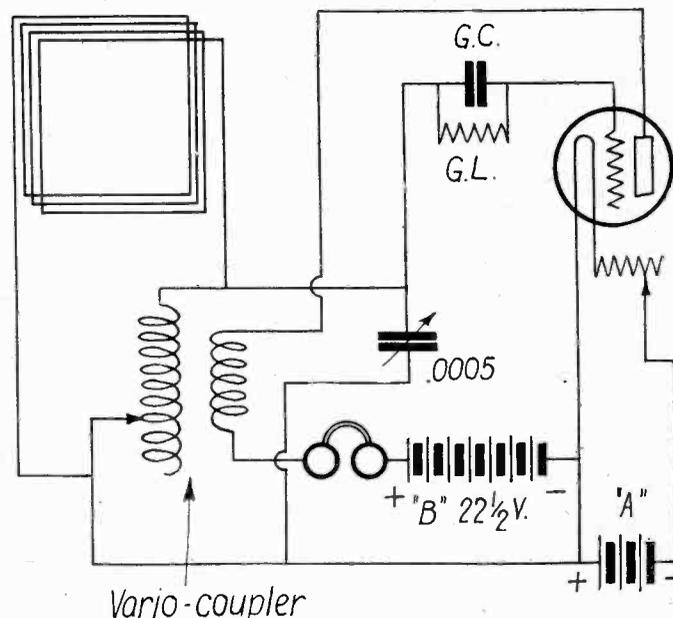


Fig. 2. Another adaptation of the same circuit. Slightly more complicated in control, and less selective, but more range and volume on local stations. Tickler feedback regeneration is used.

be found that the trouble has disappeared and the set will regenerate over the entire band of wave lengths.

Either of the above described sets will give good results in apartment houses where a small expenditure is desired and no aerial can be erected. They can be mounted in a small cabinet and if a small loop is used, the latter can be mounted directly on the top of the cabinet.

Perils of a Novice

WHEN a salesman sells a customer radio goods, he forms an instant opinion of the man who is buying by the manner in which he designates the parts he wants. If the purchaser states that he wants a lamp when he means a tube, the salesman knows he has a novice to deal with, and—if he is inclined to be slick—will put something over on him. The same may happen if he asks for other parts which have a proper name which the buyer does not know. Learn the names of the various parts and ask for them by name.

Corrected Official List of Broadcasting Stations in the United States

FOLLOWING is the fifth installment of a corrected list of commercial broadcasting stations in the United States as issued by the Department of Commerce. The list will be continued in next week's RADIO WORLD:

Call	Station	Frequency Kcys.	Wave Length Meters	Power Watts
WMAK	Norton Laboratories, Lockport, N. Y.	833	360	500
WPG	Nushawg Ptry. Farm, New Lebanon, Ohio ("A")	1,280	234	50
WIAD	Ocean City Yacht Club, Ocean City, N. J.	1,180	254	10
WAAD	Ohio Mechanics Institute, Cincinnati, Ohio	833	360	25
WEAO	Ohio State University, Columbus, Ohio	833	360	250
KFAH	Olesen, O. K., Hollywood, Cal.	833	360	100
KFCZ	Omaha Central High School, Omaha, Nebr.	1,160	258	100
WAAW	Omaha Grain Exchange, Omaha, Neb.	833	360	200
KFDJ	Oregon Agricultural College, Corvallis, Ore.	833	360	50
KDYQ	Oregon Institute of Technology, Portland, Ore.	833	360	10
WTAN	Orndorff Radio Shop, Mattoon, Illinois ("A")	1,250	240	100
WHAP	Otta & Kuhns, Decatur, Ill.	833	360	20
WJAR	Outlet Co., The, Providence, R. I.	833	360	200
WMAC	Page, J. Edward, Cazenovia, N. Y.	1,150	261	200
WIAR	Paducah Evening Sun, Paducah, Ky.	833	360	100
WKAA	Paar, H. F., Cedar Rapids, Iowa	1,160	268	100
WOC	Palmer School of Chiropractic, Davenport, Ia.	620	484	500
WOAH	Palmetto Radio Corp., Charleston, S. C.	833	360	10
WMAT	Paramount Radio Corp., Duluth, Minn.	1,130	266	25
WHAR	Paramount Radio & Elect. Co., Atlantic City, N. J.	1,300	231	15
WABD	Parker High School, Dayton, Ohio	1,060	283	10
WGAQ	Patterson, W. G., Shreveport, La.	833	360	150
WOAV	Pennsylvania National Guard, Erie, Pa.	1,240	242	100
WPAB	Pennsylvania State College, State College, Pa.	833	360	1,000
WBAK	Pennsylvania State Police, Department of, Harrisburg, Pa.	833	360	500
WTAC	Penn Traffic Co., Johnstown, Pa.	833	360	150
WNAV	People's Tel. & Tel. Co., (A) Knoxville, Tenn.	1,270	236	500
WJAN	Peoria Star Co., Peoria, Ill.	1,070	280	100
WJAM	Perham, D. C., Cedar Rapids, Iowa (A)	1,120	268	20
WOAZ	Penick Hughes Co., Stamford, Texas	833	360	100
WDBF	Phillips, Robert G., Youngstown, O.	1,150	261	50
WPAP	Phillips, Theodore D., Winchester, Ky.	833	360	10
KFFY	Pincus & Murphey, Inc., Alexandria, La.	1,100	275	100
WCK	Pine Bluff Company, The, Pine Bluff, Ark.	833	360	500
WJAS	Pittsburgh Radio Supply House, Pittsburgh, Pa.	833	360	250
WSAT	Plainview Elect. Co., Plainview, Tex.	1,120	268	20
KWG	Portable Wireless Telephone Co., Stockton, Cal.	833	360	100
KGW	Portland Oregonian, Portland, Ore.	610	492	500
WOAQ	Portsmouth Kiwanis Club, Portsmouth, Va.	833	360	15
Call	Station	Frequency Kcys.	Wave Length Meters	Power Watts
KFJC	Post-Intelligencer, Seattle, Wash.	1,290	233	100
WMH	Precision Equipment Co., Cincinnati, Ohio	1,210	248	10
WQAR	Press Publishing Co., Muncie, Ind.	833	360	10
KSS	Prest & Dean Radio Research Laboratory, Long Beach, Cal.	833	360	10
WQAS	Prince Walter Co., Lowell, Mass.	1,130	266	100
KSD	Pulitzer Publishing Co., St. Louis, Mo.	550	546	500
WLAN	Putnam Hardware Co., Houlton, Me.	833	360	100
WBAA	Purdue University, W. Lafayette, Ind.	833	360	20
KDZQ	Pyle & Nichols, Denver, Colo.	833	360	100
WCAW	Quincy Electric Supply Co., Quincy, Ill.	833	360	10
WLAT	Radio and Specialty Co., Burlington, Ia.	833	360	15
KFHP	Radio Bug Products Co., Kearney, Neb.	1,220	246	10
WRAF	Radio Club, Inc., La Porte, Ind.	1,340	224	10
WJY	Radio Corp. of America, New York, N. Y.	740	405	500
WJZ	Radio Corp. of America, New York, N. Y.	660	455	500
WKAQ	Radio Corp. of America, San Juan, P. R.	833	360	100
KFAW	Radio Den, The, Santa Ana, Cal.	833	360	40
WGAX	Radio Elect. Co., Washington C. H., Ohio	833	360	20
KFEV	Radio Electric Shop, Douglas, Wyo.	833	360	100
WFAG	Radio Engineering Laboratory, Waterford, N. Y.	833	360	20
WHAI	Radio Equipment & Mfg. Co., Davenport, Ia.	833	360	15
KFEP	Radio Equipment Co. (Joseph L. Turre), Denver, Colo.	1,250	240	10
WQAX	Radio Equipment Co., Peoria, Ill.	833	360	20
WQAT	Radio Equipment Corp., Westhampton, Va.	833	360	50
WRAY	Radio Sales Corporation, Scranton, Pa.	833	360	50
WRAO	Radio Service Co., St. Louis, Mo.	833	360	100
KJJ	Radio Shop, The, Sunnyvale, Cal.	833	360	100
WRAS	Radio Supply Co., McLeansboro, Ill.	833	360	20
WMAB	Radio Supply Co., Oklahoma City, Okla.	833	360	100
KFDC	Radio Supply Co., Spokane, Wash.	833	360	10
KNV	Radio Supply Co. of California, Los Angeles, Cal.	833	360	100
WRAH	Read, Stanley N., Providence, R. I.	833	360	10
WGF	Register and Tribune, Des Moines, Iowa	833	360	100
WHAZ	Rensselaer Polytechnic Institute, Troy, N. Y.	790	380	500
WBAU	Republican Publishing Co., Hamilton, Ohio	1,160	258	50
KLZ	Reynolds Radio Co., Inc., Denver, Colo.	833	360	500
WNAR	Rhodes, C. C., Butler, Mo.	833	360	10
KDZE	Rhodes Co., The, Seattle, Wash.	833	360	10
WRAA	Rice Institute, Houston, Texas	833	360	200
KFCM	Richmond Radio Shop, Richmond, Cal.	833	360	50
WKN	Riechman Crosby Co., The, Memphis, Tenn.	833	360	50

(To be continued. Readers who preserve these installments as they appear in RADIO WORLD will have a complete and up-to-date list of broadcasters in the United States. The publication of this corrected list began in RADIO WORLD for October 13, 1923.)

Double Circuit Selectivity at Single Circuit Cost

By C. White,
Consulting Engineer

IT is a common belief that we cannot have a double circuit tuner unless we purchase two variometers and a variocoupler, but such is not the case, since the advantages of a double circuit tuner can be had at a very low cost. A double or triple circuit tuner gives more selectivity than a single circuit tuner; then again it is generally much quieter in operation. The coupling between the primary and the secondary allows certain signals to be tuned in and out more sharply because of the inherent sharper resonance of a coupled circuit either with tuned or untuned primary. Of course, I do not mean to say that every double circuit tuner is better than a single circuit tuner because of that fact alone. There are many more facts to be considered. There are, for instance, more paths for energy loss in a coupled tuner than in a single circuit. Therefore more care must be taken in building one if you wish to get the maximum signal strength from your receiver. The very reason that a single circuit tuner will work even when literally thrown together has led many fans who have decided to change their circuit to try their luck with other types of regenerative circuits. They are greatly surprised to discover that the selectivity they were anxious to secure was really very small. With regenerative circuits it is almost true to a word that most of the performance is dependent upon proper arrangement and construction.

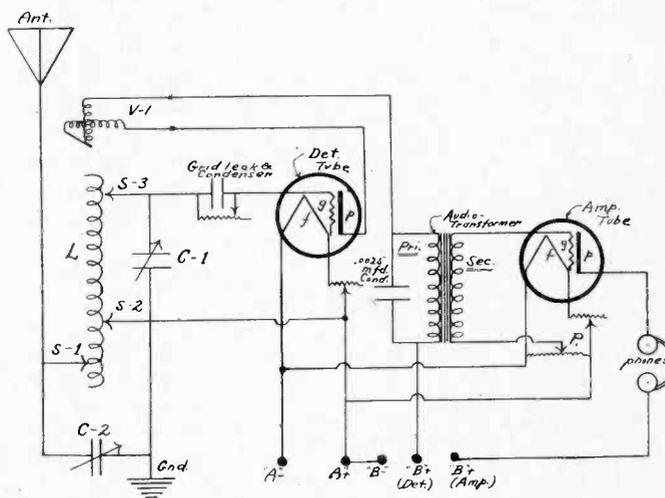
The trick of the whole circuit lies in the fact that the inductance L is tapped in such a manner to afford many ways of connecting the condensers in the circuit. This means that there is a choice of many possible combinations to suit your particular needs. You are not confined to one general method of tuning and circuit arrangement. The switch arms S-1, S-2, and S-3 solve the problem.

To get a clear conception of the flexibility let us study the method of bringing out the switch points in the three different switch arms. The coil L is wound on 4" tubing and has 80 turns in all with switch taps at every tenth turn. There are eight switch points for each switch arm and, since there are three switch arms, there are 24 taps in all. Each group of eight taps connects to the same taps on the coil L as any other group, thereby making it possible to shift the switch arms S-1, S-2 and S-3 to any particular group of turns on the inductance or tuning coil.

When the switch arm S-1 is on the same tap, or rather on a tap connecting to the same turn as the arm S-2, then the tuning is essentially nothing more than a single circuit tuner with the condenser C-1 in parallel with the active portion of the coil L. Now if S-1 is placed on a tap that connects it in with that portion of the coil below the tap on which S-2 is resting the tuning circuit is double, the primary circuit consisting of the portion of L between S-2 and S-1 and the condenser C-2 while the secondary circuit contains that portion of the coil L between S-3 and S-2 and the condenser C-1. This is the particular connection that is shown in the schematic diagram herewith. There are still a number of other combinations which can be had with this arrangement of three switch arms and three groups of taps connected in parallel or multiple.

It is interesting as well as exceedingly instructive to compare the many possible ways of tuning in a station with this very flexible circuit. The variometer V-1 serves to control the amount of regenerative ac-

tion. Often when first assembling and trying out the circuit there is a marked failure to secure the proper increase or decrease in volume as the shaft of the variometer is turned. This failure is due to the fact that the polarity of the current in the variometer should be reversed to secure feed-back action. This is quite easily accomplished by reversing the terminal connections to the variometer at the points marked x x on the diagram. I believe that the best relative connection, however, is that as indicated on the diagram. That is, the switch arm S-1 should be placed on



Two-tube receiver which is extremely selective and very flexible as to control and tuning.

the lower portion of the coil, S-3 on the upper portion, while S-2 should serve somewhere in the middle portion. It will also be noted that S-3 when on the upper taps of the coil L acts as a regenerative control since it can be moved so as to increase or decrease the distance between V-1 and the active part of L. You should use only condensers of small capacity for C-1 and C-2 generally a five or seven plate condenser will suffice. In tuning in you do not have to use the condenser C-2 unless interference is very severe. By placing the movable plates of C-2 so that they are not meshed with the fixed plates, C-2 will not appreciably affect the tuning of the receiver.

The variometer V-1 will serve to increase the volume on distant stations, and the potentiometer P, which has a resistance of 300 ohms or more, serves as a control of quality as well as volume. It will not be necessary to use phone jacks in this circuit since volume can be raised or lowered effectively by V-1 and the potentiometer P, controlling the amount of audio-frequency amplification.

This circuit is quite unique in adjustment and operation, and is indeed very effective when used with the UV199 tubes. There is nothing very special or difficult in its construction. The unit L is easily wound by any one at home and will greatly save the expense of buying a variocoupler. The extra primary condenser C-2, which is the same type as C-1, is added to the circuit to insure extra sharp selectivity when interference would completely kill reception on an ordinary single circuit receiver. The audio-frequency transformer is the standard commercial style.

