

SIMPLIFIED FLEWELLING CIRCUIT (See Inside)

15c. a Copy ¹⁹²³ September 22 \$6.00 a Year

RADIO WORLD

Title Reg. U. S. Pat Off.

ILLUSTRATED

EVERY WEEK

THESE ROMANY PEOPLE APPRECIATE RADIO BROADCASTING



(C. Gilliams Service)

Although they still retain the customs of their ancestors, these modern gypsies have proved that they are up-to-date as far as the comforts of modern conveniences can make them. They use an ultra-modern radio receiver that works on a loop, with dry cell battery tubes. After the long day's trek over country roads, these roaming nomads gather around the set, much the same as they used to gather around the musically inclined members of their tribe, and listen to the news of the day and some good dance and vocal numbers. The particular group of gypsies pictured here were caught listening in on the baseball scores while camped near Newark, New Jersey.

AN ANTI-INTERFERENCE CIRCUIT (See Inside)

The Wireless Oracle

By Hirsch M. Kaplan

Say did you hear what the regular announcer of station WHN had to say the other night? If you didn't, here goes for an earful. "The mechanical equipment of our station is being improved daily." Yes, we've already noticed that. "And, within a very short time our station will be equipped with the best equipment possible. We are aiming to make station WHN the most powerful station in the country besides offering the best programs obtainable."

You sure are there with plenty of volume WBAK. Do you ever broadcast a regular program?

While listenin' in for DX have you ever missed the call letter of a station only to hear them say "Tulip Town"? Well, just to enlighten you, that was station KDZR of Bellingham, Wash.

The people of Newark, N. J., ought to be proud of having a station like WAAM. Compared to the size of the town and the population of this burg this station is keeping pace with most of our larger stations. The popular program as offered by Mr. Hanbury the other night was great stuff!

Somehow or other we can't get excited over "lyric sopranos" on the air. The girls try hard, and they must be good or they wouldn't get the chance to do their stuff, but it certainly doesn't come in so wonderful.

The Oriole Orchestra, from Chicago, came through kinda mused up, but the announcer from WJAZ could be heard distinctly with the phones held ten inches from the ears. Walter Graham, my second "op," thinks that they were the bees' knees.

WMAF again helped us to spend an enjoyable evening by offering the West End Ladies Trio. Programs of their sort are never tiring.

Although Nat Sanders and his popular program was the berries, his impersonation of Jimmy Sheares' song, "Hot Roasted Peanuts" was poor.

By the way have you noticed how popular Jimmy Sheares' hit has become? Only the other night I heard three orchestras, two pianos, five popular singers and one violinist play that number.

We have it fresh from the post office that our "Friend Henry" has decided to erect a broadcasting station at Dearborn, Mich., that will reach to every corner of the country. Preparing for the 1924 campaign, Hank?

The Hotel Adelphi's Roof Garden Orchestra through WOO would make a wooden image do a "can-can."

WBS, can't you get in stride with the steps of progress that radio has been and is taking? Your modulation and phonographic programs are still rank.

We can well believe that story about static starting in Mexico. Every time we swing our loop in the direction of WIP we pick up more than our share of those joy-killing sounds.

There seems to be great competition among the dance orchestras of our various ocean liners. First we had Paul Whitmen's S. S. "Leviathan" orchestra, then the dance orchestra of the S. S. "Berengaria," and the other evening we had the orchestra of the S. S. "Paris." They all provide such sterling entertainment that it would be very difficult to proclaim one better than the other.

WAAM, although a small powered station and on a low wave, still make themselves conspicuous by their popular programs, through a station that ranks with the best. That's the stuff. You sure do set a fine example for your complaining brothers.



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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]

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An Anti-Interference Circuit

By C. White, Consulting Engineer

AMATEURS who are complaining as to the non-selectivity of the circuits they are now using, are advised to pause and take a good look at the circuit herewith described. We have all heard of the four-circuit receivers and all the others that make such marvelous claims for selectivity. Here is a double circuit with the addition of a double wave-trap circuit, that virtually makes

it a four-circuit selector. If this circuit does not eliminate interference in nearby or interfering stations, the case is helpless. With this circuit one should be enabled to tune out two stations above and below the desired station, and hear the desired station whether it is DX or local. The circuit has been tested and works to perfection as a selective circuit.—Editor, RADIO WORLD.

WE are constantly searching for the ideal circuit but with every circuit there is some drawback that makes it non-acceptable under certain circumstances. To me it seems that the problem nowadays is to get greater selectivity and more quiet operation under all conditions.

There are many excellent ways that we can accomplish this, but in so doing we must be guided by the financial side. A multi-tube set has the disadvantage of rather high maintenance cost, such as tube renewals, batteries, etc. Then, on the other hand, a single tube must needs be limited for many reasons from performing well under all conditions.

The great question sums itself up as to how we can get sensitivity and selectivity with a single tube and no radio-frequency amplification. I do not intend completely to answer that question. If I could I would be more than glad to write it up, but I will say that we can go a long distance toward the ideal by improving your circuit from time to time in the many ways that are constantly being suggested in RADIO WORLD. It will pay you to keep close track of these.

The circuit I am going to outline is a combination of the Reinartz idea of regeneration, tickler regeneration and a multiple filtering method. An anti-capacity switching arrangement allows you to choose either type of regeneration that is best adapted to your needs and the two filtering circuits allow you effectively to cut out any two stations that are causing considerable trouble. It has been my general experience that interference is often two-fold and a filter that is capable of

only cutting out one station and not the other interfering station only half does the trick.

After looking at the diagram I guess you will think there are too many expensive condensers in the circuit, but if you already have some condensers on hand you will only have to purchase a few new ones, since the condensers in a few places in the circuit are very flexible as to size. And besides it is well worth the extra

trouble and expense to get a set that is remarkably free of interference and noise.

In constructing the receiver you must adhere fairly close to the assembly details in order to get full advantage of the circuit efficiency. It is quite obvious that a cabinet larger than the customary size must be used for this tuner. Do not try to crowd the wiring detail in the ordinary single tube cabinet. For example, the filtering circuits, L-1, L-2, C-1, L-3, L-4 and C-2, must be assembled separately in a shielded compartment in order to prevent inductive coupling between the L-1, L-2 and the L-3, L-4 group of coils. A shielded partition can

easily be made of copper foil mounted on a thin wooden partition. Then, again, there should be a similar partition between the filter L-3, L-4 and the main tuning coil E-F to prevent inductive coupling. The panel of the set should be covered with copper foil on the inner side, and all the grounding pieces of copper foil should be electrically connected together and attached to the ground terminal of the set. It is advisable to have all wire insulated with spaghetti, especially where the con-

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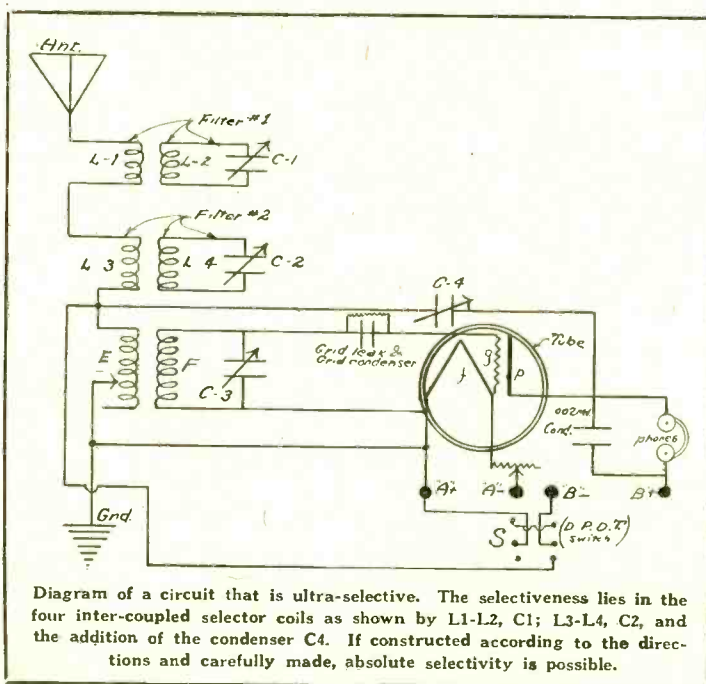


Diagram of a circuit that is ultra-selective. The selectiveness lies in the four inter-coupled selector coils as shown by L1-L2, C1; L3-L4, C2, and the addition of the condenser C4. If constructed according to the directions and carefully made, absolute selectivity is possible.

Stopping Autos and Airplanes by Radio Officially Denied

WASHINGTON, D. C.—Public antipathy against Germany's war plans of the future should not be increased by the report from Berlin that the German Government can stop and render powerless automobiles, airplanes or other motor vehicles by radio. Herr Prostrat Hermann Thurn, an administrative head of the German wireless service, dismissed the stories as "so much nonsense," in an interview sent officially to Washington. He further stated that the correspondent who sent the dispatches to papers in the United States to the effect that in June a number of automobiles en route to Hamburg were halted when their magnetos were stopped by powerful radio waves from Nauen, was the victim of unscrupulous persons. "No such achievement has yet been anywhere reached," the German engineer asserted, adding that even if it had been attained by Germany, "it would have most certainly been kept a secret and not bruited about by anybody connected with Nauen."

This official information also discredits the stories that airplanes of France flying over Bavaria were

stopped and forced down by radio waves from German stations.

Both stories of radio magneto control are impossible, according to the German radio expert, who pointed out that: Magnetos are enclosed in iron or steel jackets and could not be influenced by radio waves; no matter how powerful, radio waves cannot be directed with precision so as to affect the magneto of a vehicle or vessel at any distance from the directing station, particularly when the vehicle is in motion; and that are definite or precise directing cannot be achieved, every vehicle or vessel within the zone of influence of the electrical wave would be similarly affected. This would stop, bring down or sink the vehicles or ships of the operating agency as well as those of the enemy.

Some skeptics may believe that the Herr Administrator would have denied the statements in an effort to protect Germany's secret radio control, but the official forwarding the dispatches believes implicitly in this radio engineer, whom he knows personally and professionally, and he feels that his negations and criticisms should be taken without reservation.

An Anti-Interference Circuit

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necting wire passes through the grounded partition on to the compartment on the other side.

The condensers, as I have said before, are the big items of expense in making this tuner, and therefore you should use care in purchasing the right kind as to quality. Nothing but very high grade condensers ever give satisfactory results in a radio circuit. There are plenty of good, high grade condensers now on the market and you will have little trouble to find one.