RADIO WORLD

TELEPHONES:
LACKAWANNA 6976 and LACKAWANNA 2063
PUBLISHED EVERY WEDNESDAY (Dated
SATURDAY OF SAME WEEK)
FROM PUBLICATION OFFICE,
1493 BROADWAY, NEW YORK, N. Y.
BY HENNESSY RADIO PUBLICATIONS
CORPORATION

ROLAND BURKE HENNESSY, President
M. B. HENNESSY, Vice-President
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SUBSCRIPTION RATES

Fifteen cents a copy. \$6.00 a year. \$3.00 for
six months. \$1.50 for three months.
Add \$1.00 a year extra for foreign postage.
Canada 50 cents.

Receipt by new subscribers of the first copy of
RADIO WORLD mailed to them after sending in
their order, is automatic acknowledgment of their
subscription order.

ADVERTISING RATES

One page: One time—\$150.00.
Half, Quarter, Third and Two-thirds pages at
proportionate rates.
One inch, one time—\$5.00. Per agate line
\$0.40.

On four consecutive issues, 10% discount.
On thirteen consecutive issues, 15% discount.
Cover and preferred-position rates made known
on application.

Terms: 30 days net, 2% 10 days.

CLASSIFIED ADVERTISEMENTS

Five cents per word. Minimum, 10 words.
Discount of 10% on 4 consecutive issues—15%
on thirteen consecutive issues. Cash with order.

Entered as second-class matter, March 28, 1922,
at the Post Office at New York, New York, under
the act of March 3, 1879.

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While every possible care is taken to state
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NOVEMBER 10, 1923

Charles Proteus Steinmetz

IN the death of Charles Proteus Steinmetz the scientific world loses one of its most brilliant minds. What would have been to the average man an almost insurmountable physical handicap had no effect on his attitude toward life and seemed to be but a spur to higher mental efforts. His attainments in the mathematical and electrical domains of pure science were of the first degree. He was the research scout and pioneer who originated or dug out by clear and keen reasoning from the known to the unknown those basic principles on which many valuable and important electrical devices and machines were created by his co-workers in the shop.

Dr. Steinmetz's ability to clarify and demonstrate an abstruse technical principle made his work all the more valuable, for he was thus enabled to pass along to others the fruits of his laborious research. His wide knowledge of many branches of science was of great value to

him in his specific and chosen life work.

His first employer, Rudolf Eickemeyer, was an inventor of exceptional ability in the designing of hat-making machinery and later in the then new field of electric motors for power purposes. The Eickemeyer winding for armatures, which Steinmetz helped to develop with his employer and Stephen D. Field, is in use to this day. Eickemeyer was a most thorough investigator and kept a series of daily diaries referring exclusively to his work. This habit of careful, orderly, painstaking procedure Steinmetz absorbed by example from his elderly employer and it stood him in good stead, as he himself has many times asserted. It no doubt had much to do with the success of many research problems he solved.

The influence of Steinmetz's work on radio was of an indirect but none the less important character. He was a confirmed radio fan, although we have no record of any radio inventions directly attributable to him.

Passing on at the very zenith of his wonderful mental powers and with the future he visioned forever blotted out, Dr. Steinmetz leaves behind him a life of accomplishment which it is the privilege of few to achieve.

Emergency Value of Radio Proved

ON the evening of October 27 thirteen broadcasting stations dotting the breadth of the United States transmitted the ceremonies incident to Navy Day and the dedication of Roosevelt House, the restored birthplace of Col. Theodore Roosevelt, in New York City. It was the first time so ambitious and concerted an effort had been made by the broadcasters and was an instantaneously successful demonstration of what might be expected of organized radio in a time of national emergency. There is no way of computing the number of people who listened in, but it must have run into the millions, as there are believed to be somewhere near 2,000,000 receiving sets in operation in the country. Civilization progresses in direct proportion to the development of means of transportation and communication. In view of this latest and most wonderful demonstration of the absolute efficiency of radio as a method of reaching practically all of our people instantly, the greatness and power of the United States is again forcefully emphasized.

Radio Sets and Parts

AT the recent Radio Show in New York City were exhibited a number of receiving sets encased in period furniture especially constructed to hold them and selling for prices which made the radio fan's eyes stick out. They resembled, in effect, the higher type phonographs which were designed for their decorative values and to harmonize with the furnishings of expensive rooms. The thought was expressed at the time that this development might be ahead of its logical era—that the public was not yet ready to absorb radio sets of such calibre and price. On the other hand, these sets were put out by concerns of established reputation who presumably know their market. They must have believed they could be sold or they wouldn't have been made.

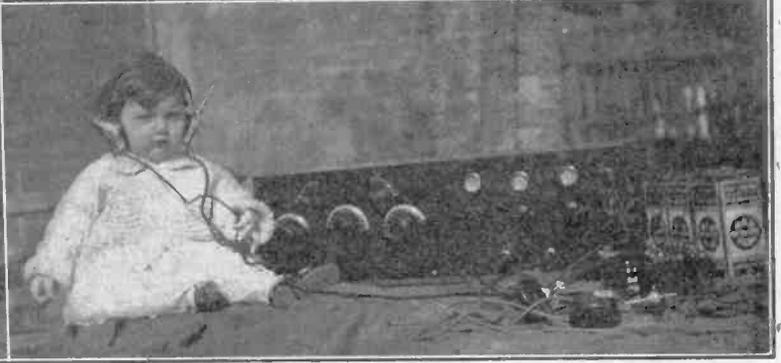
Now comes an announcement from a source which should be reliable that the completed radio set is growing greatly in favor with the buying public as proved by sales during the past few months. This is not to say that the sale of parts has fallen off, but that the demand for finished sets has shown an unusual increase. Perhaps this is but a natural development in the progress of the industry. So much publicity has been given to radio and it has done so much for itself by sheer merit, that it ought not to be surprising to hear that the public is buying the completed product instead of "rolling its own." As radio approaches the public utility stage, and there is no doubt of its being just that, the natural tendency of the manufacturer is to give the purchaser what he wants in as simple and "fool-proof" form as the present stage of the art will permit.

In our opinion, there need be no alarm now or ever over a falling off in the sale of radio parts. The layman who buys a set and who possesses absolutely no knowledge of radio, is sure to absorb more or less of the underlying principles and conceivably might turn out to be an experimenter of the most ardent type.

As for the radio fan, the real consumer of parts, he is bound to be always with us. He it is who forms the real backbone of the radio game and it is from him that many of our future improvements and refinements will come. He is persistently interested and seldom outgrows the fad he takes up as a boy or young man.

The manufacturer who maintains a high quality, guaranteed product will always find a market for his goods.

The Children Break Into the Radio News



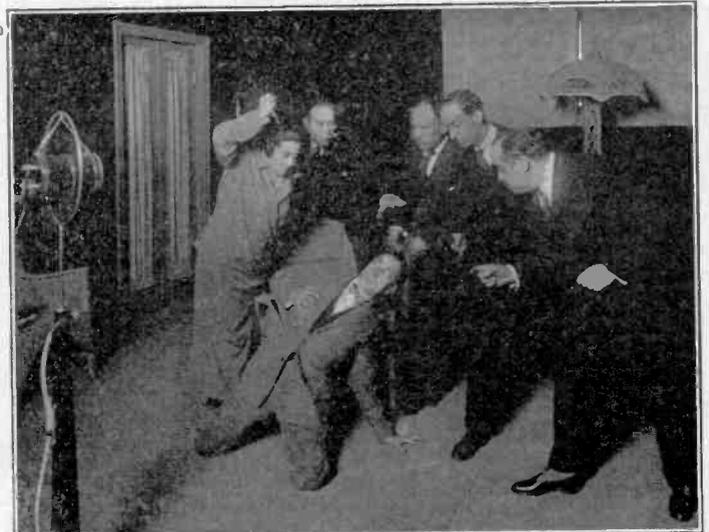
(C. Radio World)

Despair! Sorrow! written on the face of little Minnie Santella, when she accidentally knocked over Daddy Santella's radio set and could not listen in to her bed-time story. She was so anxious to hear The Man-In-The-Moon tales that she tumbled the set right over, breaking nothing but her enjoyable evening story. Thereupon, daddy fixed the receiver up once more, and we have the story as told by the illustration on the right. Contentment beams right through her tears and everything is sublime. The receiver is a three-tube Armstrong regenerative made by Frank Santella, of 440 Cleveland Street, Brooklyn, N. Y., from a circuit which appeared in RADIO WORLD. This composite illustration serves to show what a dull place this world would be for babies and grown-ups if we couldn't have the radio programs that we have gotten so used to.



(C. Fotograms)

This young "Diana of the Chase," Miss Vivian Butler, realizes that the best time to get grey squirrels with a gun is at daybreak or dusk. They are hungry in the morning and tired at night, and do not exercise their usual speed and care. Therefore, equipped with a portable loop receiver and a trusty 12-gauge shotgun, she waits for them to appear, and then, "Bang -Bang!" New fur coat! The receiver makes the waiting less tiresome and allows her to keep her eyes open, and her hand steady.



(C. La Presse)

Thrillers—real thrillers—blood-curdling—hair-raising—spine-tickling thrillers have been tried out on the broadcast fans, and strange to say they relish them. Station CKAC, the La Presse broadcasting station at Montreal, Quebec, tried out broadcasting the "Grand Guignol" players of Paris fame, and found that it was such a complete success that they had a hard time complying with all the requests and answering the mail.



C. Amer. Tel. & Tel. Co.

The participants in the recent Lief Ericsson celebration held by the American Scandinavian Foundation to celebrate the discovery of America in the year 1000 by that intrepid explorer of ancient times, Lief Ericsson. The songs and music were broadcast direct from The Town Hall through Station WEAJ. All the girls and boys were dressed in native costumes, and while the broadcast listener could not see it, he most assuredly appreciated the songs. It is not very often that the fan gets a chance to hear a program such as that and the station received many letters of commendation from all parts of the country, Lief Ericsson and his exploits are to the Scandinavians what Col. Roosevelt is to Americans.

Here Are Good Broadcast Programs

Station WOC, Davenport, Ia.

464 Meters. Central Standard Time. Friday, November 9.—10:00 A. M.—Opening market quotations. 10:55 A. M.—Time signals. 11:00 A. M.—Weather and river forecast. 11:05 A. M.—Market quotations. 12:00 Noon—Chimes concert. 2:00 P. M.—Closing stocks and markets. 3:30 P. M.—Educational program: Lecture by C. C. Flanagan. (Musical numbers to be announced.) 5:45 P. M.—Chimes concert. 6:30 P. M.—Sandman's visit. 6:50 P. M.—Sport news and weather forecast. 8:00 P. M.—Musical program (1 hour): Erwin Swindell, musical director. Program arranged by the Exchange Club of Rock Island, Illinois.

Saturday, November 10.—10:00 A. M.—Opening market quotations. 10:55 A. M.—Time signals. 11:00 A. M.—Weather and river forecast. 11:05 A. M.—Market quotations. 12:00 Noon—Chimes concert. 12:30 P. M.—Closing stocks and markets. 3:30 P. M.—Educational program: Lecture by C. C. Flanagan. (Musical numbers to be announced.) 5:45 P. M.—Chimes concert. 6:30 P. M.—Sandman's visit. 6:50 P. M.—Sport news and weather forecast. P. S. C. Orchestra, Gerald M. Barrow, director; V. B. Rochte, baritone soloist; Featuring "Sonny Boy," "Baby Brown Eyes," "Mother's Love," "Shreveport Blues," "The Natchez and the Robert E. Lee," and "Sunny Jim." Popular selections released through the National Association of Broadcasters, of which WOC is a member.

Station KDKA, East Pittsburgh, Pa.

326 Meters. Eastern Standard Time.—Saturday, November 10.—10:00 A. M.—Music. Union Live Stock Market Report from the National Stockman and Farmer. 11:55 A. M.—Arlington time signals. 12:50 P. M.—United States Bureau of Market Reports furnished through the National Stockman and Farmer. 1:30 P. M.—Concert by Dougherty's Orchestra from McCreery's Dining Room. 3:00 P. M.—Pitt-Grove City football scores from Forbes Field, Pittsburgh, Pa. 6:00 P. M.—Football scores. 6:15 P. M.—Dinner concert by the Westinghouse Band under the direction of T. J. Vastine. 7:00 P. M.—Football scores. 7:05 P. M.—Dinner concert continued. 7:30 P. M.—"Bringing the World to America," prepared by "Our World." 7:45 P. M.—"Goodnight Story," for the Little Folks. 8:00 P. M.—Features. 8:30 P. M.—Concert by the Westinghouse Band under the direction of T. J. Vastine. 9:55 P. M.—Arlington time signals. Weather forecast.

Station WFAA, Dallas, Texas

476 Meters. Central Standard Time. November 9.—12:30-1:00 P. M.—Address, Dr. Robert Stuart Hyer, Southern Methodist University, on the Sunday School lesson. 8:30-9:30 P. M.—Mizpah Orchestra, Raymond Bevelly, director.

November 10.—12:30-1:00 P. M.—Address, Miss Sudie Williams, supervisor of music, Dallas city schools, on "Music Memory Measures." 8:30-9:30 P. M.—A. Harris & Co.'s Orchestra, in popular recital, Prof. A. A. Cruze, director. 11:00-12:00 P. M.—Musical recital, presenting Mrs. Lena Holland Fielder, singer, with assisting musicians.

November 11.—2:30-3:30 P. M.—Radio Chapel Bible Class, Dr. William M. Anderson, Jr., pastor First Presbyterian Church, teacher; half-hour Bible study and half-hour gospel song. 9:30-10:00 P. M.—Singers from Oak Lawn Methodist Church, E. W. Pfaffenberger, director. 10:00-11:00 P. M.—Britling's Dallas Cafeteria Orchestra, Lou Goldberg, director.

Station WLW, Cincinnati, Ohio

309 Meters. Central Standard Time. Friday, November 9.—10:30 A. M.—Weather forecast. Business reports. 1:30 P. M.—Business reports. 3:00 P. M.—Stock quotations. 4:00 P. M.—Special matinee arranged by Margaret Spaulding (Dramatic Department of Cincinnati Conservatory of Music). Music by Rubin Phillips, violinist; Kathleen Welshimer, pianist. One act play: Fantasy, "Pierrot's Mother." No evening program.

Saturday, November 10.—10:30 A. M.—Weather forecast and business reports. 1:30 P. M.—Business reports. No evening program.

Sunday, November 11.—9:30 A. M.—Sunday School Services conducted by the Editorial Staff of Sunday School Publications of Methodist Book Concern. 11:00 A. M.—Church services of the Church of the Covenant, the Rev. Frank Stevenson, minister. No evening program.

Station WGY, Schenectady, N. Y.

380 Meters. Eastern Standard Time. Friday, November 9.—11:55 A. M.—Time signals. 12:30 P. M.—Stock market report. 12:40 P. M.—Produce market report. 12:45 P. M.—Weather forecast. 2:00 P. M.—Music and household talk. "Decorative Features for the Living Room" (Courtesy of "Modern Priscilla"). 6:00 P. M.—Produce and stock market quotations; news bulletins. 6:30 P. M.—Children's program. 7:35 P. M.—Health talk, N. Y. State Department of Health. 7:45 P. M.—Piano recital, followed by Huskin' Bee at Josh Quinby's. 10:30 P. M.—Musical program.