The coils in this circuit can be readily wound at home with No. 22 S.C.C. magnet wire. After finishing each coil it is advisable to shellac it, taking care to cover it with only a thin coat, since too much shellac increases the capacity of the windings, thus destroying sharp tuning. Now as to the specifications of the various units. You will notice that each group of inductances consists of two separate coils. The coil in the Ant.-Gnd. circuit is always wound on the larger size 4 inch tubing, while the coil on the other side of the circuit is always wound on the smaller size tubing (3½ inch). Of course, the size of the coil tubing can be varied slightly without any detrimental effect just so long as one tube is large enough to slip snugly over the smaller one in much the same manner as the two coils in the air core transformers used in the "neutrodyne" (called "neutroformers"). In figuring the length of tubing to cut off for each coil it is good to figure about 20 turns of wire to the inch for No. 22. Using the 20 turns as a basis, the tubing holding the coil L-1 and L-2 should be 3 inches long because L-2 has 40 turns of wire and allowing for end space 3 inches will be just right. Although the coil L-1 has only three turns of wire, it is wound on the same length of tubing as L-2 in order to make the ends of the two tubes fit flush when slipped over each other to make the complete inductance unit. The coils L-3 and L-4 are identical to L-1 and L-2, that is, the primary having three turns and the secondary 40 turns. The unit E-F is assembled in the same manner as the filter coils. It differs in that

the coil E has 50 turns with taps for switchpoints at every fifth turn. The coil F, which is wound on the smaller size tube, has 50 turns, untapped.

The condensers C-1 and C-2 can be either 11 or 23 plate air variables, the 11 plate size being the better for this particular use. The condenser C-3 should be an 11 plate type with a venier, while C-4 should be a 23 plate condenser. It matters little how the movable and fixed plates of C-1 and C-2 are attached in the receiver, but the condenser C-3 should have the movable plates connected to the ground side of the filament-grid circuit. C-4 works better when the movable plate side is connected to the Ant. side of the circuit; that is, the fixed plates are directly connected to the plate of the tube.

Although I have shown the circuit with detector tube only, the circuit is easily adaptable for use with the ordinary two-stage amplifier. You are free to use any tube in this circuit you so desire as long as you select the proper size filament rheostat and grid leak and condenser to go with it. Do not try to work a 201-A tube with a grid leak that has been made or adjusted to work efficiently with the UV200.

Just a word about the 201-A tubes. I have been recently using these tubes as detectors and find that they give results equal to the 200 under all conditions provided the correct grid leak is used. Taking the fact into consideration that the 201-A is not as critical on the filament adjustment leads me to think that it is better as far as manipulation is concerned. Splendid results can be obtained with the new UV199 tubes in this receiver.

In tuning remember to set C-1 and C-2 at zero capacity. These condensers are used to tune out interference only and nothing else. The switch S is a D. P. D. T. anti-capacity switch (made by Federal Tel. & Tel. Co.) and is used to select the type of regeneration desired. If you fail to obtain regeneration when S is in the down position reverse the terminal connections to the coil F.

Commercial and Naval Radio Services to Japan Are Open

By Carl H. Butman

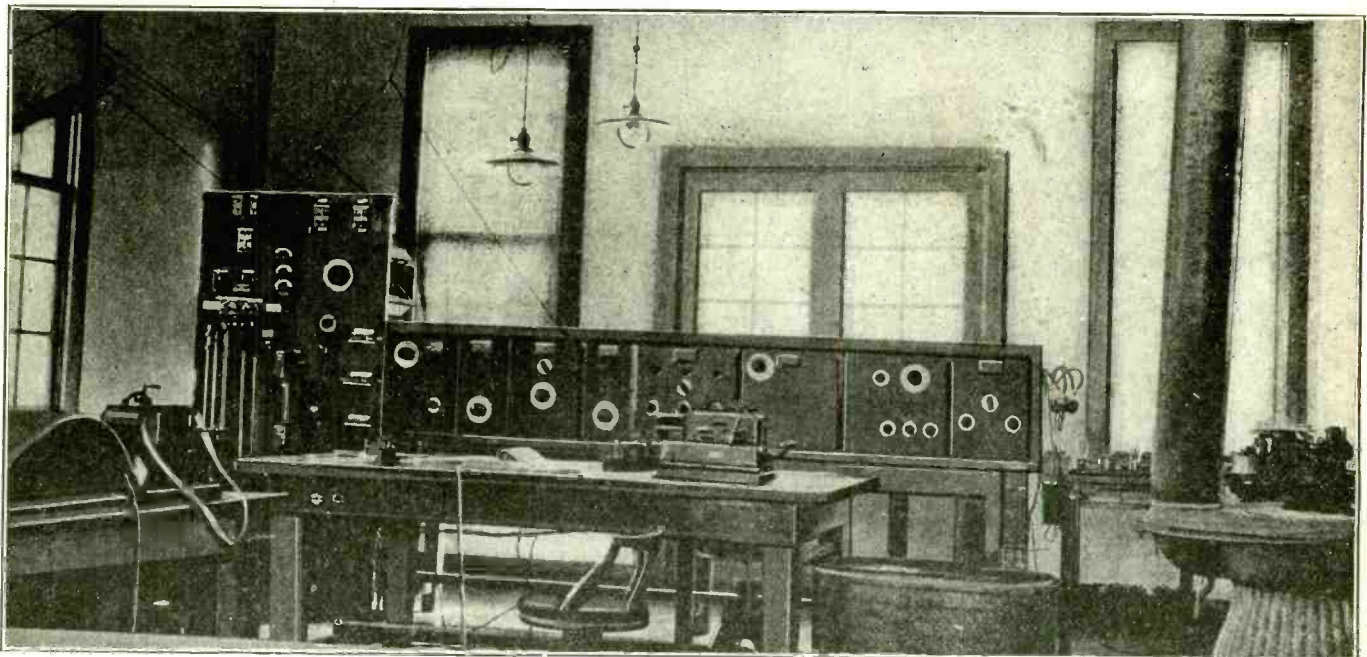
WASHINGTON, D. C.—The Japanese calamity, which practically wiped out Tokyo and Yokohama and broke the Pacific cable, gave radio another opportunity to demonstrate to the world its value of international communication, especially in the event of emergencies when land lines and cables fail. Without the single radio communication link left at Iwaki the world might have been without details of the Japanese disaster for as long as a week. Bits of news and imperative information would have been put through by cable, but radio is said by Secretary Hoover to have literally saved the day in bringing in relief as well as in carrying out the news.

To be sure, the first brief message of the disaster came to the Japanese Ambassador at Washington by cable from Nagasaki via London—out of the back door of the East, as it were, and over cables estimated 15,000

time had no means of communication. At the suggestion of the Japanese Ambassador at Washington, however, a courier service was established to Tokyo and now a regular schedule is in operation. A statement that communication was open to Tokyo, by the State Department, led some to believe that line wire communication between the station and Tokyo was established. However, communication used in the old sense means that the roads were open. According to the latest reports no wires have been re-established. Since the advent of radio, it seems that a new word must be substituted for "communication" when referring to roads and other lines of transportation.

Radiograms are now accepted for all points in Japan, except Tokyo and Yokohama, being mailed from Iwaki. Messages for these two cities are subject to delay.

Radio was the means of getting the first authentic



(C. Fotograms)

The transmitting station at Haranomachi, Japan, which gave the world the first meagre details of the terrible earthquakes. It was from this station that the operators broadcast all the later details, and was the only means of communication between Japan and the rest of the civilized world. All the cable systems were either ruptured, or put out of commission by having their shore ends destroyed in the stricken district. The transmitter is remotely controlled from the Tamioka station, which is 178 miles from Haranomachi. Both are considered as one plant under the name of the Iwaki radio station.

miles long. The Pacific Commercial cable from Japan to Bonin Island, reported submerged, and thence to Guam, was put out of service by the earthquake. Messages are now routed east via Manila, Shanghai and Nagasaki, or west via London.

It remained for radio to carry most of the official dispatches and news reports across the Pacific to North America, and radio, aided by the remaining cable connection of Nagasaki, has handled a tremendous amount of traffic. The Japanese government station at Iwaki, or Tomioka, stepped into the breach and the world now knows of the excellent service rendered by the Japanese operator who stood a long watch alone. His call and messages on the disaster were picked up by the Radio Corporation's station at Bolinas, Cal., and relayed to all points in the United States. Iwaki, which is about 144 miles from the stricken cities, for some

account of the disaster to the new world on September 4. The master of the S.S. "President Jefferson" radioed to his Shanghai office from the port of Yokohama direct. The American Consul put the message on the cable for Secretary Hughes in Washington. Facts relating the unsafe condition of the harbor at Yokohama were immediately broadcast by the Naval Hydrographic Office here that all ships might be warned of the hidden dangers there, the absence of lights, etc., radio again serving in its most valued capacity, that of protecting life at sea.

The United States naval forces in Japanese waters are rendering official emergency service via radio. The American Asiatic Fleet is now at Yokohama and the destroyer "Borie" is stationed at Nagasaki as a radio relay ship. Messages from the American flagship are

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First American Built Dirigible Equipped with Radio

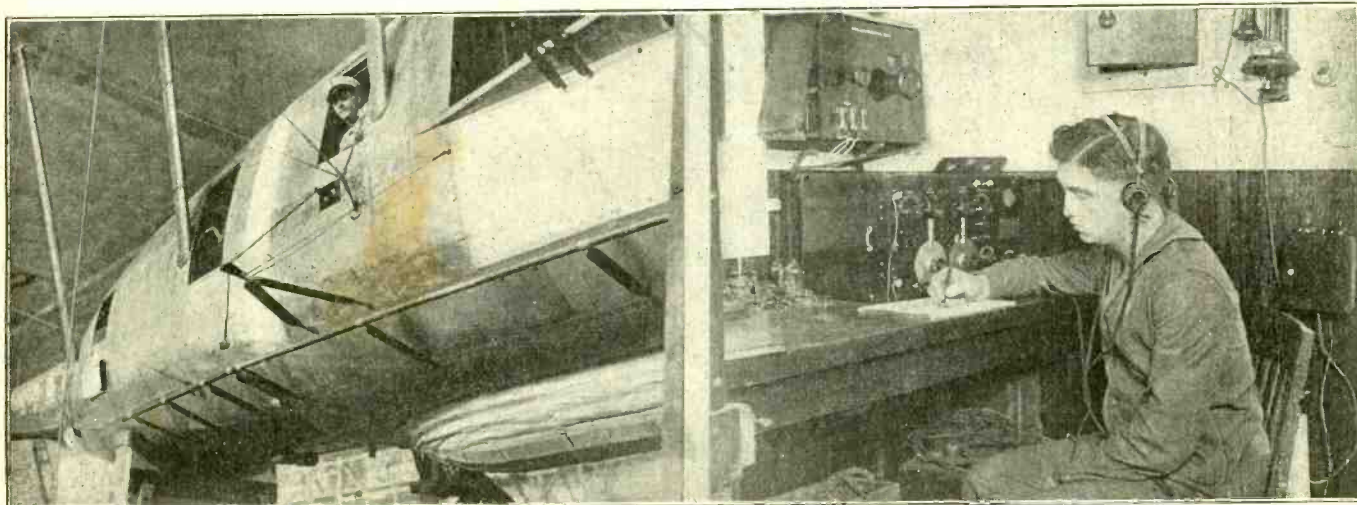
UP to the present time, the American aeronautic forces of the Army and Navy have not paid much attention to dirigible or lighter than air craft. However, there has been under construction by the navy at Lakehurst, N. J., the largest rigid type "lighter than air" craft that has been attempted in America. The only other nation that has attempted with success the construction of this type of airship is the German, famous for the Zeppelins.