Saturday, November 10.—11:55 A. M.—U. S. Naval Observatory time signals. 12:30 P. M.—Stock market report. 12:40 P. M.—Produce market report. 9:30 P. M.—Phil Romano's Rain-bo Orchestra at the Kenmore Hotel (Albany, N. Y.)

Station KYW, Chicago, Ill.

536 Meters. Central Standard Time. Saturday, November 10.—9:30 A. M.—Late news and comment of the financial and commercial market. 10:00 A. M.—Market reports. 10:30 A. M.—Late financial news and comment. 10:58 A. M.—Observatory time signals. 11:00 A. M.—Market reports. 11:05 A. M.—Weather report. 11:30 A. M.—Late news and comment of the financial and commercial market. 11:35 A. M.—Table talk by Mrs. Anna J. Peterson of Peoples Gas Company. 12:00 M.—Market reports. 12:10 P. M.—Final market reports. 12:20 P. M.—Final stock reports. 12:30 P. M.—Late financial comment and news bulletins. 2:00 P. M.—University of Chicago vs. University of Indiana football contest at Stagg Field, Chicago. 4:30 P. M.—News and sports. 5:00 P. M.—Latest news of the day. 6:30 P. M.—News, financial and final market and sport summary. Financial summary furnished by the Union Trust Company and Chicago Journal of Commerce. 6:50 P. M.—Children's bedtime story. 8:00 to 8:58 P. M.—Musical program, courtesy of the International Harvester Company. Artists and program will be announced by radiophone. 8:58 P. M.—Naval Observatory time signals. 9:00 P. M.—News and weather reports. 9:05 P. M.—"Under the Evening Lamp" service furnished by the Youth's Companion consisting of stories, humorous sketches and articles. News, sports and children's bedtime story.

Sunday, November 11.—11:00 A. M.—Central Church service broadcast from Orchestra Hall, Chicago. Dr. Frederick F. Shannon, pastor. Musical program under the direction of Daniel Protheros. 6:30 P. M.—Excerpts from the New Testament—An American Translation by Prof. Edgar J. Goodspeed, read by William Ziegler Nourse. 7:00 P. M.—Chicago Sunday Evening Club services broadcast from Orchestra Hall, Chicago. Special musical program will be given by the Choir of One Hundred under the direction of Edgar Nelson. The speaker of that evening will be announced by radiophone. Special program will be prepared for Armistice Day.

Station WBZ, Springfield, Mass.

337 Meters. Eastern Standard Time. Saturday, November 10.—11:55 A. M.—Arlington time signals; weather reports; Boston and Springfield Market reports. 7:00 P. M.—Dinner concert by the Hotel Kimball Trio direct from the Hotel Kimball dining room; Jan Geerts, violinist and director; Angela Godard Lonergan, cellist; Paul Lawrence, pianist. 7:30 P. M.—Twilight tales for the kiddies. "Bringing the World to America," prepared by "Our World" Magazine. 8:00 P. M.—Concert by Mrs. Nellie Hamilton, pianist; Gladys Noble, soprano. 9:00 P. M.—Bedtime story for grownups, by Orison S. Marden. 9:55 P. M.—Arlington time signals.

Sunday, November 11.—11:00 A. M.—Church services direct from the Church of the Unity, the Rev. Charles A. Wing, pastor, assisted by the Philharmonic Male Quartet and Miss Adele Graves, harpist; Raymond C. Hodge, first tenor; Howard I. Smith, second tenor; William H. Lippmann, baritone; George B. Dowd, bass; Miss Adele Graves, harpist; Robert W. Field, organist and director. 6:45 P. M.—Sunday vespers on the Springfield Municipal Chimes transmitted direct from the Campanile, Ernest Newton Bagg, chime ringer. 8:30 P. M.—Church services conducted by the Rev. Fred W. Adams, pastor of the Trinity Methodist Episcopal Church, assisted by Church Quartet; Mrs. Fred Winslow Adams, soprano; Mrs. William J. Warner, contralto; Frederic L. Wade, tenor; William J. Stevens, bass; Arthur H. Turner, accompanist. 9:55 P. M.—Arlington time signals.

Station WIP, Philadelphia

509 meters. Eastern Standard Time, Nov. 9.—1:30 P. M.—Official weather forecast. 3:00 P. M.—Artist recital by artists from the Remick Studios. 6:00 P. M.—Official weather forecast. 7:00 P. M.—Uncle Wip's Bedtime Stories and roll call for the children.

Nov. 10.—1:00 P. M.—Organ recital by Karl Bonawitz on the Germantown Theatre organ. 1:30 P. M.—Official weather forecast. 2:00 to 4:30 P. M.—Play by play report of the football game at Franklin Field. 6:00 P. M.—Official weather forecast. 7:00 P. M.—Uncle Wip's Bedtime Stories and roll call for the children. 8:00 P. M.—Patriotic program in honor of Armistice Day under the auspices of Philadelphia's own 315th Infantry. 79th Division; address by Rev. Dr. Russel Conwell. 10:15 P. M.—Charlie Kerr and his orchestra from the St. James Hotel.

Station KHJ, Los Angeles, Calif.

395 Meters. Pacific Time. November 9.—12:30-1:15 P. M.—News items. Music. 2:30-3:30 P. M.—Matinee musicale. 6:45-7:00 P. M.—Children's program. 7:00-7:30 P. M.—Organ recital, from First Methodist Episcopal Church. Arthur Blakeley, organist. 8:00-10:00 P. M.—De luxe program. Walter F. McEntire will talk on the Mission San Luis Rey de Francis. 10:00-12 P. M.—Broadcasting Art Hickman's Orchestra, by line telephony, from the Los Angeles Biltmore Hotel.

November 10.—12:30-1:15 P. M.—News items. Music. 2:30-3:30 P. M.—Matinee musicale. 6:45-7:30 P. M.—Children's program. 8:00-10:00 P. M.—De luxe program. 10:00-12:00 P. M.—Broadcasting Art Hickman's Orchestra, by line telephony, from the Los Angeles Biltmore Hotel.

Station WOR, Newark, N. J.

406 meters. Eastern Standard Time—Nov. 9.—2:30-4:00 P. M.—No one under 50 permitted to listen-in. Old time songs, popular and classic, which were popular in the days of our grandparents' youth. WOR favorites will give this program especially for grandmas and grand-dads. 6:15 P. M.—"Welfare Federations and What They Mean to a Community," by Clarence Potter of the Y. M. C. A. of the Oranges. 6:30 P. M.—"Man in the Moon Stories for the Children." 7:00 P. M.—Margaret Behling, mezzo-soprano of New York.

Nov. 10.—2:30 P. M.—Recital by Mme. Amy Ray Seward. 2:45 P. M.—To be announced. 3:00 P. M.—"Health Hints"—a talk by Dr. Harriett Van Buren Peckham. 3:15 P. M.—Recital by Mme. Amy Ray Seward. 3:40 P. M.—"Half Hours With Successful Women"—Lady Jane Gray—"The Doll Lady." 6:15 P. M.—Joint recital by Caroline L. Thomas, violinist, of New York, and Marion Patten, pianist. 6:30 P. M.—Dr. Hills-Cole, Ph.D., continuing with his second talk on "Voices from the Dead." 6:45 P. M.—Piano solos by Marion Patten. 7:00 P. M.—Violin solos by Caroline L. Thomas, assisted by Marion Patten at the piano. 7:15 P. M.—"Sporting News Up-to-the-Minute"—A talk by Fred J. Bendel, Sporting Editor of the Newark Morning Ledger. 8:00 P. M.—A talk by Dr. Henry R. Rose, D.D., of Newark. 8:30 P. M.—Return engagement by popular request of the well-known Zimble Trio. 9:00 P. M.—14th Infantry Quartet of Brooklyn. 9:15 P. M.—Tenor solos by Frank Stock, of New York. 9:30 P. M.—Concert by the Zimble Trio. 9:50 P. M.—14th Infantry Quartet of Brooklyn. 10:05 P. M.—Tenor solos by Frank Stock of New York. 10:20 P. M.—Concert by the Zimble Trio. 10:45 P. M.—14th Infantry Quartet of Brooklyn.

Station WRC, Washington, D. C.

460 meters. Eastern Standard Time, Nov. 9.—10 A. M.—Foreign Exchange quotations, prepared by the Washington Loan and Trust Co. 6:00 P. M.—Children's Hour, by Peggy Albion. 8:00 P. M.—A talk on the Coast Guard by Oliver Maxam. 8:15 P. M.—Song recital by Frances Cole. 8:30 P. M.—Violin recital by Arsenio Ralon. 8:45 P. M.—Song recital by Marion Walker. 9:00 P. M.—Piano recital by Minna Niemann. 9:15 P. M.—Song recital by Frances Cole. 9:30 P. M.—Violin recital by Arsenio Ralon. 9:45 P. M.—Song recital by Marion Walker. 10:00 P. M.—Piano recital by Minna Niemann.

Nov. 10.—10:00 A. M.—Foreign Exchange quotations furnished by the Washington Loan and Trust Co. 3:00 P. M.—Fashion developments of the minute, prepared by Harper's Bazar. 3:10 P. M.—Song recital by Rose Finckel. 3:20 P. M.—Violin recital by Josephine Plant. 3:30 P. M.—Farm home reports. 3:40 P. M.—Current events prepared by the Review of Reviews. 3:50 P. M.—Instruction in code practice. 4:00 P. M.—The magazine of Wall Street. 6:00 P. M.—Children's Hour by Marietta Stockard Albion.

Station KSD, St. Louis, Mo.

546 Meters. Central Standard Time. Friday, November 9.—8:00 P. M.—Program by Maplewood Baptist Church Choir, F. D. Anderson, director. John Herget, solo accordionist.

Saturday, November 10.—3:00 P. M.—Program given by group of children under 14 years of age. 8:00 P. M.—Orchestral concert, organ recital, vocal and instrumental specialties broadcast direct from the Missouri Theatre.

"Battling Butler" Gets the Air from WJZ

ONE of the happiest mixtures of farce comedy and musical excellence was broadcast by Station WJZ on the evening of October 23 when the musical comedy (with the accent on both words) "Battling Butler" was put on the air directly from the Selwyn Theatre, New York. The play is perfectly suited for radio listeners, containing as it does a maximum of comedy lines and a multitude of song hits.

Hallowe'en by Radio

THOSE who listened in to the Capitol Theatre concert last week enjoyed the vicarious pleasure of a real Hallowe'en party, which took place in the studio. "Roxy" was the genial toastmaster, and the whole "gang" was there. Raymond Hitchcock dropped in and added to the general frivolity. There was real humor, real music, and real entertainment. The only thing which hovered outside the pale of authenticity was the beer.

Answers to Readers

Where can the Cockaday parts be obtained? Where can I obtain a complete description of this circuit with a description of how it works? What make of apparatus do you suggest?—John D. Roy, 209 Manitoa St., Willimantic, Ct.

On page 18 of RADIO WORLD for October 6 there is a diagram of the circuit you mention as well as a description of it on page 20. The coils can be home-made as described. The particular apparatus used in the circuit is also described. If you do not wish to make your own coils they may be purchased already made in any of the larger radio stores.

* * *

I have a one-step radio set using WD11 tubes. Should a faint blue light appear between the grid and filament on these tubes when they are being operated? I am using 60 volts on the plate. The reception is not distinct and I cannot get any distant stations.—J. E. Hare, Win, Johnson County, Ky.

You are forcing your tubes. There should not be a blue light. Use less plate voltage

tains both the technical diagram and the picture diagram. Learn to understand the technical diagrams as not many magazines use the picture method.

* * *

Will you publish the three-condenser, two honeycomb coil Flewelling receiver with a stage of tuned radio-frequency?—Herbert Starback, Box 352, Lake Forest, Ill.

This is impossible. Do not try it as it cannot be accomplished.

* * *

I have tried the circuit described by H. S. Potter in your issue of Sept. 15th and have had very good results with it. I want to add either one or two stages of audio-frequency amplification to this circuit but have failed due to the peculiar construction and placing of the phone and plate circuit. Will you give me a circuit for this?—E. R. Siebert, 4666 Vancouver Ave., Detroit, Mich.

The circuit you wish is herewith published. Note the fact that separate A and B batteries are used for the amplifier. This is to prevent any chance of howling or extraneous noises and is done because of the peculiar working of the circuit.

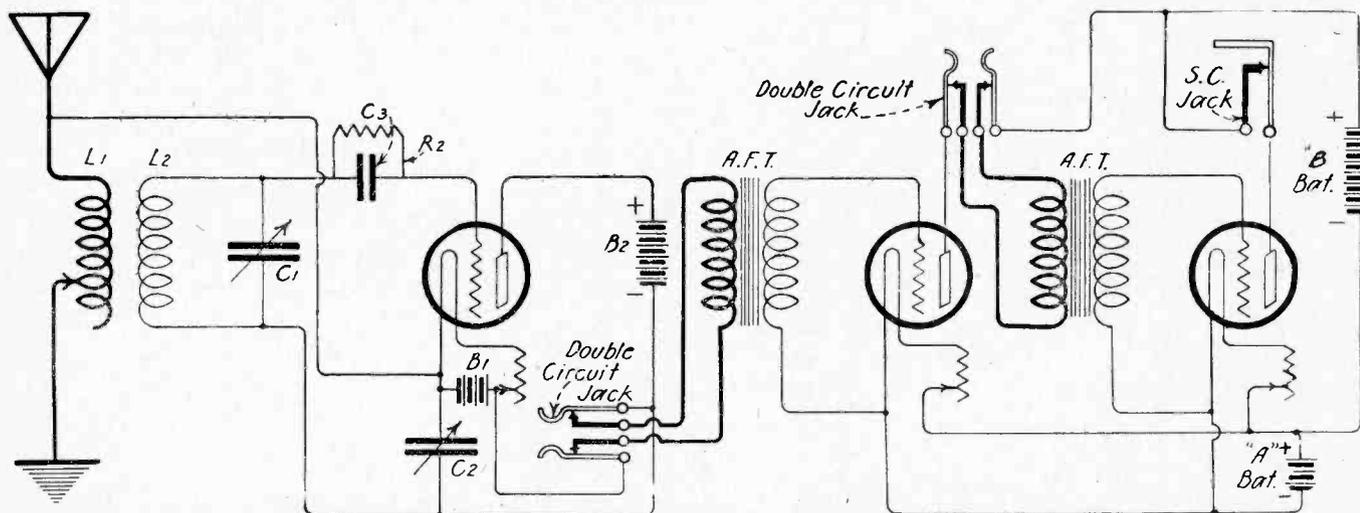
it, and how will I obtain the different voltages necessary?—William Shultz, 3408 Benitean, Detroit, Mich.

This is not advisable. In the first place, in order to use a transformer you will have to use alternating current. This will create an annoying hum in your set which will drown out all signals. Do not attempt it.

* * *

My set does not get the higher wave stations such as WEAF and above. It is good for distance, but does not reach the wave lengths I would like. How can this be accomplished? Until just recently I used to get squeals when tuning in, but now the receiver is quiet and I cannot get the volume out of it I did.—Alf Hjembo, 11 Stephens Place, Staten Island, N. Y.