The advantage of this type of aircraft in patrol and other work is the fact that it does not have to keep moving at all times but can remain stationary at different heights, or drift with the air currents. This gives the pilots and observers greater chance to chart and observe the particular district over which they are flying. In airplanes this is so far impossible, as they have to keep moving. The ZR-1 is a most thoroughly equipped craft. It is capable of extremely long jour-

C. W. transmitter and an up-to-date navy type receiver, especially designed and built for this particular installation. Due to the fact that a trailing type of antenna is used, and the metal work of the dirigible is used as a ground or counterpoise, the receiver was designed especially for this type of work.

The initial flight of this monster of the air demonstrated its practicability, and during the series of successful trial flights, it kept in constant touch with its home base through radio, advising of the operation, speed and action at varying heights, thereby allowing the observers on the ground to accurately note its action from a distance.

Radio in airplane flights is a past performance, but this is the first time that an American lighter than air craft has been equipped with radio, especially as powerful an apparatus as that installed in the ZR-1. This power and its especially constructed apparatus will



(C. Both photos Kadel and Herbert)

The radio gondola of the dirigible ZR-1 showing the trailing antenna, with the heavy weight attached to prevent its flying back and entangling itself in the controls. John T. Robertson, radio operator of the ZR-1, observing the camera man at work. Current for the operation of the powerful transmitter is derived from a wind driven generator located at the fore part of the radio gondola.

The home station of the ZR-1 at Lakehurst, N. J., receiving reports from the craft while it was in the air. The receiver is the latest type naval apparatus, comprising three stages of radio-frequency, detector and two stages of audio-frequency. The transmitter is remotely controlled by means of relays, and this station and the ZR-1 during flight are constantly in communication.

neys, as the fuel used can be stored in the cupolas meant for that purpose and also because of its ability to drift with the varying currents of the air.

Paramount in its electrical installation, however, is the radio apparatus. The transmitter is a three-KW.

enable it to send and receive over much longer distances than has been done heretofore by airplanes, which are naturally limited as to space, and therefore cannot install powerful apparatus, which takes up space and is heavy.

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picked up by the "Borie," relayed to the naval radio station at Cavite and thence to the naval station at San Francisco. Government west bound messages are sent from Washington via Annapolis radio station or commercial land lines to San Francisco, where they are relayed via Honolulu, Guam and Cavite to the "Borie" and thence to the American fleet off Yokohama. The U. S. S. "Sacramento" is stationed at Woosung, China, to relay radio messages.

Many radio experts feel that the terrible disaster and the severing of communication out of Japan will aid materially in establishing better radio service between Nippon and the world. The policy of the Japanese government has been to control radio, although American commercial companies have been endeavoring to provide better stations and transmission.

Is It Home-made Static?

NOW that the cooler weather is coming on, lots of fans expect a decrease in static and are much disappointed when they do not find it so. Do you realize that noises exactly like static, and probably louder and longer are often caused by faulty B batteries? To test it out, turn off your detector tube, stick your jack in the last tube of your amplifiers, and turn on your amplifier tubes full. You will then discover just where your "static" is coming from. The remedy, of course, is to find out just which set of batteries is causing the disturbance and to remove them.

One Thousand Amateurs at A. R. R. L. Chicago Convention

THE second national American Radio Relay League convention opened at Chicago on September 12 with a registration of approximately 1,000 delegates.

The banquet in the evening at the Hotel La Salle was splendidly attended. An inspiring message was read from Hiram Percy Maxim, president of the league. Addresses also were made by other officers and members of the board of directors, as well as by officers of the Chicago Radio Traffic Association who are directing the affairs of the convention. Another prominent speaker was W. D. Terrill, chief supervisor of radio, Department of Commerce.

The diners enthusiastically welcomed the distin-

guished French radio amateur, Leon Deloy, and A. H. Krussell, a Canadian amateur. The convention, therefore, took on an international aspect, a most encouraging development.

Dr. Lee De Forest, the eminent radio pioneer, is returning to the United States on the S.S. "Leviathan." The delegates cheered the reading of the following message from Dr. De Forest, which was radioed from the "Leviathan" to the banquet hall:

"Radio will have a continually expanding influence on the welfare of the world. It will make people happier through its entertainment utility, healthier by its spread of information, and better through its power to promote understanding."

Major White Gives Dempsey a Lesson in Radio

MAJOR J. ANDREW WHITE, who broadcast the Dempsey-Firpo fracas recently held, visited Jack's training quarters at Saratoga a few days before the fight and showed him how to work a portable receiver of the type that hundreds of interested fight fans and broadcast listeners would use to hear the ringside returns that Major White was to announce from the ringside.

Dempsey, while not a fan himself, understands what it means to thousands of fight fans and listeners who would not be able to get to the championship battle, to hear a blow by blow account of the fight, told in Major White's interesting and terse manner.

Another point of interest in the fight is that thousands of South American supporters of Firpo had sets installed so that they would be enabled to hear the instant returns of the battle.

The illustration shows Major White instructing and explaining to Jack the why and wherefore of the different dials on the Aeriola, Sr., that he is using. It is not stated whether Dempsey assimilated the technical explanations as well as he can interpret a left hook to the jaw followed up by a right cross to the bread basket, but by his expression it evidently puzzles him.

In the large cities thousands of people who could not get to the fight and who did not own sets, stood outside radio stores that had loud speakers and got the returns "hot off the griddle."



(C. Radio Corporation of America)

Major J. Andrew White Explains a Radio Set to Jack Dempsey

To Save Money

MANY sets use potentiometers across the A battery leads of the first tube, on the battery side of the rheostat. When you turn off for the night you simply turn out your tubes and forget about it—unless you are wise. Then you realize that your battery is constantly discharging across the potentiometer all night and you disconnect your battery leads from the set altogether. Four hundred ohms is a lot of resistance, but even at that it will shorten a battery's life considerable by leaving it in the circuit.

MacMillan Party Safe

APRESS dispatch from Prince Rupert, British Columbia, Canada, states that Captain Donald B. MacMillan, Arctic explorer, and the members of his expedition who sailed from Wiscasset, Me., last June aboard the auxiliary schooner "Bowdoin" are well and safe at Etah, on the northwest coast of Greenland, according to a radio message picked up there by Jack Barnesly, an amateur operator.

The "Bowdoin" will winter at Flagler Bay, the message said. A foot of snow was reported.

Radio Successfully Aids Aviation

By Carl H. Butman

WASHINGTON, D. C.—Radio, the latest “wonder of the world,” is materially aiding the development and efficiency of military and naval aviation. War-time flying in its many phases, would avail little to the commanders-in-chief if instantaneous communication between the bases and the air fleets was not constant. Radio telegraphy and telephony establish direct liaison between the air and the ground or sea, thus combining these arms of the service.

Peace-time tests and maneuvers between the aerial forces and those of the land and sea aided by radio are carried on regularly by both the army and navy; their scope and frequency are being extended each year.

A recent army air service report from France Field, Canal Zone, states that during the past fiscal year 261 radio flights were made, embracing aerial radio tests, voice-controlled formations, coast and field artillery reglages or gun-fire observations, tactical maneuvers, reconnaissances and coast patrol work. This was an average of a radio flight each working day. The diversity as well as the volume of radio communication accomplished in the Canal Zone was in excess of any previous year but will be extended next year, the report states. France Field pilots had never before attempted tactical maneuvers, coast patrol, field artillery spotting or voice-control formation flying, yet the report indicates successful results in all lines where radio was used.

More radio test flights are necessary, the report recommends, as constant testing is the only means of keeping radio equipment in first-class condition, particularly under the severely corrosive climate of the tropics. Furthermore, the training and experience of pilots through regular use of radio is held of utmost importance. Following maneuvers with the naval fleet and demonstrations at Balboa Flying Field, weekly voice-control flights, in which the pilots receive their instructions and orders by radiophone from their commander in the air or on the ground, were recommended in order to improve and train the flying personnel in airplane tactics and radio communication.

Coast artillery spotting held last fall proved far superior to any held in the Canal Zone, not only in point of reliability and efficiency of two-way radio-telephone communication, but also in the extension of

the ranges at which this two-way radio communication was carried on. The Air Service, called upon by the Coast Artillery Defences of Cristobal and Balboa to spot their fire for three coast artillery stations, carried out 49 radio-telephone flights, all of which, according to the coast artillery, were eminently successful.

The first attempt to use two-way radio-telephone to spot firing for the field artillery was at Gatun. A radio operating truck, type SCR-108, was sent to Gatun and used as a mobile ground station. This truck was connected by field telephone lines with the battery commander's station direct. The results were very satisfactory and highly commended by field artillery officers. Four field artillery officers were utilized in spotting fire from the air. After 30 minutes of instruction in the use of the radio telephone they were qualified to operate the radio-telephone set in the airplane during the flight and adjust the fire of their battery.

The value of radio-telephone communication in giving and receiving instructions in the air was clearly demonstrated when France Field sent all of its planes and flying personnel to the Balboa Flying Field for inspection and maneuvers. The success indicated what should be expected with more improved radio telephone and telegraph sets operating with ground radio sets of higher power, it is stated officially.

During the U. S. Navy maneuvers in Panama Bay, the air service was called upon to do special reconnaissance work and to patrol the Pacific Coast for a distance of almost 100 miles to the southwest. That two DH4B airplanes, equipped with SCR-73 spark sets were able to send position reports in the air from Aguadulce, Panama, a distance of approximately 80 miles, to the France Field radio station through interference, was a feat never accomplished before. SCR-68 radio-telephone sets on Martin bombers successfully sent position reports on two occasions by voice and buzzer modulation from Pearl Islands to France Field, a distance of almost 100 miles. The SCR-73 spark sets, it is believed, could send from the air to France Field, approximately from 150 to 200 miles, without much trouble. When installed on Martin bombers they should approximate a range of about 300 miles, it is estimated.

United States Radio Conferees Announced

THE United States committee of electrical and radio experts representing eight governmental departments having to do with radio and other electrical communications has just been announced by the State Department. This committee, headed by Under Secretary Phillips of the State Department, will meet at an early date to consider the plans and policies of this Government on matters pertaining to international electrical communications.

The agenda prepared by the committee will become the basis for the United States' report to the Fourth International Electrical Communication Conference when it is held in Paris. It is probable that the American delegates to the International Conference will be selected from the personnel of the committee, but as

no date for the general conference has been set, the State Department has not made announcement of its representative or plans. The international conference was to have been held this spring but was indefinitely postponed. The United States governmental representatives are: State, William Phillips, Under Secretary, Chairman; Treasury, Lieut. Zeusler, U. S. Coast Guard, and Constructor Walton, alternate; Army, Maj. Gen. George O. Squier, Signal Corps, and Maj. W. E. Prosser, alternate; Postoffice, Second Asst. Postmaster General Paul Henderson; Navy, Rear Admiral W. R. Shoemaker, and Commander D. C. Bingham, alternate; Agriculture, W. A. Wheeler, and E. B. Calvert, alternate; Commerce, Solicitor S. B. Davis, and P. E. D. Nagle, alternate; and U. S. Shipping Board, L. L. Lee.

RADIO PRIMER—For the New Army of Radio Beginners

By Lynn Brooks

INDUCTANCES: In radio reception as well as transmission, some means for varying the frequency to which the receiver or transmitter will respond has to be evolved. In order to cover this from the receiving end tuners are used. The simplest tuner consists of a coil of wire wound on a suitable tube or former, the value of which is varied by means of a slider. This inserted in the antenna-ground lead of the receiver allows the receiver to respond to the different wave lengths due to varying the frequency value of the circuit. The greater the amount of wire used, the lower the frequency the receiver responds to and the higher the wave length. This is similar to a violin string. The longer the string, the deeper the tone and the longer and slower the sound waves.

The main disadvantage of a tuner made of a coil as described, is the fact that it is not selective. It will not respond to one frequency sharply, but responds to several bands as well. The next tuning device of the single inductance variety is the variometer. This depends upon the mutual inductance of two coils revolving within one another and connected together. As we vary the relation of the magnetic field we also vary the mutual inductance, due to the principle that two coils through which a current is flowing are at their highest point when the current runs in the same direction in both coils. As we vary this, instead of helping they practically "buck" each other.

The next important tuning device is the loose coupler or variocoupler. This consists of two windings so arranged that one can revolve or slide in and out of the other. In the loose coupler, the outside winding is generally considered the primary or antenna inductance and its value is varied by means of a slider or taps. The secondary or inside one is variable by means of taps or a slider, and can slide in and out of the magnetic field of the first. This arrangement allows sharp tuning, because the primary circuit does not interfere or have any connection outside of a magnetic one with the secondary. The current flows through the first or primary coil, which as before stated is varied as to inductance value by means of sliders or taps, introducing more or less wire into the circuit and therefore the circuit will respond to a higher or lower frequency. The current flowing in this circuit induces a like current in the secondary circuit, which is also variable, and by means of sliding this in or out of the magnetic field, the best point of resonance can easily be gained, at which

point the two circuits will be considered "tuned" and the strongest signals from a desired station will be had.

In the coupler of the later variety, the same principle is used, with the exception that the secondary coil is not variable as to the amount of inductance used, tuning being accomplished by varying the mutual magnetic inductance between the two. The secondary coil of these couplers is variable through 180° inside the first, coupling being accomplished by this means instead of sliding it in and out. In the latter type, when it is found desirable to gain variance of this secondary coil, it is shunted by a capacity which is variable, and the inductance value is raised or lowered by varying the capacity in the immediate circuit.

Fixed inductances used to form couplers of different types come as duo-lateral, honeycomb or spiderweb. The advantage of each of these is the fact that the distributed capacity between adjacent turns is low. In the first type this capacity contributes a great deal to the inability of the apparatus to tune sharply. This is due to the fact that one turn with its insulation forms a condenser with the next turn, the entire winding resembling a coil with a constant capacity across it.

THE REASON FOR INDUCTANCE: Many people when examining a receiver do not understand just why coils should be used in the circuits. Take as an example two stations sending. One will send out on a wave length of 500 meters (frequency value 599.6 kilocycles). Then the second we will suppose will send on 400 meters (frequency value 749.6 kilocycles). Now should we desire to receive the one on 500 meters, we should introduce enough inductance or inductance and capacity into our circuit to enable our receiver to respond to or approximate the frequency value of the desired station. This is seen to be 599.6 kilocycles, which means that the alterations or waves emanating from the transmitter make 599,600 complete reversals per second. When our receivers respond to this frequency we have the station tuned in and we hear the voice or signal. Now should we desire to hear the one on the lower wave length, we must arrange our receiver to respond to a higher frequency. Analogy: The shorter the string of the violin, the higher the tone, the shorter the wave vibrations, but the faster. Therefore, we remove some of the inductance from our circuit and when our circuit will respond to 749,600 cycles per second we have succeeded in tuning our receiver to 400 meters.

No Broadcasters Licensed

FOR the first time in many months no new broadcasters sought licenses for stations during the week ending September 8. This is a confirmation of predictions of Secretary Hoover, and his radio aides, that the saturation point has really been reached. That 567 were enough broadcasters, nearly everyone agreed last month, and so few regret that the number has fallen off four. The point now established is that evidently those who contemplated entering the field also recognized this fact and refrained from taking out licenses. The activity this month is the least since Feb-

ruary, 1922, which indicates a better state of stability in the broadcasting field.

During August seven new stations came into being, thirteen transferred from Class C to Class A, and eleven ceased operation. This leaves the present number of broadcasters at 563 stations, a large percentage of which are good, reliable stations, likely to survive.

One Class B station, well-known WGY, transferred from its classification to Class D, covering broadcasting development, and now shares this honor with Pittsburgh's KDKA.

Tests on Radio Transmission by Day and by Night

Effect of Light and Darkness on the Energy of Radio Waves

MEASUREMENTS of the energy of radio-transmission between Rocky Point, Long Island, and London, made last winter by cooperation between the Radio Corporation of America and the American Telephone and Telegraph Co., bring out some interesting facts, reported by Ralph Brown, of the telegraph company to the National Academy of Science and printed in its Transactions. The tests show that the energy of the transmitting wave is about eighteen times as great in the middle of the night as it is in the daytime. This difference, however, lessens in the summer when the nights are shorter. It appears to be due to the fact that obstacles resulting in absorption are fewer by night than by day. A typical example of the strength of the waves as they reached England is given in the diagram herewith.

When daylight covers the entire transmission path from Rocky Point to London the field is uniformly low but during the night it rises to considerably higher values. At night the field is relatively steady and free from fluctuations of the kind ordinarily known as "fading," but the general shape of the curve may change from night to night as is indicated by the dissimilarity between the two dark periods shown.

The outstanding thing shown is that the high night values are practically as steady as the day values and have no greater percentage variation from the average. The improved night transmission is a definite recurring phenomenon which may not properly be called a freak transmission effect.

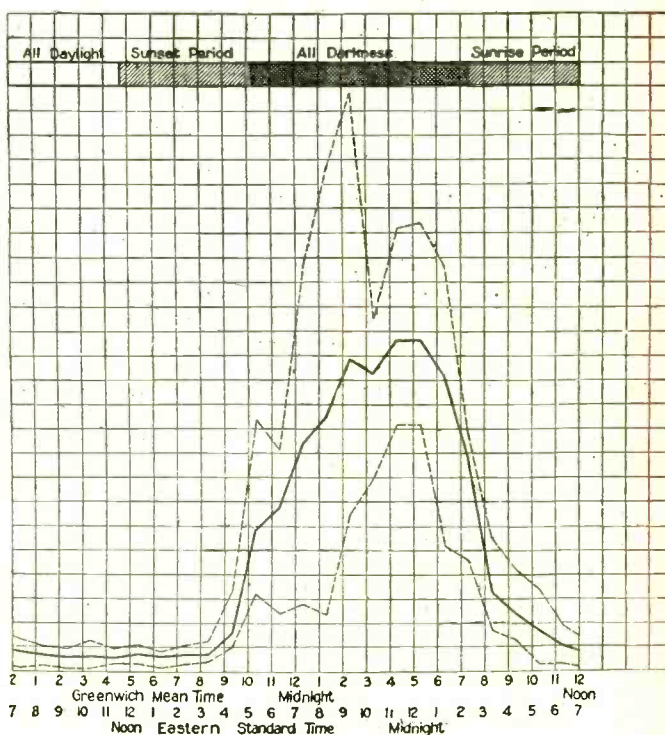
In accordance with the usual theory of radio transmission the decrease in strength of the electric waves, as they pass outward to the distant receiving station, is caused by the spreading of their energy over a larger and larger circle of wave front and by losses due to the electrical imperfections of the media traversed.

One characteristic of these winter-time data is worthy of note. The average night values are eighteen times as large as the average day values and rise about half-way up the field which would be obtained if there were no absorption loss in the transmission media, yet, not even the maximum recorded field shows any tendency to exceed the theoretical value for transmission without absorption loss. This evidence falls easily into line

with the theory that good night transmission is simply due to a diminution of the absorption losses.

During the last days of February a radical change occurred in the nature of the night transmission phenomena. The reason for the suddenness of the shift is unknown, but a decrease in the night field is consistent with the fact that the period of darkness over the entire transmission path is only about 6 hours on April 1, as against 10½ hours on January 1.

Of the ten hours winter night, six hours are spent in rising to and falling from the high values, which are



Curves showing how the energy of the transmitting radio waves varies. The dotted lines indicate minimum and maximum energy. The heavy line is the average for 54 days.

steadily maintained only during a four-hour period. When the time of darkness over the entire path decreases to six hours or less the peak might be expected to be wiped out.

Making Use of a Nuisance

THE owners of regenerative sets regard body capacity effect as an absolute nuisance. However, it may be used to serve a very useful purpose. By its use, it is possible to tune a station in to the exact point where reception is at its loudest. When tuning a set, using a vernier, it is hard to tell when the station is coming in at its loudest, as a small change in volume is hard to detect, although this same small change would perhaps be useful in getting the call letters of a station after it has begun to fade.

In the first place, the fixed plates of the condenser should be connected to the grid of the tube. Shielding is then unnecessary. This reduces body effect a great

deal. What is left may then be used for accurate tuning. Proceed as follows: Tune the condenser until reception is at its loudest. Then remove your hand from the dial. If the volume of the signal decreases, increase the capacity of the condenser slightly. Repeat this, until when you take your hand away, there is no decrease in volume. If when you first take your hand away, the volume increases, you can usually get it slightly louder than this by reducing the capacity of the condenser until there is no change in volume. This plan is more valuable when the station is coming in weak rather than loud, when a slight change in volume is hard to detect.

Combining Regeneration with Tuned Radio-Frequency

By R. L. Dougherty

IN RADIO WORLD for August 11 there was described a method of combining tuned radio frequency in a set in such a manner that it could be rightly called a "Universal" receiver, inasmuch as it would receive over all wave lengths from 180 to 25,000 with equal ease.

While fair success could be had with a receiver of this sort, the present day fans are so accustomed to the use of regeneration in connection with their receivers that they scorn to tackle one that does not combine it in some form, as being beyond the pale. In a way they are right, as regeneration makes remarkable distance possible. But when combined with a receiver of the sort shown in which feedback coupling is had through the radio-frequency tube, there is a liability that the ticklishness of the receiver will cause plenty of "howls" if the receiver is not tuned just right.