If you are using a series condenser in your antenna lead or ground lead, remove it, or better yet, arrange a series-parallel switch so that you may place your condenser in either series or parallel. When a condenser is in series with an inductance it cuts down the wave length the receiver will respond to, by raising the frequency at which the circuit oscillates. When it is in parallel, the wave length is raised, because then the frequency at which the circuit oscillates is dropped or lowered. Your trouble with the squeals may be due to either faulty B batteries, improper grid leak, or a poor connection, perhaps in the socket of your



Circuit asked for by E. R. Siebert. It is the Potter circuit with two stages of audio-frequency amplification. Separate A and B batteries for the amplifier work best with this receiver, due to the peculiar method of coupling used in the Potter receiver. Use the same constants for detector as in the Potter circuit.

and keep your filament down lower. Use 22½ volts on the detector and 45 on the plate of the amplifier.

* * *

I have a receiver using Atwater-Kent apparatus. I can receive stations up to 517 meters, but cannot get down below 309. Can you suggest some manner in which I can accommodate my receiver to get these lower stations? My antenna is 100 feet long with a ground 50 feet from my set. Where can I get the best hook-up for the Atwater-Kent parts?—John Sabiston, Jr., Maple Ave., Bayshore, L. I.

In order to receive the shorter waves, it will be necessary for you to insert a condenser (variable 23 or 43 plate) in your ground lead. This will enable you to get the lower stations. Write to the Atwater-Kent people, the manufacturers. They publish a little booklet giving several circuits for their own apparatus.

* * *

Please publish a diagram of a single tube receiver in picture form. I cannot understand the technical diagrams.—B. Bernfield, c/o Danner and Co., 621 8th Ave., New York City.

We published such a diagram in RADIO WORLD for October 20, page eight. It con-

Where can I get some information on a lead and aluminum plate rectifier for charging my 6 volt radio storage battery? How should they be connected up? What solution is to be used in it?—M. B. Greiver, Canastota, N. Y.

A comprehensive article on the construction and operation of chargers of this type, for both storage A and B batteries, appeared in RADIO WORLD for October 27, page 11. It gives all the details.

* * *

In RADIO WORLD for October 20, you described "A Circuit for Real Clarity Plus Distance." This article shows a coupler being used with antenna and ground. Can I use a loop with this? If so, how? Please give me a diagram for this.—A. D. Sylvestre, 471 Laguachetiers West, Montreal, Canada.

This can be done. All that is necessary is to connect the loop across the secondary condenser where the two leads of the coupler normally would go, and disregard the coupler. No diagram is necessary for this change.

* * *

Is it advisable to use a door bell transformer for B battery voltage in place of the regular battery? If so, how will I do

tube. Examine the set thoroughly and test your batteries.

* * *

I have a Radiola RC set, using the 1½ volt tubes. Lately I have been getting a disturbing whistle whenever I plug in on the last stage, and turn my tubes about a quarter the way up. This sometimes stops after a time, but is there most all the time. Richard Houseman, 511 West 54th St., New York.

Suggest that you examine your last tube. Some of the tubes you mention do not have the lugs the same length, with the result that sometimes only three of the lugs are making good contact. Change your tube around and see if that is not the trouble. In using this receiver you should burn your amplifying tubes about ¾ the way up, in order to get the maximum amplification. Use 22½ volts on the detector and 67 volts on the amplifiers. Do this by removing the bridge from the last two binding posts on the rear of the cabinet, and connecting the batteries as follows: The last binding post (bottom) goes to the plus of the 67 volt battery. The next to the last from the bottom goes to the 22½ volt tap of the battery, while the minus goes to the fourth tap from the bottom. This should stop your trouble.

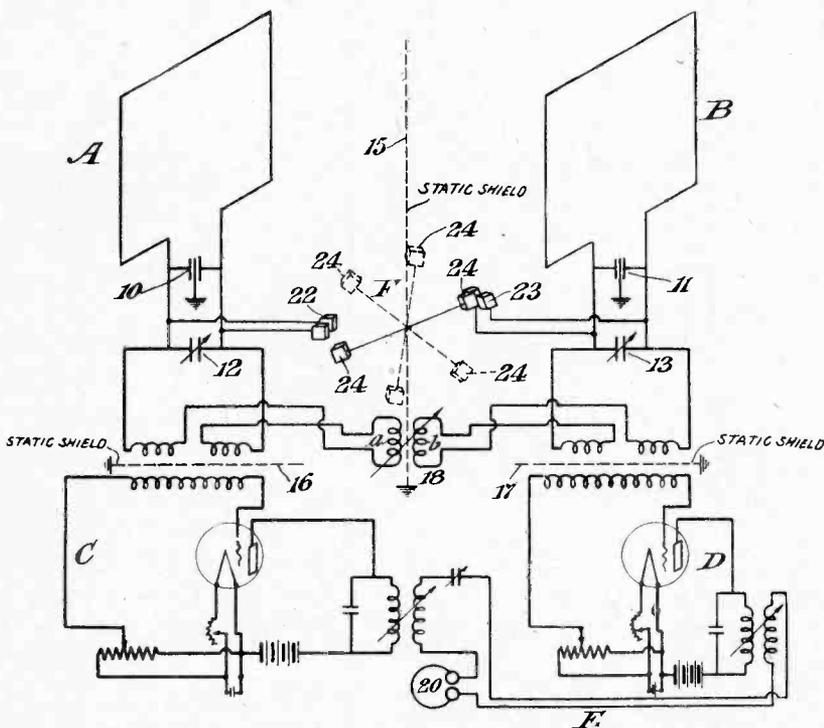
Latest Radio Patents

Radio Reception

No. 1,471,165: Patented October 16, 1923. Patentee: L. L. Jones, New York City.

This invention relates to a method and apparatus or system for the reception of radio signals. The invention aims to provide a receiving system whereby radio signals of low damping, and especially continuous waves, may be efficiently received with the exclusion of disturbances of all kinds resulting from waves or pulses of relatively high damping, or from waves differing in frequency from the signal waves. A further object of the invention is to provide a receiving system in which sustained wave signals are received in an indicator operable by audible frequency current produced by the periodic interruption method and which has the advantage that the whole

substantially equal amounts of wave energy of high damping or of frequency substantially different from the signal frequency, and greatly unequal amounts of signal energy of low damping, and wherein the currents produced by the energy absorbed in the two antennas are separately rectified and thereafter combined in opposition for operating the indicating means. The current resulting from energy absorbed from waves of high damping, and from waves of a frequency substantially different from the signal frequency, are thus caused to neutralize each other in the indicating circuit, while a signal current is produced in the indicating circuit by the absorbed signal wave energy of low damping and operates the indicating device free from dis-



Receiver embodying several new and distinct ideas in radio reception. A balanced loop system is used which, when combined with the apparatus named, provides an extremely sharp-tuning, interference-proof receiver.

available signal energy is absorbed from the wave field for operating the indicator. A further object of the invention is to provide a unilateral loop receiver which in addition to the usual advantage of directional elimination of such a receiver, shall have the property of substantially eliminating disturbances resulting from waves coming from directions from which the desired signal waves reach the receiver.

With these objects in view, the invention comprises a method wherein two receiving antennas, or absorbing means are utilized which are designed to receive

turbance. The two receiving antennas should be electrically alike, should have low and equal dampings, and should be in close proximity and electrically and magnetically decoupled one from the other. Loop antennas are best used because of the greater difficulty of decoupling open antennas. The loop antennas should both point in the same direction, and should most desirably be symmetrically placed with respect to surrounding objects. For convenience in adjusting the setting of the loops, it is desirable to use loops of fairly small dimensions.

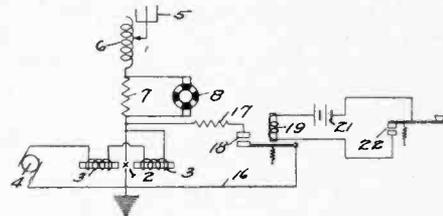
Radiotelegraph Signaling System

No. 1,471,319: Patented October 16, 1923. Patentees: H. Pratt, San Francisco; H. F. Elliott, Palo Alto, and E. B. Murphy, Burlingame, Cal.

The invention relates to a radio telegraph signaling system in which audio

frequency wave trains are radiated from an antenna system to which an undamped wave arc generator is connected. It is desirable for several reasons under certain conditions, to produce audio frequency wave trains from a continuous undamped wave transmission system and several methods have been suggested for accomplishing such result. In these

methods the continuous wave has been broken up into time spaced groups at such a frequency that the group frequency is within the range of audibility. This has been accomplished by interrupting the antenna circuit at an audio frequency rate and shunting the arc with a condenser circuit or an oscillatory circuit, into which the radio frequency current passed during the interval that the antenna circuit was opened, or during the time that its resistance was largely increased. These methods all involve the continuous and normal operation of the arc, and during the intervals of no radi-



New radio telegraph system, allowing modulation at audio current in an arc telephone transmitter.

ation the energy of the arc is wasted in the shunt or oscillatory circuit.

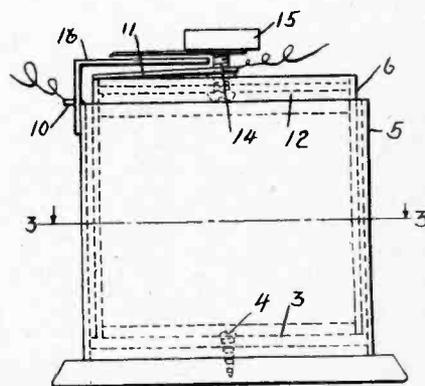
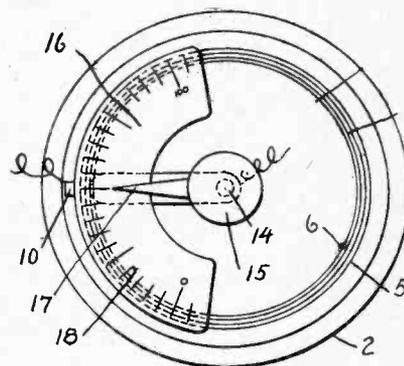
An object of our invention is to produce modulation of the antenna current at audio frequencies, in an arc radio transmitter.

Another object of our invention is to eliminate a certain waste of energy in performing such modulation for producing a more economically operating system.

Condenser

No. 15,689 (Reissue): Patented September 25, 1923. Inventor C. D. Tuska, Hartford, Conn.

This invention relates to condensers. A condenser involving the invention may be employed with utility in various ways in the electric and allied arts, although in



Method and means of constructing a condenser which is variable, yet sufficiently simple to permit low production cost.

practice it has demonstrated particular advantage as part of the equipment of a wireless telegraph station.

DXers, We're Off For the Season!

DX Nite Owls, Attention!

THE DX season is now upon us. All faithful DXers are requested to get ready for the fray and prepare themselves for the night vigil.

Send your records to the DX Editor of RADIO WORLD.

Write only on one side of the paper and write clearly.

Give full particulars of your location, your set, your aeriels and other items of interest.

Startin' in Nice!

From C. P. Polk, Fayette, Ia.

I have read the DX Nite Owl records for some time in the RADIO WORLD. My set is a single tube, WD11 affair which I constructed. I have had it but two months.

The following is a list of the stations I have heard. They cover 15 States: WOAW, Omaha, Nebraska; WDAP, Chicago, Ill.; WOC, Davenport, Ia.; WCAF, Kansas City, Kan.; WSB, Atlanta, Geo.; WHB, Kansas City, Kan.; WOS, Jefferson, City, Mo.; WFAA, Dallas, Texas; WCX, Detroit, Mich.; WMC, Memphis, Tenn.; WJAZ, Chicago, Ill.; WGY, Schenectady, N. Y.; WGI, Medford, Mass.; WTAG, Minneapolis, Minn.; KSD, St. Louis, Mo.; WWJ, Detroit, Mich.; WBAP, Fort Worth, Texas; WGF, Des Moines, Iowa; WHAS, Louisville, Ky.; WOR, Newark, N. J.; WMAI, Chicago, Ill.; WRAM, Waterloo, Ia.

I consider this a fair range for a WD11 set. RADIO WORLD is a great help to me in solving difficulties and learning more about radio construction.

Here's a Chance to Swap One

From W. Latchford, 1566 Third St., Rensselaer, N. Y.

I read RADIO WORLD regularly and get a great deal of pleasure and solid technical advice out of it, especially the "DX Nite Owl" section.

My set consists of a Fisher variocoupler, 21 plate variable condenser, WD11 tube. I use a Bradleystat which I find to be the best filament control I have ever tried.

Although the distance over which I have received is not extraordinary, the clearness and volume of the signals is exceptional for one tube.

Here is a list of the stations I received from January 1 to March 31:

WGY, WOR, WCX, KSD, WHAM, WLAG, WSB, WNAC, WDAR, PWX, WMAK, WHAZ, KDKA, WLW, WDAP, WGR, WLAK, WGM, WBZ, WOC, WGI, KOP, WNJ, WCAE, WLK, KYW, CFCA, WDAF, WDAJ, WQAA, WGF, WOO, WEA, WJAX, WHAS, WMAQ, CKAC, WHB, WHA, WIP, WCAF, WEAQ, WJZ, WWJ, WMC, WDAK, CHYC, WBAP, WJAZ, WFI, WMAF, NOF. Total, 8,390 miles. These stations can be tuned in any night they are in operation and I have written and received replies from them.

I am using a regenerative hookup and very seldom have to touch the secondary control of the coupler. If anyone wants any information on the hookup or any of the instruments used, I will answer their questions upon the receipt of a stamp.

They're Starting to Break Right! Just Wait

From J. E. Bradley, Justin, Texas

Noticed your statement to the DXers about Receiving Records. We have only had one good night here so far. It is still warm and plenty of static, but Sept. 25th had very good luck.

KDKA, Pittsburgh, 7:20 P. M.—Piano solo, talk on the motion picture, Covered Wagon, Mr. McMahon. WPAD, 7:30, Chicago, 7:30, Quartette, "Not a Baby But a Big Lady." WSAI, Cincinnati, 7:35, Hotel Gibson Orchestra. WHB, Kansas City, Mo., 8:10, Moonlite Melody Serenaders. WHAS, Louisville, Ky., 8:15, Schilling Orchestra, "Barney Google." KSD, St. Louis, Mo., 8:25, talk on aviation meet to be held there commencing Oct. 1. WWJ, Detroit, Mich., 8:28, Detroit News Orchestra. WOAI, San Antonio, Tex., 10:13, Solo by Miss Clark. WLW, Cincinnati, O., 10:15, "When Will My Dreams Come True," band. WSB, Atlanta, Ga., 10:20, boxing match, Joe Selva vs. Gilbert Fox. WOAW, Omaha, Neb., 10:25, Edith Louise Waggoner in Piano Recital. WDAP, Chicago, Ill., "Syncopated Elevated Man," by Jack Nelson. KHJ, Los Angeles, Cal., 10:31, announcement. WJAZ, Chicago, Ill., 10:35, "My Lovely Cecelia," by Geo. Smith. WTAS, Elgin, Ill., 10:50, "Phonograph," "Dumbell" and "You Gave Me Your Heart"

This was just two hours' work. Have the same old receiver that I had last year. Will be glad when it gets a little cooler and can go out and get them. Have not picked up our old friend "Radio Golf" Jones at Trunucu, Cuba, since last March.

Your magazine gets better and better all the time.

Forty-four Is a Fair Start

From Ralph Coady, Hopkins, Fla.

Herewith is a list of stations I have received with my single tube, single circuit: KDKA, KFAF, KSD, WIP, WWJ, WGAQ, WOC, PWX, WGY, WFAA, WSY, WLW, WSB, WDAJ, WOS, WHB, WGM, WBAP, WBT, WJZ, WOR, WHAS, WDAL, WPA, WQAM, WEA, WJAX, WAAC, WMC, WDAI, WHAM, WDAF, WOO, WHAZ, WLAJ, WMAV, WBAV, WGI, WEAY, WBZ, WKAQ, WDAE, WDAR, and SKW of Trunucu, Cuba.

It must be remembered that Florida is in the zone of tropical static until the winter months. I would like to hear from those having transmitters.

Not Bad for a Beginning

From Bill Parr, Justin, Texas

My old radio friend, J. E. Bradley, here, has been after me to send into you my "DX" work with a homemade crystal set for the coarse tuning it is tapped off every eight turns for eight taps and for the sharp tuning it is tapped off every three turns for eight taps. Just last night I picked up KDKA with a boxing match direct from the ring. And I have picked up the following stations since last winter: WLAG, WOC, WOAW, KSD, WDAF, WHB, WJAZ, WWJ, and another in Syracuse, N. Y., WMC, WBAD, WDAP, WFAA, WOS, KLZ, WOAI and WSB.

I think this is very good for a crystal set. I use W. E. head phones, 2200 ohms, and have all my connections soldered good.

MAGNAVOX Radio Products



M1—\$35.00

Magnavox Reproducer for dry battery receiving sets

THIS new semi-dynamic Magnavox Reproducer is particularly recommended for dry battery receiving sets where low voltage and low current consumption tubes are used. The M1 is supreme in its class.

Magnavox Reproducers

R2 with 18-inch curvex horn \$60.00
R3 with 14-inch curvex horn \$35.00
M1 with 14-in. curvex horn. Requires no battery for the field . \$35.00

Magnavox Combination Sets

A1-R consisting of electro-dynamic Reproducer with 14-inch curvex horn and 1 stage of amplification \$59.00
A2-R consisting of electro-dynamic Reproducer with 14-inch curvex horn and 2 stages of amplification \$85.00

Magnavox Power Amplifiers

A1—new 1-stage Power Amplifier \$27.50
AC-2-C—2-stage Power Amplifier \$55.00
AC-3-C—3-stage Power Amplifier \$75.00

Magnavox products can be had at Registered Magnavox Dealers everywhere. Write for new 32-page catalogue.

The Magnavox Company Oakland, California

New York Office: 370 Seventh Avenue
Canadian Distributors
Perkins Electric Co., Ltd., Montreal

Features of the Second Annual Chicago Radio Show

GENERAL interest in the radio industry and among the radio fans is now centering in the Second Annual Chicago Show, which will be held in the Coliseum from November 20 to 25. With practically all the exhibition space sold to leading manufacturers and jobbers before November 1, the management has had plenty of time to arrange an elaborate program.

One of the chief features will be a general survey of radio to determine just what the public wants from the leading broadcasting stations. The Chicago stations have organized to broadcast the question "What Would You Like to Hear Over the Radio?" There will be 500 prizes for the answers and these will be tabulated by the management and in that way what is most popular with the listeners-in will be determined.

It is expected that more than 200,000 replies, or more than enough to settle for all time any question regarding the popularity of radio, will be received. These replies will be piled on a stage at the show and each night a part of the prizes will be awarded.

The amateur set building contests are bringing in entries ranging from crystal to eleven-tube superheterodyne sets from all over the United States, and this display, which will be housed in the Coliseum Annex, will be one of the big features of the show.

One large Eastern firm is preparing to exhibit a recording-radio by means of which speeches by prominent persons, popular songs, etc., can be registered on phonograph records as they come over the air.

Notable speakers, including Major Armstrong, Prof. Hazeltine, Dr. Lee De Forest, E. T. Flewelling and others, have been invited to address the crowds at the show and many of them have accepted. There will also be feature concerts broadcast from the Coliseum by means of sealed wires to the local broadcasting stations.

Exhibitors at Chicago Radio Show

FOLLOWING is a list of the exhibitors who have signed contracts for space at the Second Annual Chicago Radio Show which will be held at the Coliseum November 20-25. The numbers preceding the names are the booth numbers at present assigned to exhibitors:

B, National Carbon Company; 6, Hudson-Ross; 7, The Barsook Company; 8 and 9, H. H. Frost; 10, American Radio & Research Corp.; D, DeForest Radio Tel. & Tel. Co.; 19, Nathaniel Baldwin, Inc.; 20, Marco Meyer & Co.; 21, the Veriton Radio Assn.; 24, Philadelphia Storage Battery Co.; 25, The Bristol Co.; 27, H. H. Frost; 28, Columbia Radio Corporation; 29, Electrical Research Lab.; 32, Sterling Mfg. Company; 36, Eisman Magnetic Corp.; 37, Pacent Electric Company; 38 and 39, C. Brandes, Inc.; 40, Willard Storage Battery Company; 41, Premier Electric Company; 42, Howard Radio Company; 43, Colin B. Kennedy Corp.; 44, Zenith Radio Corporation; 45, Burgess Battery Company; 46, Automatic Electrical Devices Company; 47, Radio Digest; 48, Kellogg Switchboard & Supply Company; 49, Jefferson Electric Mfg. Company; 50, Alden Manufacturing Company; 51, Winkler-Reichman Company;

54, Walnart Electric Company; 55 and 56, Atwater-Kent Mfg. Company; 57, Kellogg-Switchboard & Supply Company; 58, Acme Apparatus Company; 59, Jewel Electrical Instrument Company; 60, Thor-darson Electric Mfg. Company; 61, French Battery Company; 62, Chicago Radio Apparatus Company; 63, Federal Telegraph & Telephone Company; 65, Signal Electric Company; 67, Eiseman Magneto Corp.; 69, Commonwealth Edison Company; 71, Carter Radio; 72, Rauland Manufacturing Company; 73, Trimm Radio Mfg. Company; 73A, Bremer-Tully Manufacturing Company; 74, Lynn Radio Company; 75 and 76, F. A. D. Andrea, Inc.; 77, A. H. Grebe & Company; 78L, Crosley Manufacturing Company; 78A, Precision Equipment Company; 79, Harry Alter & Company; 80, United States Mfg. & Distributing Company; 81, Moon Radio Corporation; 82, Cutting-Washington Radio Corp.; 83, Buell Electric Company; 86, The Ekko Company; 87, Radio Age; 91, Cutting-Washington Radio Corp.; 92, Moon Radio Corp.; 107, Neon Lamp Works; 109, Timmons-Talker; 110, Radio World (national radio weekly); 110A, Dalton, Whittier & True; 111, Chicago Daily Journal; 112, H. P. Preis; 125, Radio (San Francisco magazine); 133, Dictograph Products Corp.; 139, David A. Wright Corp.; 141, Radio Topics.

Radio Trade Notes

Migdol Bros., who have just opened a radio hardware store at 116 French Street, New Brunswick, N. J., are in the market for radio merchandise and would like to receive price lists.

* * *

C. H. Stoops, 1205 N Street, N. W., Washington, D. C., is considering opening a radio store in the Middle West and is interested in receiving propositions from dealers and distributors.

* * *

Radio Supply House, 500 16th Street, Moline, Ill., is looking for anything that sells in the radio line and requests wholesale and retail prices on radio sets and parts.

* * *

Wikoff Machine & Repair Co., Hagerstown, Indiana, are considering going into the business of assembling sets and distributing radio apparatus. They would like to hear from manufacturers.

* * *

C. B. Metcalf, Box 227, Essex Junction, Vermont, is starting in the radio business as a retailer and distributor. He wishes to get in touch with manufacturers and wholesalers.

Snappy Work by Hovey of Oklahoma

OUR old friend, O. H. Hovey, the radio dealer of Perry Oklahoma, whose radio activities we have had occasion to commend, has been at it again. One day recently he received a storm warning in the weather reports via radio, saying that a hurricane in the Gulf of Mexico was coming in at an alarming rate. He hustled to a print shop, had hand bills containing the storm warning slapped into type and in 20 minutes had distributed and posted them in prominent places. Hovey is just another word for "hustler."

Court Removes Sonora Receiver

ACTING on a petition of creditors and officials of the Sonora Phonograph Company and the Sonoran, Inc., Federal Judge Garvin, in Brooklyn, N. Y., last week signed an order discharging former Representative John M. Johnstone as receiver of the companies.

New Radio and Electric Firms

Andrea Manufacturing Co., Bronx, New York City, to make radio apparatus, \$25,000; F. A. D. and J. Andrea, R. M. Klein. (Attorneys, Pennie, Davis, Marvin & Edmons, 165 Broadway.)

Thor Electrical Co., New York City, \$20,000; I. J. Lichter, C. G. Widman, S. F. Andrews. (Attorney, E. S. Merrill, 527 5th Av.)

Electrad, New York City, make radio instruments, 100 shares common stock, no par value; T. F. Thornton, I. Skutch, J. P. H. Rieper. (Attorney, F. J. Knorr, Albany.)

Teleradio Engineer Corp., New York City, has increased its capital stock from \$5,000 to \$50,000.

The Moon Radio Corporation, New York City, has increased its capital stock from \$2,000 to \$600,000.

Rochester Battery & Welders Service, Rochester, N. Y., \$10,200; J. A. Regan, C. V. Bryan, F. A. Reineman. (Attorney, M. E. Rigney, Rochester.)

Radio and Electrical Business Opportunities

Rate: 40c a line. Minimum, 3 lines.

AUTOMOBILE labor and gasoline saving automatic devices, useful for motor boats as well; also have electrical motor invention, effecting saving in power consumption; adapted for railroads, electrical vehicles, plants, etc.; approved by engineers; patents applied for; wish to meet responsible party able to finance manufacturing or having sales force and financially able to start manufacturing of either invention; promoters, agents or information seekers need not answer. Box 5, Radio World.

YOUNG technical man has \$2,000 to \$4,000 to invest in good, sound business with services; should yield about \$3,000 a year, Box 11, Radio World.

ELECTRICAL shop and equipment of Leo Altman (deceased), electrical contractor, for sale; established 10 years. 1226 Washington Ave., New York City.

RADIO SHOP, established five years; other business activities force sacrificing half-interest; small cash payment acceptable; lifetime opportunity. Box 13, Radio World.

PARTNER wanted in established radio store, best location, retail and wholesale; wonderful opportunity. Box 14, Radio World.

NEW LINE IN FLASHLIGHTS

"Disc Contact" patent pending; incorporated in universal tool handle for motorists and mechanics, illuminates work, leaves one hand free; adapted to razor handle, illuminates face without interference; invaluable to campers and travelers; perfect model, practically tested; need capital manufacture and market. Box 15, Radio World.

FINANCIAL backing for meritorious invention with broad patent protection; this is not a promotion scheme; there are no retainer charges or advance fees, but we will finance, develop and produce several inventions that meet with our requirements. In reply give brief description and where can be seen. Will call in person to investigate. Engineer, Box 16, Radio World.

MECHANICAL and electro-mechanical work solicited; special machinery completely constructed; light assembling on contract; inventions patented, developed and financed. Leo F. Robertson, Inc., 540 West 22nd St., New York City.

FOR SALE—Established, profitable radio business; well advertised and prominently located; must sell due to other interests. Box 17, Radio World.

Additional Phone Service for Radio World

Due to increase in business activities, it has been found necessary to install two telephone trunk lines in the office of RADIO WORLD. These two trunk line numbers are Lackawanna 2063 and Lackawanna 6976. If one is busy, try the other.

Radio Merchandising

Advertising Rates: Display, \$5.00 an inch, \$150.00 a page. Classified Quick-Action Advertising, 5 cents a word. Phones: Lackawanna 6976 & 2063

Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

Horace Humm, 119 West Bridge St., Elyria, Ohio. (Distributor and retailer.)
 L. A. Knise, 215 Grand St., Susquehanna, Pa.
 Leo V. Barnaby, 257 Chandler St., Worcester, Mass.
 J. D. Henderson, Carmongay, Alberta, Canada. (Retailer.)
 L. T. Neddow, 2 Franklin St., Springfield, Vermont.
 J. Hall, 112 Passaic St., Trenton, N. J.
 Harold Petric, Roulette, Potter Co., Pa.
 C. B. Metcalf, Box 227, Essex Junction, Vermont.
 Ralph T. Hndnut, 1117 Park Place, Brooklyn, N. Y.
 H. R. Schofield, Woodbine, Iowa. (Can place several sets.)
 R. R. Lakin, Box 894, Ord, Nebraska.
 Clifford R. Dallas, R. R. 2, Muscatine, Iowa.
 Robert W. Allan, R. 2, Box 42, Okmulgee, Oklahoma.
 J. W. Aiken, North Troy, Vermont.
 Clifford Perkins, 9 North St., Auburn, N. Y.
 Campbell Electric Co., Palestine, Texas.
 B. M. Burtchaell, 566 25th Ave., San Francisco, Calif. (Interested in receivers tuning up to 600-800 meters.)
 Ronald Ransier, Akron, N. Y.
 A. W. Giles, McKeesport, Pa.
 Migdol Bros., 116 French St., New Brunswick, N. J.
 C. H. Stoops, 1205 N St., N. W., Washington, D. C.
 Radio Supply House, 500 16th St., Moline, Ill.
 H. E. Howard, Summitville, Ind.

Valley Electric Co. Adds to Its Staff

THE appointment of E. W. Martin as Chicago district manager has just been announced by the Valley Electric Company, St. Louis manufacturers of Valley radio battery chargers and other electrical products.

Mr. Martin comes to the Valley organization from the Westinghouse Electric & Manufacturing Company with which he has been associated for a number of years in various capacities.

The appointment of C. L. Krentz to the sales department of the Chicago office is also announced by the Valley Electric Company.

Coming Events

BOSTON RADIO EXPOSITION, December 3-8, Boston, Mass.

NATIONAL RADIO WEEK, November 25 to December 1, 1923.

SECOND ANNUAL RADIO SHOW, Los Angeles, Calif., February, 1924.

SECOND ANNUAL RADIO SHOW, Coliseum, Chicago, November 20-25.

MERRIMAC VALLEY RADIO SHOW, Lawrence, Mass., November 8, 9 and 10, under the auspices of the Lawrence Radio Club. For particulars address J. C. Dowd, 353 Essex Street, Lawrence, Mass.

Radio Also Affects the Motion Picture Industry

THERE have been big doings in the motion picture field during the past fortnight. The Famous Players-Lasky Corporation, the most important concern in the picture business, has decided to shut down on all producing activities until the opening of 1924. Other important concerns threaten to do likewise. The claim is made that the cost of production has gone up to such tremendous figures that a plan of retrenchment must be adopted immediately.