The constants of the receiver remain practically the

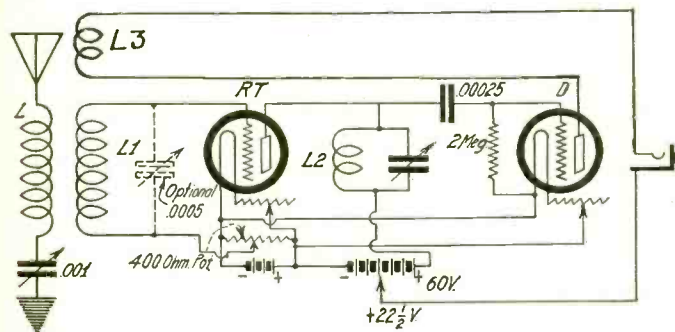


Fig. 1. Circuit diagram illustrating how you can add regeneration to the tuned radio-frequency receiver described in RADIO WORLD, August 11. By inserting the feed-back coil (L3) the advantage of regeneration is added to the circuit, combining the distance possible with radio-frequency with the sharp tuning of a regenerative circuit. Being a double circuit it is selective and flexible. The constants are identical with those of the August 11 circuit, with the addition of the feed-back coil.

same as that of the aforementioned receiver, with a triple honeycomb coil mount used for the primary, secondary and tickler. You can therefore really call this an accommodation of the three-circuit regenerative receiver with a stage of tuned radio-frequency amplification. The addition of regeneration to the receiver can easily be made if the first set has already been constructed, as all that will be necessary is the breaking of the plate lead that goes to the phone and the insertion of the third or tickler coil in the circuit.

For the edification of the fan who is sceptical as to the efficiency of the "tuned impedance" type of radio-frequency, it might be of value to state that there is no form of radio-frequency amplification as popular with the fan who wants real selectivity as that particular form. The fan who knows by experience, won't tackle anything but tuned radio-frequency, simply because of the extreme selectivity it affords. It is no exaggeration to state that a difference of four meters in wave length between two stations is sufficient to render either one of them inaudible when the other is tuned in.

By employing regeneration in this circuit, a bit of the selectivity may possibly be lost, but not so much that you will be bothered with anything like broad tuning. The detector tube cannot respond to anything but

the wave that the radio-frequency circuit is tuned to, so for that reason I advocate that all fans who have enough experience in the operation of a receiver should use tuned radio-frequency, leaving the transformer coupled for those who do not mind whether they get selectivity or not. As a matter of plain fact really sharp tuning with transformer coupled radio-frequency is not only impossible—it is foolish to even expect it.

Take into consideration the fact that you must tune your primary circuit in order to receive signals. To do this you vary the inductance, or the capacity, either shunting or in series with the inductance, or both, whichever may give you the best tuning. After passing through the radio-frequency tube the impulses that originally passed through the antenna circuit are identically the same—they have not changed one bit. Why not tune your radio-frequency amplifiers the same way? When using the transformer this is impossible because the windings cannot be varied, nor will shunting capacitances across them give any real tuning or help.

Page after page could be written enumerating the advantages of tuned radio-frequency, both as to theory and practice, but as this is not meant to be an article of that type the aforementioned advantages should be sufficient to convince anybody that for real tuning selectivity, where radio-frequency is concerned, the only way of approaching the subject in the correct manner is to use some means of tuning your radio-frequency amplifiers.

When constructing the receiver it is imperative that the entire panel be shielded very carefully. Ground this shielding. Also see that the rotary plates of the condenser in the primary circuit are connected to the ground. The condenser across the tuned impedance coil should be affixed to the panel by means of extension rods so as to keep it at least two inches in back of the panel. This can be done by the use of a sub-panel back of the main panel, and using a fiber rod to manipulate it. This is illustrated in Fig. 2. If the optional condenser is used across the secondary, it also should be mounted on a sub-panel 2 inches in back of the main panel, using an extension rod for manipulation. This is because both regeneration and radio-frequency is used. If these two condensers are not mounted in the manner explained it will be almost an utter impossibility to hold a station if the hands are taken away from the controls once it is tuned in—due to the metallic shafting.

Wire the set very carefully according to the diagram, using the varnished cambric tubing or "spaghetti" wherever leads cross at close quarters, and making the leads on the tuned impedance circuit as short as it is humanly possible for you to do it. An easy manner of accomplishing this is to mount the honeycomb mount for the coil L2 on the same sub-base directly under the condenser. Then by using binding posts on the back of the base, the battery and tube connections can be made as short as possible, and you will not have to run your leads all over the panel.

When tuning the receiver it will be found necessary to change the tuning of the circuit L2 by means of the condenser for every change in tuning in the primary

circuit unless the station is on the same wave length. After handling the receiver a week or so, and becoming used to its "rinktums," you can chart the wave length that the tuned impedance circuit responds to for definite settings of the condenser shunting it and for definite inductances used.

In operating the set turn on the two tubes to normal brilliancy and, selecting an arbitrary value for your L2 circuit, manipulate the primary, secondary and tickler much the same as you would were you using the regulation three-circuit honeycomb circuit. When a station is heard leave the primary circuit as it is and manipulate the circuit L2. Generally the signals will respond with a suddenness that is surprising, and if the condenser is not turned carefully you will run right over it, so for that reason it is a good idea to incorporate a panel vernier button for use with the circuit. Then, after hearing the call and desiring a station of lower or higher wave length, either more or less capacity is used in that particular circuit. Retune your primary, secondary and tickler controls until the station is heard. Then, after tuning your L2 circuit, increase the coupling of your secondary and tickler until the station comes in thickly—then clear it up with the potentiometer, lastly retuning your L2 circuit for maximum signals.

The circuit shown is easy to work once you get the hang of it, but there is a great deal of fine tuning that will have to be done before the signals will be tuned in correctly, so for that reason do not get impatient if you do not succeed in tuning in KYW the first night that you work it, even though the local stations may be comparatively easy to tune in and through. Learn how to do it exactly on the local or nearby DX stations before trying the real DX and you will become so used to manipulating the controls that you will instinctively tune the set simply by the "feel" of the air.

The circuit is especially adapted to the new UV199 tube because no storage battery is necessary, and also because these tubes are such marvelous radio-frequency amplifiers. You will be surprised at the volume possible with this circuit on cool winter nights as well as the distance that you can cover with it.

For broadcast work the coils for circuit L2 should be 35, 50, and 75. These will allow the receiver to cover all the broadcast waves efficiently. For the lower stations use the smaller coil, for the medium station use the larger coil, and for stations operating around 600 use the largest. If amateur stations are desired it is

good to incorporate a 25 in the outfit also. It will take but a few minutes to find out which coil should be used in the L2 circuit for each band of wave lengths. For the primary, secondary and tickler circuits the regular honeycomb coils that are generally specified for a given wave-length should be used. However, for the information of those planning to build this receiver to respond to broadcast waves, it is safe to recommend that they purchase two each of the coils stated above and by changing them around in various positions in the mounting they can strike the happy medium. It is always best practice to use a smaller value of secondary inductance than that used as a tickler.

Care in construction, carefully soldered leads, and good panel material carefully shielded will repay the builder by surprising distance and tuning when the DX months come along. Then if it is considered necessary an additional two-stage amplifier can be added and loud-speaker operation is in order for all stations that can be heard on the detector.

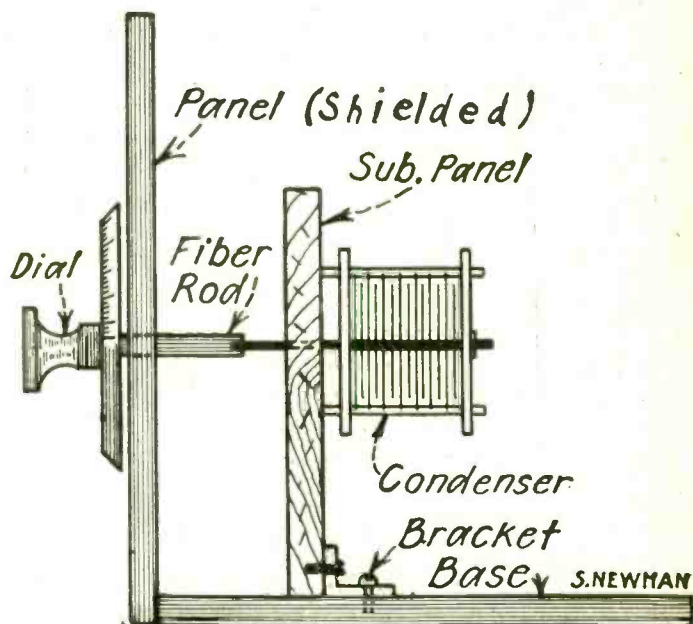


Fig. 2. Showing how to arrange the condensers on a sub-panel in back of the main panel to reduce any possible chance of capacity effect being felt. The sub-panel may be of well-dried hardwood, or small panels of hard rubber or bakelite. A space of two inches should be allowed between the panel itself and the sub-panel.

Retrieving Fading Stations

By Byrt C. Caldwell

WHEN the DX stations begin to swing and gradually fade away, most fans frantically begin to twirl the dials in the foolish belief that they can in this way regain the station. After a few minutes, they succeed in again tuning in the station, but the announcer has given the call letters, and more music is being played. Then it fades again and the process of losing the station is repeated. The fan usually succeeds in not succeeding in getting the precious call letters. Although, by leaving the tuning strictly alone, the signals will usually swing back again, it is often possible to coax them back. It is, of course, impossible to make them swing back. However, the fan seldom has his set tuned for maximum sensitivity.

When the signal fades, if it does not disappear to

the extent that it is impossible to hear speech, leave the set alone, but if it fades until it is no longer audible, or is merely a whisper in the phones, tighten the coupling of the set until it just begins to howl. Then very carefully, with the accent on the very, loosen the coupling. This will often bring the station in again, and when the signals swing in they will be louder than they were in the first place. In this condition, the set is wonderfully sensitive, so sensitive in fact, that it is liable any moment to "spill over." In this case loosen the coupling until the set stops howling.

This plan is only adaptable to those sets which use a tickler feedback, or which have some means of controlling the regeneration. (See RADIO WORLD, September 1, page 15).

Characteristic Curves of Vacuum Tubes and Their Meaning

By J. E. Anderson, M. A.

ALTHOUGH articles on the characteristics of vacuum tubes appear from time to time in various radio journals, there still seems to be a demand for more, at least if the number of questions that are asked daily by radio fans is to be taken as a criterion. The questions that are most frequently asked concern the various means for maintaining the grid at the proper potential with respect to the filament, such as the grid biasing battery, the grid and plate potentiometers, the grid leak and the filament vernier rheostat. In view of these questions it will not be amiss to call attention to the characteristic curves and some of the information they contain.