As a matter of plain fact, the trouble is due not so much to the cost of production as to the drop off in the attendance at thousands of motion picture theatres throughout the country. This diffidence on the part of the public is declared by theatre owners to be due to the fact that, in order to get certain good pictures, they must take a lot of bad ones, and that their patrons refuse to patronize the poorer photoplays. Added

to this there is the very obvious fact that radio has affected the motion picture patronage exactly as it has affected the sales of phonographs.

It is a perfectly well known fact that, from now until next June, millions of potential theatregoers will spend their evenings with their radio sets. This may not be a pleasant reflection for the picture people, but it is foolish for them to combat the truth. At least three or four managers have taken the bull by the horns and, instead of fighting radio, have linked up their activities with the new science entertainment, and in this way get some advertising in the hope that this will increase business at the box office.

The sooner the world at large understands that radio is here to stay, and that it is better to make use of it instead of fighting it, the better it will be for everybody.

Radio at Its Best During National Radio Week, Nov. 25—Dec. 1

RADIO development takes its place as the marvel of all ages. Practically undreamed of but a few years ago, today millions know its joys.

Radio has become the greatest national home amusement and pastime. No town, village or hamlet is too small or too far away to have its many radio enthusiasts.

Thousands of those tied down to home duties who cannot otherwise know the joys and thrills of masterful musical productions now have the world's artists brought to their own firesides.

In the sports field, radio has again made life more cheerful. The best of sports can only have limited audiences but with the broadcasting of every event of importance the limits have been put away—

everybody and anybody can follow the sports with a radio set.

In time of national danger, fire, flood or other of Nature's disasters, the value of radio is indisputable.

No home is complete without its radio equipment. Every broadcasting station is planning on the finest program ever produced, for National Radio Week, following this general outline: Sunday, November 25, Religious Programs; Monday, November 26, Radio and the Stage; Tuesday, November 27, Government Day, Afternoon for Children; Wednesday, November 28, Radio and Music; Thursday, November 29, Thanksgiving Day, Sports; Friday, November 30, Education Day; Saturday, December 1, Radio in the Home.

Government Commercial and Amateur Lists Ready

COPIES of the government's lists of amateur stations as of June 30, 1923, and the commercial governmental and special station lists as of the same date are now available at the Government Printing Office, through the Superintendent of Public Documents.

A total of 5,397 stations is listed in the commercial pamphlet comprising 2,723 commercial ship, 1,009 government ship, 290 government land, 12 trans-oceanic, 45 general public, 179 point to point, 261 experimental, 127 technical and training, 178 special amateur and 573 broadcasting stations. Be-

sides the calls, ownership, power, wave length and frequencies of these stations, the publication includes considerable valuable data on radio compass stations, the International Morse alphabet with abbreviations, and the initial letters assigned to each government for use as calls by the International Radio Bureau. This booklet is sold by the Superintendent of Documents for 15 cents.

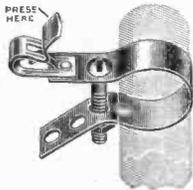
The amateur list includes 16,570 stations licensed to amateurs with their calls, locations and names of owners. It is sold for 25 cents a copy.

Put Your Shoulder to the Wheel for the Success of
 National Radio Week, November 25 to December 1, 1923

PATENTS
 promptly procured. Trade
 Marks designed & registered
 INVENTION RE-
FREE CORDING BLANK
 Phone Vanderbilt 7212

FREE MANUFACTURERS
BOOK PATENT CO. INC
 520 FIFTH AVE.
 NEW YORK

IMPROVED GROUND CLAMP



Equipped
 with
 Fahnestock
 Patent
 Wire
 Connectors
 Easily
 Attached

No Soldering—For Radio Use Only

AT YOUR DEALERS

FAHNESTOCK ELEC. CO.

Long Island City, N. Y.



IT HAS HAPPENED TO
 ALL OF YOU IN A FRAC-
 TION OF A SECOND!

WHEN the filament burns
 out, at least \$5.00 goes with
 it to put the set in operation
 again.

WHY not save nearly one-
 half the cost of a new tube
 by sending us your burned out
 or broken tube to be repaired?

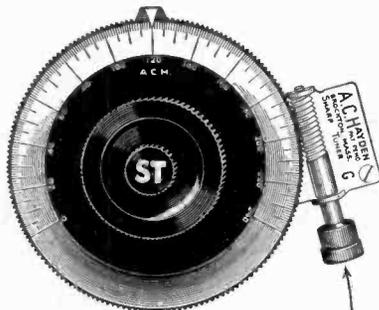
WE REPAIR EVERY TYPE
 OF tungsten wire filament re-
 ceiving tube. All our tubes
 are TESTED and GUARAN-
 TEED to function as well as
 when new. All tubes returned
 P. P. C. O. D.

**HARVARD RADIO
 LABORATORIES**

P. O. Box 1781

BOSTON MASS.

**USE A C H SHARP
 TUNER DIALS**



Why the A.C.H. is different

3 in. DIAL

156-10-1

4 in. DIAL

215-10-1

Rough tuning with dial or one thousandth of an
 inch in either direction.

MONEY BACK GUARANTEE

Price ACH 3" Dial Complete.....\$2.50

Price ACH 4" Dial Complete.....\$5.00

Regular fitting 5-16" hole, 1/4" and 3-16",
 Bushings, 5c. each extra. 10c. for all.

"Have bought 3 A.C.H. Dials, send 4" dials.
 Vernier Condenser unreliable."
 Hugh G. Ball, Hood River, Oregon.

"Enclose \$10 for more A.C.H. Dials. Am creat-
 ing interest among my friends."
 R. C. Hettler, Pittsburgh, Pa.

To retain your good will you must be satisfied
 or money back.

The ACH will improve any set.

Send for circular No. 3 on RV Loud Talker and
 Detector Set. A truly wonderful set.

All ready for you to put together.

A. G. HAYDEN RADIO & RESEARCH CO.

Brockton, Mass., U. S. A.

Mall Orders sent prepaid in U. S. A.

**Roosevelt and Navy Day
 Celebrations Widely
 Broadcast**

WITH impressive ceremonies Roose-
 velt House, the restored birthplace
 of Col. Theodore Roosevelt at 28 East
 Twentieth Street, New York City, was
 dedicated on October 27. This also was
 the date set for the celebration of Navy
 Day. The two events naturally carried a
 wide appeal to all Americans and there-
 fore the broadcasting stations had a great
 opportunity to demonstrate their ability
 to reach the entire country at one instant.

Stations WEAF, New York, and WCAP,
 Washington, D. C., of the Bell telephone
 system were hooked up by land lines.
 From these were broadcast speeches by
 notables and musical selections played
 by the Navy Band of the Brooklyn Navy
 Yard. Among the speakers was Captain
 Belknap, commanding officer of the newly
 commissioned battleship. "Colorado," one
 of the most powerful afloat.

Station WJZ, New York, of the Radio
 Corporation of America, broadcast ad-
 dresses by Mr. Hayes, a former secretary
 to Col. Roosevelt; Chief City Magistrate
 McAdoo, of New York City, Assistant
 Secretary of the Navy under President
 Cleveland; Senator Wm. M. Calder, of
 New York City, and Major General
 James G. Harbord, president of the Radio
 Corporation of America. The band of the
 U. S. S. "Colorado" played between the
 addresses.

In all, thirteen broadcasting stations
 across the country took part in the cele-
 brations. Beside the music of many bands
 the addresses of twenty-two prominent
 men were broadcast. All the people in the
 United States who had, or had access to,
 receiving sets had the opportunity of
 listening-in to these interesting cere-
 monies.

**Canada Plans Radio
 Beacon**

THE Canadian Government is about to
 install a powerful direction-finding
 wireless station at Pachena, on the west
 coast of Vancouver Island, British Colum-
 bia, to protect ships of all nations entering
 the Straits of Juan de Fuca en route to
 American and Canadian ports. Numerous
 shipwrecks have occurred in this district,
 and it is expected that the new radio
 beacon will enable vessels to determine
 their exact positions in foggy weather,
 avoiding many dangerous reefs there-
 abouts.

**For Clear and Loud Reception
 INSIST ON
 Defiance Mica Condensers**



Whose Quality is Guaranteed.

Made in the full capacity. Mail orders filled.
 .001 25c. .0085 20c.
 .002 30c. .0025 20c.
 .0005, .00025, made with 1/2, 1 and 2
 Megs G. L. 25c.



SHAMROCK CRYSTALS

Three in one. Galena, silicon
 and iron pyrites sold under a replace-
 ment guarantee. All tested,
 Price 50c each

SINGLE CRYSTALS
 Best Tested and Guaranteed

Defiance GALENA 25c
 Defiance SILICON 25c
 Defiance IRON PYRITES 30c

All individually mounted and boxed. Special
 quotations on 1000 quantities.
 All goods shipped C. O. D. or cash with order.
 Dealers write for discounts.

DEFIANCE LABORATORY

65-67 West Broadway New York City

SEND NO MONEY **Guaranteed!** **Money back if they do not satisfy after 5 DAYS TRIAL**

ORDER \$3.98

SEND no money! Order by postcard and pay postman on arrival. If they do not excel any other phones you ever used regardless of price, return them and your money will be refunded at once.

AMBASSADOR
LONG RANGE PHONES

TOWER MFG. CORP., 98 BROOKLINE AVE., BOSTON, MASS., DEPT. A

HAVE YOU SEARCHED FOR

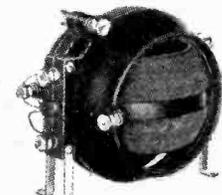
- Aerola Sr. Style Tuner Unit 150-600 Meters
 - Hi-Power Transformer with Split Tapped Winding
 - Neutralizing & Tuned R. F. Cir. Transformers
 - Reinartz Coils "New Static reducing winding"
 - Resonance Wave Coils for Static elimination
 - Wavemeter & Wave Trap combined 150-600 meter
 - Edison (Signal Corps) Batteries & Elements
 - New "Handy" Chargers for any voltage battery
 - 30 Henry Power Amplifier Chokes with 4 values
 - Hi-Power Transformer with variable ratio
 - "B" Bat. Protectors—Prevent filament burn out
 - "B" Battery Voltmeters 0-50 Volts
 - Nathaniel Baldwin New Loud Speakers & Phones
 - 200-300-400-600-800 Ohm Potentiometers
 - 6-10-30-50 Ohm & "Universal" Rheostats
 - Rheostat & Potentiom. Resistance Windings
 - Bishop "Phantom Super" Tuner Units
 - Variable Condenser Plate Cleaner
 - Liquid Copper for Shielding panels
 - Quality Precision Var. Grid Leak 0-10 Meg's
 - Resin Core Solder (Never use acid or paste)
 - Hi-Quality Mica Fixed Condensers, best made
 - Outfits of parts for any circuit you desire
- SEND FOR NEW DEALERS' LIST**
QUALITY RADIO SHOP, Richmond, Ind.

**It Costs You No More
 to Buy**

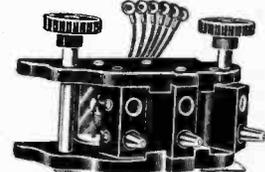
**Columbia Bakelite
 Moulded Apparatus**

The All-Circuit Variometer

The Columbia Variometer is fully bake-
 lite moulded, green silk, pigtailed, and pro-
 vides for all circuits of today and tomor-
 row; the stators may be split. You can-
 not obtain a finer tuning variometer. Body
 capacity minimized. Regenerative, Ultra-
 Audion, Flewelling, Reinartz and Reflex
 Circuits all provided for. Diagrams with
 each instrument.



Type C109A, Price.....\$5.50



The Geared Coil Mounting you have
 been looking for. Moulded of genuine
 bakelite; geared 5 to 1 reduction; 6 inch
 silk leads. A True Columbia Product.

Type C401, Price\$5.00

- A Few More Columbia Products:**
- Bakelite Moulded Variocoupler, Type C120 \$8.00
 - Bakelite 180° Variocoupler, Type C195 8.00
 - Bakelite 3 Coil Geared Mounting, Type C401 8.00
 - Bakelite 2 Coil Geared Mounting, Type C402 8.00
 - Inside Coil Mount Geared and "Vernier"
 Type C403 6.00
 - Coil Plugs50
 - All Meter 180° Couplers 7.00
- and complete line of mounted coils.

All good dealers have Columbia Products.
 Insist on them.

Columbia Radio Corp.
 155 N. Union St. Chicago

Radio Brings Broadway to Stars of Yesterday

ANOTHER group of people to whom a radio is providing a boon and a delight has been discovered. They are those actors and actresses who were favorites of the past generation of theatre-goers and who now enjoy the vicarious thrill of listening to the applause given to those who have taken their places on the boards. S. L. Rothafel, who puts the Capitol Theatre, New York City, on the air every Sunday night, has received the following round-robin from the Actors' Fund Home. It is signed by a score of some of the most famous stars of their time.

"Your Sunday night concerts have been so thoroughly enjoyed by the guests of the Actors' Fund Home that they unite in requesting me to register their appreciation and thanks, which I can hardly make strong enough on paper. The magnificent work of your orchestra in the theatre 'first part' and the storms of applause (so dear to the veteran) that follow it are the acme of delight. The studio concert of splendid variety and excellence, combined with your neighborly chat, round out a Sunday evening of unalloyed pleasure. Therefore, as an earnest of their gratitude, and with best wishes for you and your enterprise, they append their individual signatures.

"J. Sullivan, John Hyst, Lorette Bernard, May Preston, Fred R. Runnells, Isabelle Adams, W. N. Hammett, William Payne, Virginie Buchanan, Tom Callahan, Hudson Leston, John E. Dudley, Blanch Plunkett, Lizzie Hudson Collier, Charles W. King, Minnie Stephens, E. A. Docke, Mr. and Mrs. Jack Cheviot, Mrs. Frank G. Cotter, Mrs. James Halfpenny, Ben Graham, F. J. McCarthy, Jennie Christie Miller."

Radio Is a Public Utility

Is radio here to stay or is it just a passing craze? That is the question one hears on every side at the present moment, writes Jack Binns, radio editor of the New York Tribune.

Before passing final judgment on the question let us analyze the situation carefully. In the first place, radio is not an overnight production of mushroom growth. It is only the public interest that is new.

The present apparatus of standard worth is the result of twenty-four years' persistent research and experience. It has been produced by slow, steady and oftentimes painful progress, and it has withstood the test of time purely on merit.

In my opinion, radio broadcasting is a public utility. As such it is not only here to stay, but it will form one of the most important necessities of daily life. It will not supplant any of our existing forms of entertainment, but will supplement them in a manner undreamed of two years ago.

Rapid communication is a most important element in cementing a people and building up a country. Radio is ideal, and the most efficient and cheapest method yet devised.

RADIO FANS

Tune in on station
WEAF (New York)

every Thursday at 8.50 P. M. and listen to a story or article selected from

HEARST'S
INTERNATIONAL

This is one of the most popular weekly features "on the air"

FREE

Write for Free Copy of the Latest Radio Reprint E. It contains a complete story from Hearst's International Magazine. Address Radio Editor, Hearst's International Magazine, 119 West 40th Street, New York City.