The most important of the characteristics of a

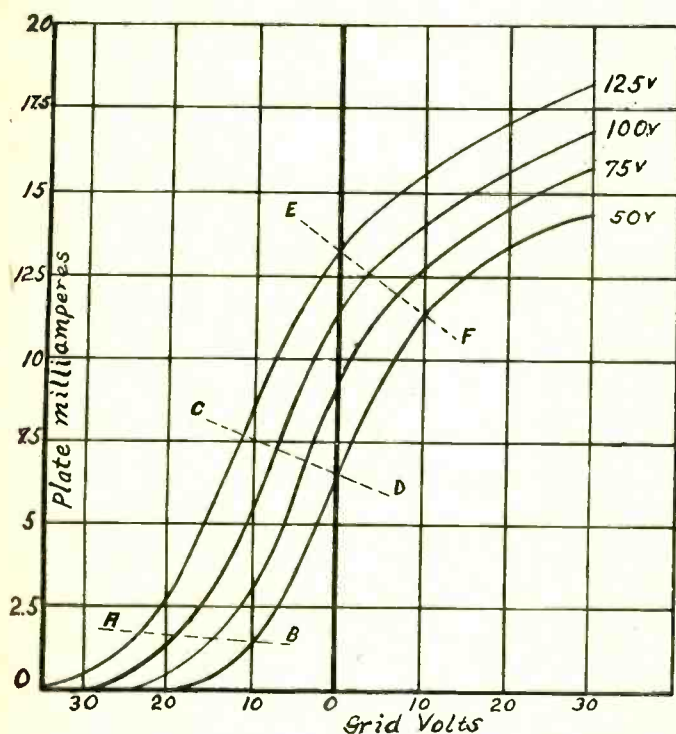


Fig. 1. Typical graph plotted for a vacuum tube at differing plate potentials, showing the relation of the plate current to the grid potentials. Charts such as these are the result of the experiments outlined in the accompanying article.

vacuum tube is the relation between the grid potential with respect to the filament and the plate current. A study of this relation will answer all the questions referred to above. In order to have a visual representation of this relation it is usually plotted on a sheet of cross section paper, using the plate current expressed in milliamperes as ordinates and the grid potential expressed in volts as abscissæ. Fig. 1 shows a set of the resulting curves, taken for four different plate potentials and covering a range of grid potentials of 60 volts, 30 volts on each side of zero or the filament potential. These curves will be better understood after an explanation of how they are obtained.

Fig. 2 shows the circuit used to obtain the curves of Fig. 1. It is typical of many vacuum tube circuits that are in daily use in radio receivers. B_1 is the grid battery which determines the grid potential, and B_2 the plate battery which determines the plate potential, both being measured with respect to the filament. V_1 and

V_2 are voltmeters with which the respective voltages of B_1 and B_2 are measured. A is an ammeter with which the filament heating current is measured, and M is a milliammeter with which the plate current is measured. The data desired are the readings of the milliammeter and the corresponding readings of the grid voltmeter, while the filament current and the plate potential are kept constant at some desired values. The procedure is as follows:

The voltage of the plate battery B_2 is first adjusted to some desired value, say 50 volts. Then the filament is lighted and the heating current adjusted to the proper value. With the aid of the instruments A and V_2 these adjustments are carefully maintained during the run. Now the voltage of B_1 is increased, with the negative terminal toward the grid, until no current flows through the milliammeter. Then the voltage is gradually reduced, in steps of about three volts, and the corresponding reading on the milliammeter observed for each value of the grid potential. When the voltage in B_1 has been reduced to zero, the grid battery is reversed, so that the positive terminal is toward the grid, and then it is gradually increased until the entire battery is in the circuit, while readings are taken of the plate current for each value of the positive grid potential. When this run has been completed, the data are plotted on cross section paper, and the lowest curve in Fig. 1 is obtained. Now the voltage in the plate battery is increased to some other convenient

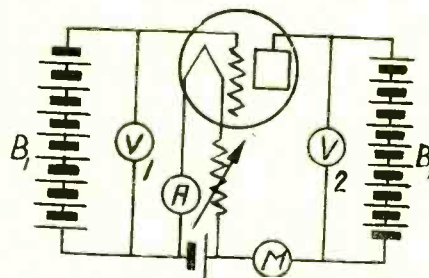


Fig. 2. Diagrammatic circuit of the apparatus used to plot the curves shown in Fig. 1. The apparatus and its manipulation to obtain the characteristic curves is described herewith, giving the reasons for each adjustment.

value, say 75 volts, and the process is repeated for the new plate potential. Thus the second curve in Fig. 1 is obtained. The other curves are obtained similarly.

By studying the curves in Fig. 1 it is seen that the effect of increasing the plate potential is to shift the curves as a whole upward and toward the left in such a way that they remain almost parallel to their original position. This variation is quite regular so that it is possible to estimate accurately the position of curves corresponding to intermediate values of plate potential, and it is even possible to visualize the position of curves corresponding to higher and lower plate potentials than those given. For any given value of grid potential the plate current is greater, the greater the plate potential is.

The characteristic curves do not depend solely on the tube, but also on the circuit with which it is associated. Curves obtained with one particular circuit will be different from those obtained with any other. The

difference is usually slight, but it is important to know the effect of various changes in the connections. In Figs. A to G is shown a set of circuits which are in daily use. Another set of circuits may be obtained by putting the filament rheostat in the negative lead to the filament. All of these circuits would give slightly different curves. These curves would not differ greatly in shape, as that depends mainly on the structure of the tube and on the filament temperature, but their position with respect to the reference framework would be different; that is, they would be shifted with respect to the line of zero grid potential.

Fig. A is the same circuit as Fig. 2. Hence curves obtained with it will be the same as the curves in Fig. 1. Fig. B differs from Fig. A only in that the plate return lead, or the negative terminal of the plate battery, is connected to the negative side of the filament battery. This is equivalent to a decrease in the plate potential by an amount equal to the voltage of the filament battery. The curves will then be shifted downward and to the right by a small amount. In both of these circuits the grid return lead is connected to the negative side of the filament battery. Hence the grid will be negative with respect to every part of the filament. This is a desirable condition in amplifier circuits, and consequently these two are used for that purpose.

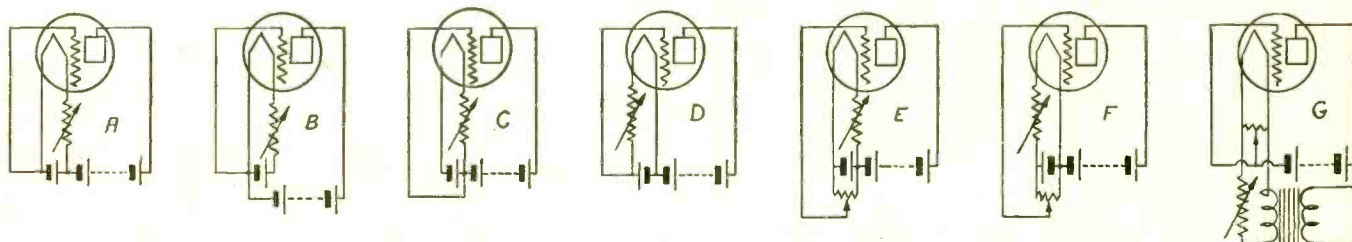
Figs. C and D differ from each other in the same way that A and B differ; that is, the effective plate potential of C is greater than that of D by an amount equal to the voltage of the filament battery. The two differ from the preceding circuits in that the grid return

"soft" detector tubes if they are to work at their maximum detecting efficiency. Fig. F differs from Fig. E in the connection of the plate return lead. These two circuits become identical if the plate return lead is connected to the sliding contact of the potentiometer.

Fig. G shows a circuit which is so arranged that the grid may be kept at a potential half way between the two terminals of the filament, as in Figs. E and F, and in which the filament is heated with alternating current. If the grid return is connected to the middle point of the high resistance potentiometer one half of the filament is at a higher potential than the grid and the other half is at a lower. This holds for both direct and alternating current, and it holds for all instantaneous values of the alternating current. Hence the average value of the filament potential with respect to the grid is zero at all times during the alternating current cycle. This balances out the generator hum which would otherwise be present in the output of the tube. This effect is not upset when a biasing battery is inserted in the grid circuit.

All the circuits shown above are different, but their differences may be reduced to two types; namely, a difference in the effective plate potential and a difference in the normal grid potential. The effect of a change in either of these may be seen from the curves in Fig. 1. The first produces a shift of the curves so that they remain parallel to their original position, while the second merely shifts them along the axis of grid voltage.

How do the curves show what negative grid biasing



Figs. A, B, C, D, E, F, G. Schematic diagrams of vacuum tube circuits as used in experimental work to determine which method of obtaining the grid bias functions best with various tubes for various types of circuits.

lead is connected to the positive side of the filament battery. This renders the grid positive with respect to every part of the filament. This condition is desirable in detector circuits when detecting with grid condenser and grid leak. Hence, Figs. C and D are used for that purpose.

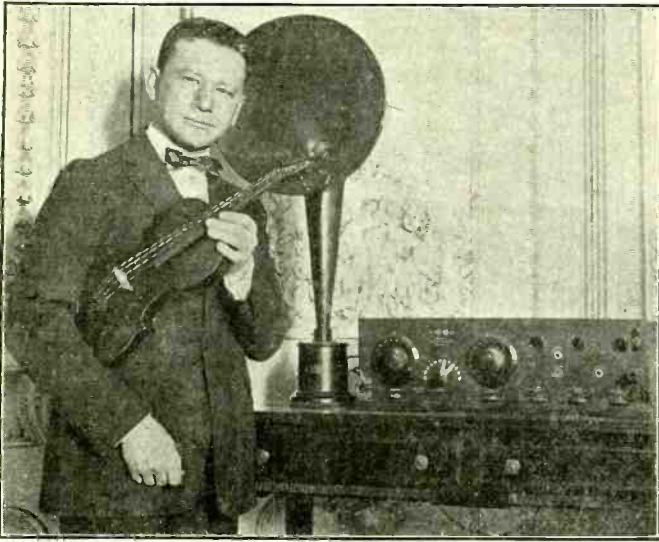
The effect in Figs. A and B of putting the filament rheostat in the negative lead to the filament is to make the grid more negative with respect to the filament; that is, it is equivalent to inserting a small negative grid biasing battery in the grid circuit. The amount of this bias depends on the resistance in the rheostat and the current flowing through it. It may vary from a small fraction of a volt to one or two volts. This connection is desirable in amplifier circuits for certain values of plate potential. The effect in Figs. C and D of putting the rheostat in the negative lead is to make the grid more positive with respect to the filament. This may make the grid too much positive for best detection and therefore it is usually not desirable.

Fig. E is a type of circuit that is used quite extensively in detectors and amplifiers. It is like Fig. A in its plate connection, but unlike it in that the grid return lead is connected to the sliding contact of a high resistance potentiometer which is connected across the filament battery. This makes it possible to adjust the grid potential to have any value between the two extremes of the filament battery. This is useful in both amplifier and detector circuits as it furnishes a fine adjustment of the grid potential. This is essential in

battery is needed to produce best a certain desired result, say greatest amplifying efficiency or greatest detection efficiency? Referring to the lowest curve in the figure, assume first that there is no grid biasing battery in the circuit and that an alternating voltage of amplitude 10 volts is impressed on the grid circuit. Then the grid voltage will fluctuate between minus 10 and plus 10 volts. When the voltage is plus 10 the plate current is 11.25 milliamperes and when the voltage is minus 10 the plate current is 1.25 milliamperes. Hence the impressed voltage of double amplitude 20 produces a fluctuation in the plate current of double amplitude of 10 milliamperes. Now insert a 10-volt negative grid bias in the circuit. The grid voltage will now fluctuate between zero and minus 20 volts. When the grid voltage is zero the plate current is 6 milliamperes and when the grid voltage is minus 20 the plate current is zero. Hence the fluctuation in the plate current now has a double amplitude of 6 milliamperes. Now insert a grid bias of 20 volts. The grid voltage will now fluctuate between minus 10 and minus 30. When the grid is at minus 10 the plate current is 1.25 milliamperes, and when it is minus 30 the plate current is zero. In fact, there is no current at all when the grid voltage is less than minus 20 volts. That means that there will be uni-directional pulses of current corresponding to the positive half of the input wave. In other words, the tube acts as a rectifier of electric oscillations. But the greatest rectification or detecting efficiency does not

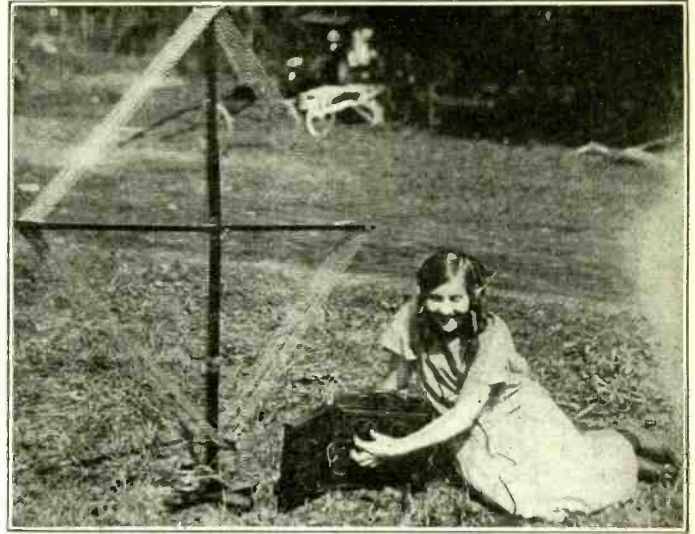
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If There Isn't Variety In These Ra



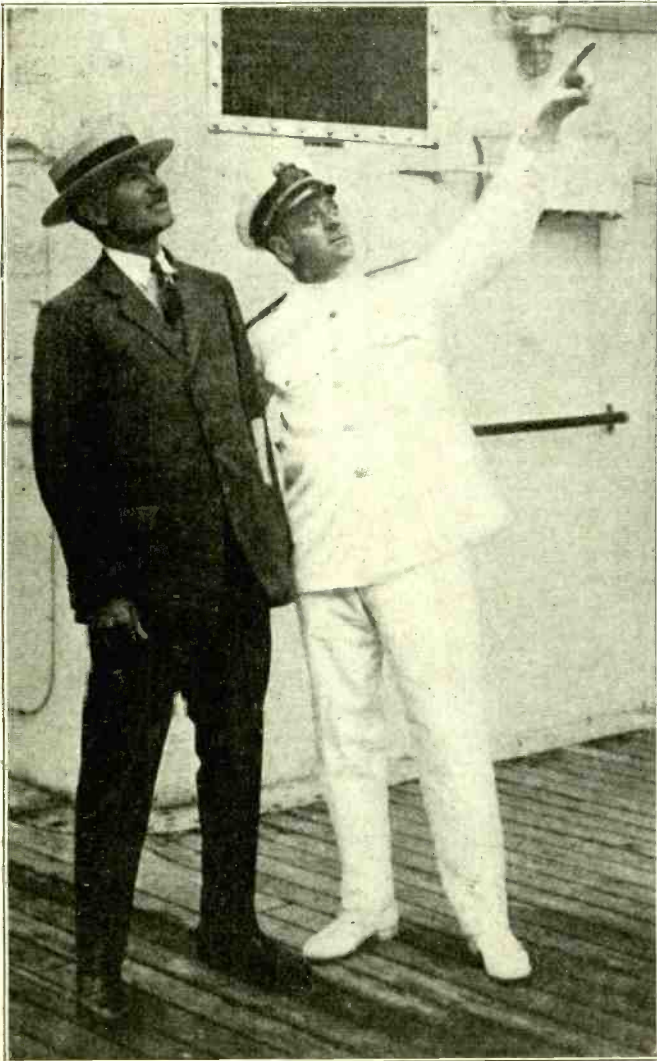
(C. Kadel and Herbert)

Efrem Zimbalist, famous violinist, with his new \$33,000 "Titian" Stradivarius which he recently brought to America, listening in to a violin solo over the radio by a pupil of one of the European teachers, and comparing the original tones with that coming over the radio. Needless to say, Zimbalist is a radio enthusiast.



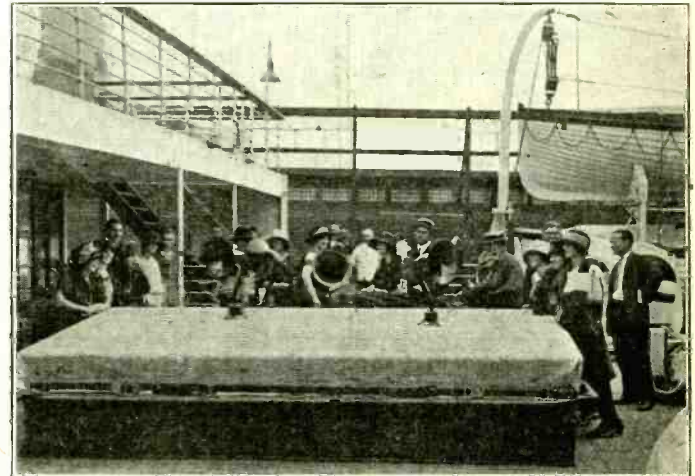
(C. Fotograms)

No matter where you motor, if you have a portable loop and a portable set, you can always set it up and have music while the rest of the folks are arranging the eatables. Miss Sophie Plass is shown listening in to some good jazz music out in the "great outdoors."



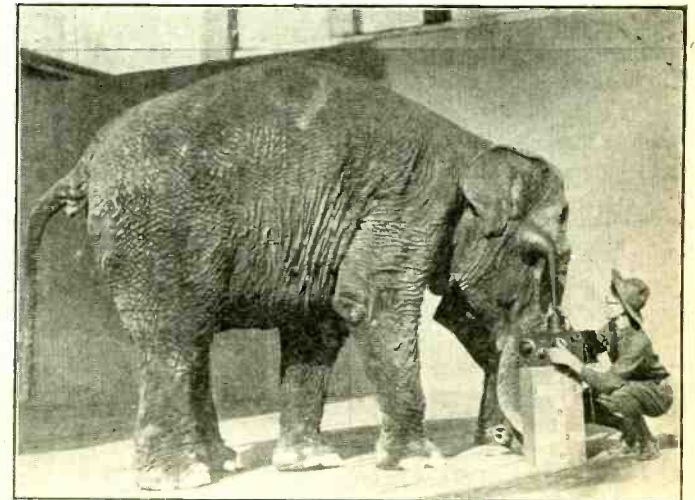
(C. Photonews)

E. N. Pickerill, chief radio officer of the giant of the seas, the "Leviathan," and the noted radio engineer and inventor, Dr. Lee DeForest. Pickerill is pointing out to the inventor the dual antenna system, and explaining how it is used in daily traffic on board the ship. Dr. DeForest sailed on the "Leviathan" to complete some new foreign radio inventions.



(C. Underwood and Underwood)

Passengers on the S. S. "California," the new Anchor liner, enjoying a real radio concert furnished by the operators of the ship. From the expressions on their faces, some comedian must have "cracked" one for their benefit.



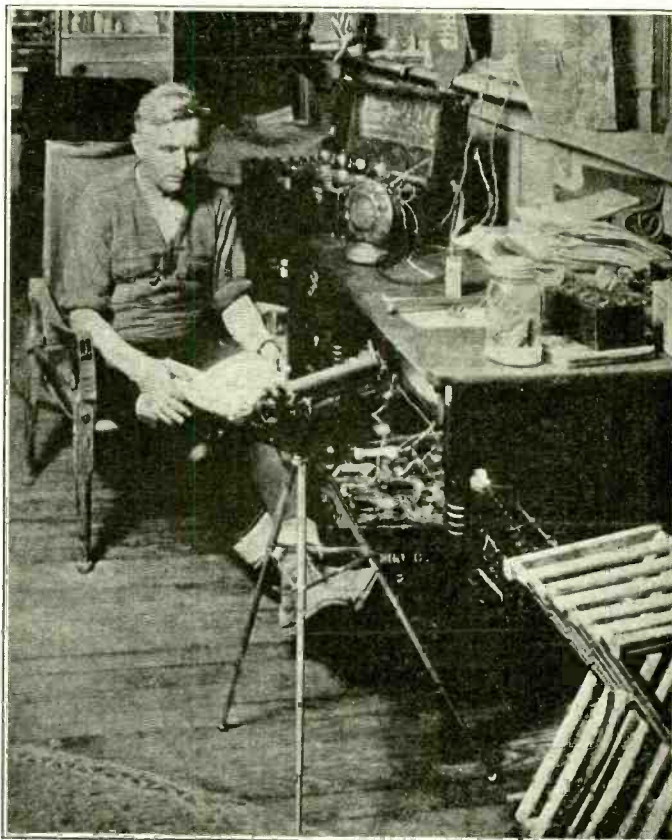
(C. Underwood and Underwood)

Pachydermatous pleasure is the outstanding expression of the immense elephantine radio "phan" upon hearing a talk upon the serious situation that the anthracite coal operators are causing in the homes of the United States. He did not appreciate the jazz, because he wanted to dance and couldn't find a suitable partner.

Radio News Pictures—But There Is!



(C. Kadel and Herbert)
The very latest radio novelty is a complete radio set on a lead pencil. The inductance is wound around the pencil, contact being made by means of the clip. The crystal detector is located in the place normally supplied with an eraser. Two binding posts complete the scheme of things, which when connected with antenna and ground and a pair of head phones and Miss Annette Bade, brought in the locals very nicely.

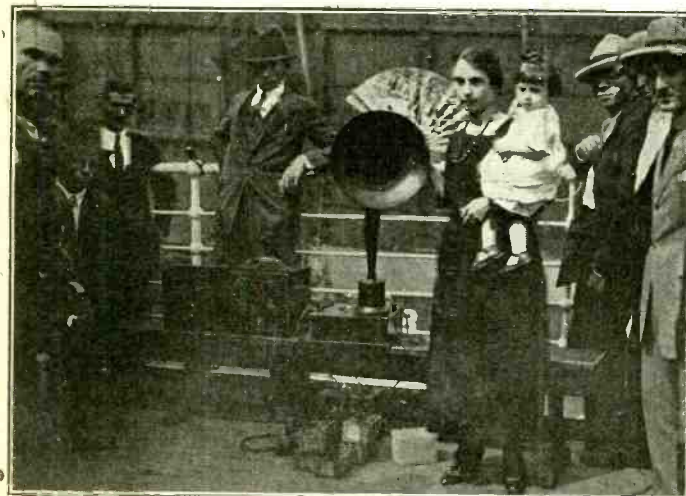


(C. Williams Service)
Camp Director "Uncle" Frank F. Gray reading to the Boy Scouts of Camp Glen Gray through the public address system installed there. All the talks, music and re-amplified broadcast programs are sent over this public address system at the camp and can be heard at any point within its domains.