Announcing

"The Latest Creation in Radio"

The

"SUPERTRAN"

F. M. C. Audio
Frequency Transformer

Has no equal on the market for

**EFFICIENCY
QUALITY
PRICE**

Report of laboratory test made by the well-known New York Radio Engineer and Inventor, LESTER L. JONES, sent upon request.

Jobbers, Dealers and Manufacturers write for our proposition and prices.

Manufactured by

FORD MICA CO., Inc.

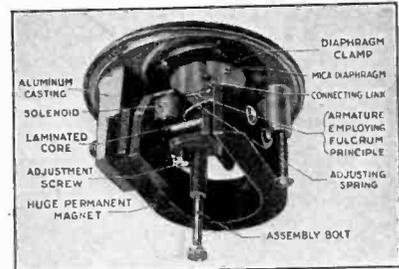
14 Christopher Street New York City, N. Y.

THE TRINITY LOUD SPEAKER



TYPE "A1"
**21" FIBER
HORN**
\$25.00

TYPE "B"
(For Phonographs)
\$12.50



INTERIOR CONSTRUCTION

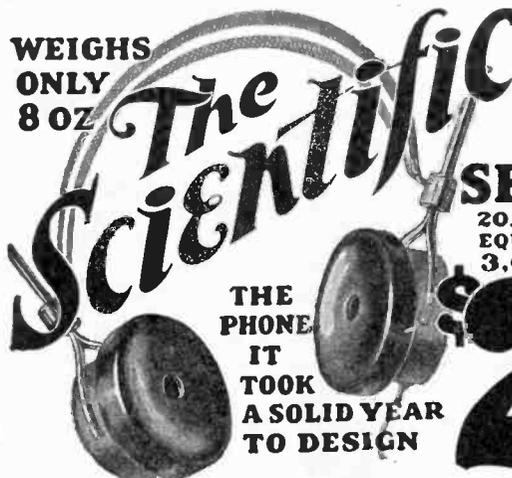
An ear phone is an ear phone no matter how fancy the horn that covers it may be, and, due to the delicate construction of an ear phone it is utterly incapable of giving true tone reproduction, especially, when relatively large currents are passed thru its coils, such as the output of a two-stage or power amplifier.

The Trinity Loud Speaker element embodies the well-proven and tested principles of the phonograph reproducer with the soundest principles of electromagnetic design best adapted for loud speaker operation. It is not an ear phone when placed on a head band and a loud speaker when covered with a horn. It is a sturdy loud-speaking element ALWAYS.

Send for Literature.

TRINITY RADIO CORPORATION

446 TREMONT STREET, BOSTON, MASS.



**WEIGHS
ONLY
8 OZ**

**A \$200,000.00 COMPANY
stands squarely back
of the guarantee on
every Scientific headset**

SEND NO MONEY!

**20,000 TURNS
EQUIVALENT TO
3,000 OHMS**

**Order TODAY
by Postcard**

**THE
PHONE
IT
TOOK
A SOLID YEAR
TO DESIGN**

\$2.95
POST-PAID

**and Pay
Postman
on arrival**

**LOUD
SPEAKER
UNIT \$1.95**

We Guarantee The Scientific Headset to be the greatest value on the market. Try it for five days. If not satisfactory send it back and your money will be refunded immediately. Circular on request. Dealers wanted.

THE SCIENTIFIC ELECTRIC WORKS
98 Brookline Ave. BOSTON, MASS.

DO YOU WANT TO BUY, SELL OR EXCHANGE RADIO OR OTHER GOODS? TRY THIS DEPARTMENT AT 5c A WORD

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

A REAL LONG DISTANCE GETTER!—The Kond.-Koil Tuner Special (Variable Condenser and tuner on one mounting). Tuner and Special Circuit for \$3.00. KAUFMAN RADIO CO., 4209 12th Avenue, Brooklyn, N. Y.

EDGEWISE WOUND COPPER RIBBON—3/16x1/16x6 inches, 15 cents turn; 3/16x1/16x5 inches, 12 cents turn. Remler Giblin and De Forest coils mounted, half list price. De Veaux Jacks, 35, 40 and 50 cents each. Super Geared Vernier, 3 plate condensers, \$1.25, list \$3.00. GEO. SCHULTZ, Calumet, Mich.

BUILD A QUALITY VACUUM TUBE AT HOME—\$7.98. Postage 20c. Ultra-audion circuit. Parts furnished with drilled panel ready to mount. **DIAGRAM AND INSTRUCTIONS INCLUDED.** Phones and tube extra. A. L. DUNN CO., 2 Betts Place, South Norwalk, Conn.

HYPNOTISM, MESMERISM, ASTOUNDS, controls others, wants gratified, mind reading (any distance), wonderful illustrated Book of 205 pages \$1.00 postpaid. R. W. COLLINS CO., 197 Fulton Street, Brooklyn, N. Y.

BUILD yourself a Storage "B" Battery from Edison elements that will last you a life time. Complete units for making 100 volt 1500 milliamperes battery, consisting of a cabinet, switch, elements, glass tubes, separators, nickle wire, electrolyte and blue print for assembly, \$12.50. Assembled battery, \$17.50. Drilled elements, 6c a pair; glass tubes, 2c each; separators, 1c each; nickle wire, 1c each; rubber covered wire, 2c foot. W. Roberts Storage "B" Battery, 41 Jefferson St., Brooklyn, N. Y.

MAGNAVOX R3 or M1—Latest nationally advertised reproducers. List, \$35. Introductory, \$25. The factory sealed carton is your guarantee. RADIO CENTRAL, Dept. W., Abilene, Kans.

CLOSING OUT my large stock of radio apparatus at less than cost. Send for complete list. It'll save you money. N. E. RISTEY, Spring Grove, Minn.

100% INCREASE IN TONE—I doubled the tone of my set and now get far-away stations loud and clear, at an expense of less than a \$1 for material. Drop postal for particulars. RADIO-FAN, 202 N. Grant, Columbus, O.

RADIO FANS!—Demand broadcasters to program these two songs—"RADIO" (Ballad), "RADIO BLUES." Copies 25c each. Special prices new music on request. MORAN MUSIC PUB. CO., 1306 Vigo, Vincennes, Ind.

LONESOME? Make new friends. Write Dolly Gray Agency, Box 186B, Denver, Colorado.

PATENTS—SEND DRAWING OR MODEL FOR EXAMINATION AND OPINION. Booklet free. Watson E. Coleman, Patent Lawyer, 624 F Street, Washington, D. C.

GENUINE EDISON ELEMENTS (new) for making "B" Batteries. Obtained from U. S. Government. A positive and negative element—6c; glass tube—3c; all other parts at reasonable prices. Postage, etc., 50c. extra per order. Free instructions. TODD ELECTRIC COMPANY, 103 West 23rd Street, New York.

SPIDER-WEB INDUCTANCES wound with double covered green silk wire and void of all compounds. Type C for Reinartz circuit, \$1.50. Type D for modified Reinartz circuit, \$1.25. Type M wave trap filter coil, \$1.25. Directions free with all coils. NOLTE MFG. CO., 61 Gautier Ave., Jersey City, N. J.

FIFTY assorted flathead solid brass machine screws, nuts, washers, copper lugs—50c. Eight initialed binding posts set—60c. Twelve nickle binding posts—50c. All three items—\$1.50. RADIO LIST for stamp. All prepaid. Stamps accepted. Kladag Radio Laboratories, Kent, Ohio.

BROADCASTERS APPRECIATE THANKS. "Radio Applause Cards" make this convenient. Just mark ballot style, address and mail. 20 for 25c; 50 for 60c; 100 for \$1.00, postpaid. Stamps not accepted. ERNEST F. DOW, West Newton, Mass.

WOULD YOU LIKE TO RECEIVE RADIO LITERATURE? Are you in the market for radio goods of any kind, either as a consumer, a distributor or a retailer? If so, send us your name and address on a post card and we will see that your name reaches the right people so that you will receive pamphlets, circulars, etc., regarding the goods you want. Address SERVICE EDITOR, RADIO WORLD, 1493 Broadway, New York City.

EXCHANGE JOLLY, INTERESTING LETTERS THROUGH OUR CLUB. Betty Lee, Inc., 4254 Broadway, New York City. Stamp appreciated.

COMING!

The Most Important Number of the Year

RADIO WORLD'S Holiday Gifts Number

DATED DECEMBER 1st

Last Advertising Form Closes November 22nd

A GREAT advertising issue especially designed to help to make both the radio and the non-radio public purchase radio goods for holiday gifts.

Extra circulation—no advance in advertising rates. Prices for cover and other special position quoted on request.

Copy received by November 19 for quarter page space or more will be printed in two colors without extra cost upon request.

Radio World's HOLIDAY GIFTS NUMBER will have a list of distinguished con-

tributors and will be larger and better than ever, and will have an especially large sale, as there will be no increase in the price per copy.

Radio World dated November 24 will be the RADIO WEEK NUMBER. This will not be a special number but will be a particularly good advertising medium as it will be published at a time when the whole country will be intensely interested in radio.

For special positions in these numbers address

ADVERTISING MANAGER
RADIO WORLD

1493 BROADWAY,

NEW YORK CITY

Phones: Lackawanna 2063
6976

**Federal Standard
Radio Products**

Standard of the Radio World, 130 separate units, each fully Guaranteed.
Write for Catalog.

Federal Telephone and Telegraph Co.
BUFFALO, N. Y.

BRISTOL AUDIOPHONE
MORE THAN A LOUD SPEAKER

Bristol Audiophone, Sr., 15-in. Horn...\$32.50
Bristol Audiophone, Jr., 11-in. Horn...\$25.50
Bristol Single Stage Power Amplifier...\$25.00
Write for Bulletin 3006-W

The Bristol Company
Waterbury, Conn.

STOP—LOOK—LISTEN

C. White's "Super-Amplifier" completely assembled with two UV-201A tubes...\$38.00
A real Push-Pull Amplifier bargain.
Write NOW

COREY HILL BATTERY CO.
1354 Commonwealth Ave. Boston 34, Mass.

For Maximum Amplification Without
Distortion and Tube Noise
use the well known

Como Duplex Transformers

Send for literature

COMO APPARATUS COMPANY
446 Tremont St. Boston, Mass.

IT'S A FRAME-UP

WAIT FOR THE EXPOSURE

Quinby Radio Construction Co.

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PANELS BLACK AND MAHOGANITE
DIALS—KNOBS

20 Stock Size Panels and Also
CUT TO ANY SIZE

"Radion" Tubing: 2", 2½", 3", 3¼", 3½", 4", 5"
Cut to Any Length
Special Parts Experimental Work
Made to Order

N. Y. Hard Rubber Turning Co.
212 CENTRE STREET NEW YORK
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Cockaday Coil Set \$2.50

Including full size blue prints of panel layout, complete picture hookup, and fully illustrated instructions for construction and operation.
Coils are fully assembled, made exactly as specified by Mr. Cockaday, D coil bank wound. Far more efficient than any home made coils.

Standard parts for this sensational circuit—panel, coils, condensers, verniers, variable resistances, vernier rheostat, socket, double jack, dial, switch, contact points, posts, busbar, wire, spagbraid, etc. (no tubes or phones).

Complete for \$11.65
Postage additional on all shipments.
Send no Money. **PAY THE POSTMAN.**
All Goods Shipped Parcel Post C. O. D.

RADIO SURPLUS STORES
HELENA, MONTANA

FOR DX FANS!

Now is the time to rebuild your set. Use the standard circuits that have proved themselves by their past performances. If you are in doubt as to just which one you want, you can find the Armstrong, Flewelling, Reinartz, Hazeltine, Cockaday, Grimes, and many others in our special issue of Oct. 6, 1923. Other features of interest in this number. Send 15c now, or better still, start your year's subscription with that number and be assured of 53 crackin' good issues delivered right to your door.

RADIO WORLD, 1493 Broadway, New York City

Shorthand by Radio

SCARCELY a week goes by without new uses of radio. Increasing the speed in taking shorthand dictation is the latest. Already it has proved practical, and its possibilities are interesting stenographers and public schools and commercial colleges throughout the country.

A popular shorthand publication has directed the attention of radio-fan stenographers to the daily—and nightly—opportunity to transcribe in shorthand the great variety of material which comes over the radio and thereby improve the accuracy of their work and increase their speed. Hundreds of student stenographers quickly tried it out with good results, and even larger numbers of shorthand writers who have finished school and taken positions have found it a means to keep up with their shorthand practice.

"Nobody need get rusty who has a radio," one stenographer wrote, "nor fail to get promoted to a better job for lack of practice."

The fact that so much of the radio broadcasting is in the evening may make radio a sort of nation-wide night school.

One of the advantages of practice in writing the material which comes by radio is the variety of subject matter—sermons, news reports, educational talks, business reports, travelogues, lectures, book reviews—and the many different styles of delivery of radio speakers. And the opportunities are open to shorthand writers in the most secluded hamlet or on the remotest farm provided they have satisfactory receiving sets.

As to the use of radio by public schools and business colleges, the New York City Board of Education recently gave an interesting demonstration. In co-operation with Station WJZ and the Gregg Publishing Company, the board held the world's first radio shorthand contest. Provided with receiving sets, pupils in the shorthand classes in several important high schools took dictation from the radio at 80 words a minute and 100 words a minute. Prizes were awarded to the students who transcribed the dictation most accurately. The Bushwick High School in Brooklyn won first honors in the contest.

The contest had an important additional result in demonstrating the necessity of good receiving apparatus both for school work of this kind and for good results by outside stenographers utilizing radio for shorthand practice.

For all such tests and for general use in this new field, reliable apparatus is essential. Not one of the winged words must be missed, and every sound must be clear and undistorted. The blurring of "S" and "th" would spoil accurate transcription. Stenographers interested in utilizing radio in this way should take special care to have sets with good amplifying transformers so that they get adequate amplification, and amplification without distortion.

**Actors Want Pay for
Broadcasting**

THE Actors' Equity Association will demand that all members be paid for an extra performance when asked to broadcast a play in which they may be appearing, Frank Gillmore, executive secretary of the organization, ruled last week when statements regarding the refusal of the members of the "Thank You" company to play for the radio on Sunday night was brought to his attention. Dispatches from Boston stated that arrangements had been completed by the Shepherd Stores in the Hub for the play to be given over Station WNAC, but that at the last minute the company refused, saying that they had been instructed from Equity headquarters to demand one-eighth of their salary for the performance.

**RADIO CONSTRUCTOR plans
make set building EASY!**

Book of
7 Complete Plans 50c

Reinartz Tuner
One Tube Reflex
Honeycomb Receiver
Long Distance Receiver
Short Wave Regenerative
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WD-11 Hookup.

FULL SIZE TEMPLATES
list of parts, diagrams, and directions
Any One Plan 25c

Beware of Imitations. Genuine published only by S. NEWMAN, and enclosed in glassine envelopes.

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THE RADIO CONSTRUCTOR

74 Dey Street, New York

SELECTO, Jr.

180° Variocoupler
Greatest Selectivity
200-600 Meters

The Rotor is mounted without the use of any mass of dielectric resulting in minimum losses with consequent selectivity and sharp tuning.

Requires only 2½" of panel width, about one half as much as most couplers, and is ideal for the portable set.

Absolutely guaranteed, which means that if not perfectly satisfactory, your money will be returned without question.

Price \$3.00 net

If your dealer cannot supply you, remit P. O. or Express Money Order and sample will be sent prepaid.

J. E. TAYLOR
202 N. Calvert St. Baltimore, Md.

**THE BULL DOG
AERIAL MAST SEAT**



Any one, with home tools, can install a firm and rigid aerial mast on any kind of roof.

Made in two types: Hinged sides with holder for "lead in" support. Also plain peaked, without hinged sides and "lead in" support.

For 1½" mast, hinged type	.....	\$3.00
For 1½" mast, peaked type, plain	.....	2.50
For 1" mast, peaked type, plain	.....	2.00
For 1½" mast, flat base type	.....	2.50

Check, Money Order or Bank Draft
MAST SEAT MFG. CO.
119 5th Street S. E., Minneapolis, Minn.
Jobbers and distributors write for discounts.

For best reception you need

The Goodman



The niftiest short wave tuner on the market. Great for present broadcasts, local and DX. Used in all parts of the world. Certificates of merit from testing laboratories. Pamphlet on request.

L. W. GOODMAN, Mfr., Drexel Hill, Pa.

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New York Prices Direct to You
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SECOND
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CHICAGO RADIO SHOW

INTERNATIONAL
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COLISEUM
NOVEMBER
20th to 25th

TUESDAY to SUNDAY
Inclusive

The World's Greatest
Exposition of

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and Associated Industries and
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Have You Considered It?

WIRE OR WRITE

OFFICE: 127 NORTH
DEARBORN ST.

Telephone—State 4161

H. J. Herrmann, James F. Kerr,
Managing Director Manager

OUT OF THE ETHER

Chats About Broadcasting Stations

By Hirsch M. Kaplan

Station WTAM of the Willard Storage Battery Co., at Cleveland, Ohio, came through with a splendid classical program rendered by their own orchestra. It seems to be all the rage of the broadcasting stations to have their own orchestra. It's not a bad idea, at that, and let us hope all stations adopt this plan in the near future.

KDKA sprung a surprise on us, much to our delight, when she came through with a blow by blow description of the clash between Harry Greb and Joe Bogash, for the middleweight championship of the world.

B. C. L.s, have you noticed the part that Fred Whitehouse takes on the programs of the local stations of New York City? First we hear him through WHN, then from WAAM, followed by an engagement at WBS, and then he travels the circuit all over again. Hope you keep it up, Freddie.

Good stuff, Hector Smith. Remedy that slight quaver in your voice and you will be a coming Alma Gluck. Miss Smith rendered her program from Station WJAR.

The famous WGY Stock Players came through with another one of their splendid offerings. This was the fiery, dashing Broadway hit, "The Hottentot," a farce comedy in four acts.

Miss Vogt, at Station WOC, played for us a number of selections on the organ which was greatly appreciated.

Folks who listened in the other afternoon surely were informed of the fact that the football season is now going on full blast. For, whatever station they tuned in, they were bound to hear the broadcasting of a football clash. Much to our surprise we tuned in our long lost friend Station WPAB, of the Penn State College, which is being operated on a wave length of 360 meters.

Miss Vaughn De Leath's Melody Makers at Station WDT helped us to pass a pleasant hour by offering a popular program.

WGR must make it a feature of their station to broadcast dinners or the like, for we again tuned them in and this time they were broadcasting the dinner given by the Buffalo Real Estate Board. Nevertheless, programs of this sort are eagerly sort for as we are sure to listen to ad-

(Concluded on next page)

WD-11 and WD-12

TUBES REPAIRED

WD-11 or WD-12	\$3.50
C-300 or UV-200	2.75
C-301 or UV-201	3.00
C-302 or UV-202	3.50
C-301A or UV-201A	3.50
DV-6 or DV-6A	3.00
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All tubes guaranteed to work like new.

Mail Orders Given Prompt Attention
"24 Hour Service"

RADIO TUBE CORP.

70 Halsey Street Newark, N. J.
TUBES SENT PARCEL POST, C. O. D.



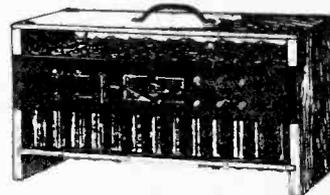
Improved Cockaday Circuit

By eliminating Electro Static effects between Tubes non-magnetic

Patent "VAC-SHIELDS" Pending

Prevent Interstage Coupling. Make it easy to tune in DX. Your set should have them. By Mail Post Paid direct from our Laboratories. 75c. three for \$2.00.

ORANGE RESEARCH LABORATORIES
41 North 16th East Orange, N. J.



Rechargeable Storage "B" Battery

Build Yourself a Rechargeable Storage "B" Battery From Edison Elements That Will Last You a Lifetime!

Complete units for making a 100 volts, 1500 Milliamperes battery consisting of cabinet, switch, elements, glass tubes, separators, wire, electrolyte and blueprints for assembling, \$12.50. Battery assembled and charged, \$17.50. 140 Volt Battery, \$23.50. Drilled elements, 6c. per pair; glass tubes, 2c. each; separators, 1c. each; nickel wire, 1c. per length; rubber covered switch wire, 2c. per foot. Mail Orders Filled.

W. ROBERTS STORAGE "B" BAT. CO.
41 JEFFERSON STREET BROOKLYN, N. Y.
Near Broadway and Myrtle Avenue
Tel. Pulaski 2023

ACKERMAN RADIO LOUD SPEAKER

Complete, Ready for Immediate Use **\$9.50** Delivered to Any Part of the United States.



For the price of a headset you can have a loud speaker that actually speaks for itself. Not alone that, but a loud speaker superior to many of the much higher priced ones now on the market.

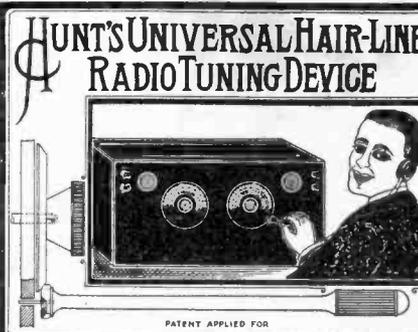
Standing 21" high, with 11" bell and made of heavy metal, eliminating vibration, together with its special loud speaking unit, this speaker reproduces voice and music far beyond expectations. Finished in plain black or brown, also special alligator grain in black and green or black and yellow.

If your local dealer is unable to supply you, send order direct to us and pay postman on delivery.

Sold on a money-back guarantee.

Ackerman Brothers Co., Inc.

301 W. 4th St. (Dept. "RW"), New York, N. Y.



OVERCOMES BODY CAPACITY

Gives micrometric adjustment outside the field of inductivity.

Tested and approved by amateurs and experts. Enables you to tune distant stations easier and more clearly. Simple as A B C. Installed from outside, no dismantling of your set necessary. Audibility made more natural or less distorted by the fine adjustments obtained. One Hunt's Device handles all dials on set or several sets. Costs only one dollar on guarantee of money refunded if not satisfied. Ask your dealer or order direct from Hunt Co., 486 Shrine Bldg., Memphis, Tenn.

Out of the Ether

(Concluded from preceding page)

dresses given by persons of national importance.

A new feature! Did you ever hear a violin quartet? Well, you certainly did miss something, if you were not tuned in on Station WHAS the other evening. For they offered a unique feature, a program by the Sharrad Violin Quartet. Never before have I heard a program of such sweet music as offered by these four artists.

WJZ again took the limelight and its radio audience by storm by broadcasting a blow by blow description of the bantamweight championship contest between Joe Burman and Abe Goldstein.

A splendid musical program, rendered both vocally and instrumentally at the Grand Central Theatre, was offered by Station KSD.

WRW verniered its way through with a program by the Boy Scouts of White Plains. It consisted of several recitations, stories and bugle numbers.

We may have bedtime stories for the children, but WBZ is also broadcasting them for the grown-ups.

Our other Chicago friend, Station WJAZ, helped us to spend a pleasant half hour by offering Joe Wallach with his violin accompanied by Bert Remick at the piano.

The orchestra of the William Penn Hotel delighted us with a program of dance music that sure was in a class by itself. They played through Station WCAE.

Movie fans received a rare treat when Lillian and Dorothy Gish, famous actresses of the screen said good-by to their audience, before leaving on an extensive trip to Europe, through Station WJZ.

Have you noticed that WOR has followed in the footsteps of our Philadelphia neighbor in that it is offering "Music While You Dine," every evening at 7 P. M.? Believe me, having a program of delightful music come through your loud speaker while you are dining makes the digestion much easier.

Erwin Swindell and his Note's Band has our permission to play some more as the presentation was much enjoyed.

The famous J. E. K. Trio rendered another one of their splendid instrumental recitals. They came through Station WEAJ.

The Hotel Gayoso Concert Orchestra, through Station WMC, gave a program of classical music which sure was appreciated as a change from the popular music that we hear so much.

WJAR of Providence, R. I., is now featuring as a regular part of their Sunday evening presentations, the musical program from the Capitol Theatre, New York City. This just goes to show you how the popularity of "Roxy" and his clique is increasing.

Farmers of today, who are the proud possessors of radio sets, can have the "Gay White Way" brought into their homes, if they will only tune in station KDKA, of the Pittsburgh Post, on a Thursday evening.

Natural Re-PRODUCTION



Atlas

AMPLITONE

LOUD SPEAKER

Re-PRODUCTION so natural that even experts exclaim "indeed a revelation," "nothing short of remarkable." Every voice inflection is faithfully reborn. Distortion made impossible by the marvelous, patented "double diaphragm." Ask your dealer for the final proof—a demonstration. Write for Booklet S.

COMPLETE WITH CONNECTING CORD

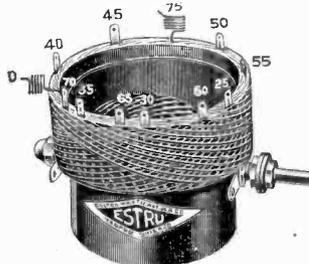
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Multiple Electric Products Co. Inc.
ORANGE ST. RADIO DIVISION NEWARK, N. J.

STOP Buying Radio Parts for Appearance and Cheap Price
LOOK For Internal Properties which give Efficient Results
LISTEN to Sets Equipped with ESTRU Parts

Introducing the Uni-flex Coupler.



Interchangeable and Build-Up Rotors and Stators—Makes Any Combination of Coupling—Transformer or Fixed or Variable Inductance—Single Unit, \$4.50. Mounts Lattice Coil Stator above or below rotor. Two or more Rotor Tubes may be fitted together with Type "S" Lattice Coil Stators. ESTRU Type "S" plain Lattice Coils may be used for Standard Inductances. ESTRU Type "ST" Tapped Lattice Coils also furnished in several sizes.

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Plain Coils	Variocouplers
Tapped Coils	R. F. Transformers
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Write to-day for full particulars and confidential prices. The ESTRU Line is nationally advertised.

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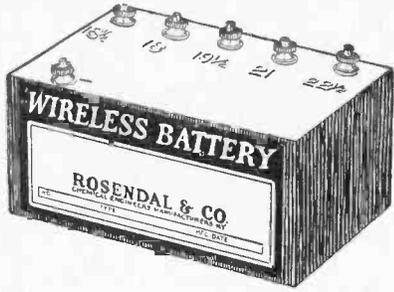
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Please send me RADIO WORLD for months, for which please find enclosed \$.....

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Three Months	1.50
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Add \$1.00 a Year to Foreign Postage; 50c for Canadian Postage.	

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NOTHING more than a number of small cells, wired together in series, each cell being composed of a zinc cup with a mixture of chemicals inside.

It took Rosendal years of painstaking analytical work to get that mixture just right—and it is RIGHT TO-DAY.

That's why a "Rosendal" is a good battery. Guaranteed money back if you're not satisfied.

Send M. O. or order for C. O. D.

ROSENDAL & CO.

Chemical and Radio Engineers
2 and 4 Stone Street New York

	Large	Med.	Small
22½ V. Plain	\$1.25	\$1.00	\$0.70
22½ V. Variable	1.38	1.13	0.75
45 V. Plain	2.50	1.75	....
45 V. Variable	2.75	2.00	....

Ask for Circular on other radio parts



Bristol Audiophone LOUD SPEAKER

No Battery Required.

\$12.50

A Genuine Baby BRISTOL AUDIOPHONE, designed to give excellent results on local and long distance reception. 11 - inch Horn of heavy metal. Especially designed for its acoustic properties. Gives volume without distortion. Satisfaction guaranteed or money refunded. Prepaid on receipt of Money Order, or Parcel Post C. O. D.

Send for Lowest Prices on BATTERIES AND OTHER RADIO SUPPLIES.
National Reserve Radio Co.
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Aetaco Back Mounting Inductance Switch



Will Not Absorb Moisture

12 Points Sure Contact

This switch is NOT made from fibre.

For convenience in mounting the set and for continued reliable service, the AETACO back

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12 Point Back Panel Mounting Inductance Switch, Special Bushing	\$0.75
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CONDENSERS	
43 Plate Condenser	\$1.75
23 Plate Condenser	1.50
17 Plate Condenser	1.35
11 Plate Condenser	1.10
5 Plate Condenser	.90
3 Plate Condenser	.80

Postage Must Be Included in All Orders.
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American Radio Stores
235 Fulton Street, New York City



SUNBEAM

12 Years at the Same Spot.

43 Plate Condensers	\$1.35
23 Plate Condensers	1.10

AUTH PHONES

List Price \$8.00

OUR PRICE \$3.50

Farm Lighting Outfits at Bargain Prices.

SUNBEAM ELECTRIC CO.
71 Third Avenue, New York City

WEEKLY SPECIAL

THIS WEEK ONLY

ONE JACK DOES THE WORK OF THREE

Say "PRALL" That's All ENJOY PERFECT RECEPTION ON DETECTOR, ONE-STEP OR TWO-STEPS WITH THE

PRALL TRIPLE-JACK

\$3.25 with Plug and Diagram

B. W. PRALL CO.

160 College Avenue
West New Brighton, Staten Island, N. Y.

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And—Our discounts are RIGHT.

Drop us a post card for our 36-page catalog just off the press.

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Radio World has made arrangements
—by which it is possible
—to offer a year's subscription for
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This is the way to get two publications
—for the price of one:
—Send \$6.00 today for RADIO WORLD
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—for 52 numbers)
—and select any one of the other
—six publications for twelve months—
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—Canadian or Foreign postage.
—This offer good only up to and
—including November 20, 1923
—Present RADIO WORLD subscribers
—can take advantage of this offer by
—extending subscriptions one year NOW.
—Or order thru your newsdealer.

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RADIO WORLD, 1493 Broadway, New York City.

Enclosed find \$6.00, for which send me RADIO WORLD for twelve months (52 numbers), beginning
and also, without additional cost, Radio News, or Popular Radio, or Radio Broadcast, or Wireless Age, or Radio Dealer, or Radio for twelve months, beginning

This Offer Good
Only Until
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