(C. Kadel and Herbert)
Bud White and his trained bear John Brown enjoy some radio concerts, and as a mark of appreciation, John gives his master a very "bearish" kiss. He appreciates jazz or orchestral music, but growls at singing and speeches. How human!

Captions by Robert L. Dougherty



(C. Radio Corporation of America)
The radio installation aboard the S. S. "Tuscania," Cunard liner, was used on Labor Day to entertain the Italian immigrants when the vessel was detained at her pier in New York City owing to congestion at Ellis Island. Most of the immigrants had never even heard of radio broadcasting before, much less heard it, and they were struck silent with awe.



(C. P. and A. Photos)
A. Schultis (right), who is retiring from the New York Central Railroad after 33 years of service, was presented with a complete Crosley receiver and loud speaker by F. Ferguson (left) on behalf of the trainmen and conductors of the Harlem Electric Division of the New York Central. Schultis is tuning in and letting the boys in on his new gift.

RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY
PHRASED FOR OUR BUSY READERS

Ampere is said to have been an acknowledged scientist and great mathematician at the age of thirteen.

"That's a pretty good joke," exclaimed the radio operator after somebody had sprung a hot one. Then, reaching for his instrument, he added thoughtfully: "I'll tell the world."—American Legion Weekly.

For the past two years applications for patents and trade marks have averaged 9,000 per month in the United States Patent Office. Despite the increased flow of new ideas, real and alleged, the clerical work of the bureau has kept entirely up with it.

More than 1,350,000 electric lamps were purchased for the use of the various federal government departments during the fiscal year ending June 30, 1923, at a total cost of \$353,000. The average cost to the government was 26 cents for each lamp, as compared to an average cost of 30.3 cents for lamps bought in 1922.

Mrs. Hertha Ayrton, a well known electrical scientist and the only woman member of the British Institution of Electrical Engineers, died last week at her home in Lancing, Sussex. In 1885 she was married to Professor W. E. Ayrton, her maiden name being Marks. She invented and constructed a line divider and assisted in the completion of a series of experiments on the electrical arc for Professor Ayrton during his absence in America in 1893.

Tungsten wire as fine as cobweb, measuring only one-thousandth of an inch in thickness, is now wound into minute coils for electric light filaments by a machine that stretches, heats and winds the cobweb-wire at a rate of 4,000 turns a minute. A core of metal, itself but four one-thousandths of an inch thick, travels through the machine, and the tungsten wire, heated cherry red by an electric current, is wound around this. When the tungsten coil has been formed, the core, of steel or brass, is dissolved out with acid, and the tiny filament is ready for service in an electric lamp.

Lightning doesn't strike twice in the same spot; it doesn't have to.—Colorado Springs Farm News.

It would be interesting to know how long Magnus Johnson's wave length is, not that we care to listen in, but merely as a matter of scientific information.—Ohio State Journal.

An ornithologist states that birds have accents according to the part of the country they are found in. The remarks of a Billingsgate parrot, which recently got tangled in a wireless aerial, seem to bear this out.—London Opinion.

More than 33,700 men and women now are employed in the shops and offices of the Hawthorne works of the Western Electric Company. This is approximately 5 per cent. of the total working force of Chicago. The Hawthorne works has now reached a point where it is practically twice as big as any other manufacturing organization in Illinois. During the last five years the number of workers has more than doubled.

The U. S. S. "Omaha," recently commissioned scout cruiser, attained maximum speed of 35.36 knots on her official trials. The average for six knots was 34.92. The "Omaha" is one of three vessels of this type built by the Todd Shipyards Corporation and equipped by Westinghouse Electric & Mfg. Co. She develops 100,000 horsepower—as much as the "Majestic" which is nine times larger—and is the speediest craft in the world of over 1,300 tons displacement.

Brudenell P. Boyle, assistant manager London office of the Westinghouse Electric International Co., who is on a business trip to this country, predicts a general but slow improvement in European business conditions. He believes the general increase in confidence is reflected in the building boom in England. The building industry is the only one that is showing real signs of activity, with the steel and electrical industries following. Mr. Boyle believes there can be no real stability in Europe until the Ruhr matter is settled, and he sees no immediate prospect of a settlement.

(Concluded from page 15)

occur at the point where the plate current becomes zero, but at the point of greatest curvature of the characteristic. This is represented by the intersections of the line AB with the curves, which for the curve in question is at minus 10 volts. Hence this is the negative grid bias required when the tube is operated as a detector-rectifier or a modulator.

If the tube is to be operated as amplifier and greatest possible amplification is desired, it must be operated at the point of the curve where the slope is steepest, because here a given variation in the grid potential will produce the greatest fluctuation in the plate current. This point is approximately shown by the intersection of the line CD with the curves. This is the point of inflection, where the curve changes its curvature from rising to falling, and is therefore the steepest possible part. For the lowest curve this point coincides with the line of zero grid potential, and therefore no grid bias is needed. For the next curve the required bias is about 4 volts, for the next about 8, and for the highest curve about 11 volts. Above the line EF the tube is of little use as an amplifier.

If the object of the tube is to secure amplification without distortion, it must be operated over a portion of the curve which is as straight as possible. Distortion is due to the curvature. Fortunately the curve is straightest where the amplification efficiency is greatest, that is, at the point of inflection, given by the intersection of the line CD. The curve is nearly a straight line in the immediate vicinity of this point. If the input voltage is small, say less than a volt, there

will be very little distortion, but if it is of the order of 10 volts the distortion will be serious. The peaks of the plate current fluctuations will be flattened. This will introduce harmonics and the quality of the audio output will be bad. The tube is overloaded. To improve the quality in this case the plate potential may be increased, or the filament temperature may be raised. If this is not sufficient it will be necessary to use a power tube. In radio frequency amplification, distortion is not of much importance and therefore the tube may be operated at a point where the amplification efficiency is far below maximum. This is usually done to prevent oscillations. If the tube is working duplex, however, this is not allowable, as distortion would be introduced into the audio component. But high frequency oscillations may then be prevented by inserting a resistance of suitable value into the circuit being used.

It is not supposed that all experimenters and users of vacuum tubes have access to characteristic curves of their tubes, nor is it expected that they purchase the necessary meters with which to obtain their own curves. But this does not detract from the qualitative value of these curves. If the experimenter fixes firmly in his mind the general shape of some typical curves, together with the effect upon these curves of making various changes in the connections, the grid and plate potentials, and the filament temperature, he may more quickly reach the desired results experimentally by acting in accordance with his mental picture of the curves. The various changes that he makes need not be hit-or-miss, but will have a definite purpose behind them.

"B" Battery Control and Improvement

By C. White, Consulting Engineer

TO many amateurs the taps on the "B" battery have little or no practical use. They are often set at a given point and there the wire stays attached until something goes wrong. Generally a decrease in volume leads to an investigation of the "B" batteries. Then there is the amateur who has burnt out one or more tubes while adjusting the taps on his "B" battery and now he has the motto "hands off" as long as things move in some manner. It must be admitted that with the average set the "B" batteries are placed in a rather inconvenient place and the mass of wires behind the set leads to confusion that might result in tube casualties. The ideal arrangement for this very necessary control is the type of "B" box as outlined in this article. This box not only affords a rapid and safe method of shifting plate voltage on the detector and the amplifier but also a very quick and reliable test of the batteries. It will be well worth the time and the money to construct this outfit.

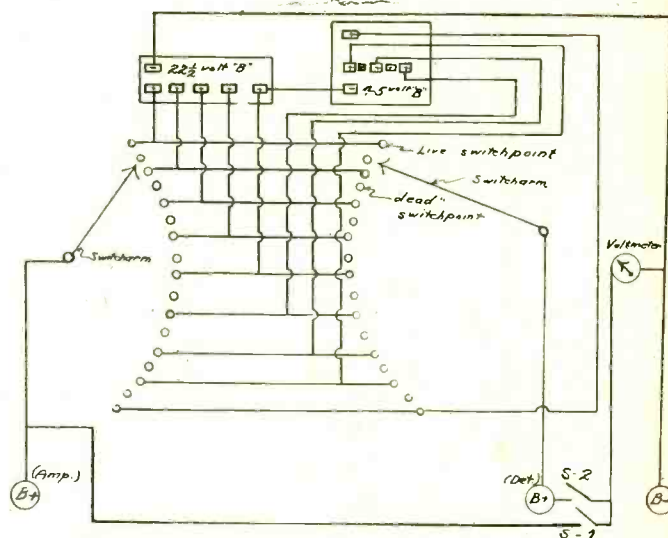
I have shown in the illustration the "B" box hooked-up to two blocks of batteries, one a 22½ and the other a 45, but you are not in the least confined to this arrangement of voltage taps; in fact, you can arrange the actual connections to the "B" batteries as best suits your particular set. If you so desire you can get a cabinet that is big enough to hold the "B" batteries or you can place the batteries outside the box. The number of taps is, of course, optional, but it is recommended that a "dead" switchpoint be placed between each two "live" ones. This is done to prevent the possibility of short-circuiting a particular cell of the "B" battery by resting the switch arm between two live contacts instead of on one only. This is impossible to do when a dead point is interposed even when shifting the switch arm. The two switches marked S-1 and S-2 are push buttons of the door bell type. It is easy to purchase these buttons in the countersunk pearl style which makes a very neat appearance for a panel-mounting. A voltmeter is one of the required articles for the "B" box. If you have not one in your possession at present I would advise you to invest in one as soon as you can. A good radio fan must be able to check up his "B" as well as his "A" battery conditions at all times.

A depleted plate battery will not only cause a diminution in volume but also introduces a certain grade of home-made static. A reliable voltmeter is the only method to tell whether your batteries in the plate circuit are still functioning properly. It is generally conceded by the dry cell "B" battery manufacturers that that type of battery is of little use when the voltage on the 22½ volt size falls below 17, and serious noise is often introduced when the 45 volt size goes below 34. This rule is by no means exact for I have personally used on amplifiers 22½ volt batteries that measured about 10 volts and got quiet operation, but this is too exceptional to be called a general occurrence, although many amateurs are getting remarkably long service from their plate batteries.

For testing a dry cell "A" battery an ammeter reading at least 35 amperes will be required. A new "A" battery will read anywhere from 27 to 35 amperes on short circuit by the ammeter. Of course, such a test should be made rather hastily, but if your battery only goes up to 10 or 12 amperes on the initial jump and falls very rapidly the cell is beginning to reach the discarding stage. A storage "A" battery should never be

tested with an ammeter or voltmeter; the former would most likely be burnt out and the latter would indicate nothing of value as to the amount of charge in the battery. The hydrometer is the most simple and reliable way to test a storage "A."

Now as to the problem of bringing out the leads in the proper order so as to make the operation of connecting them to the "B" batteries as simple and safe as possible. One method is to tag each wire separately, but as you can easily see this would mean a lot of tags hanging around to be lost or torn off, and besides it would not make a neat job. The best method of bringing out the leads that are to be connected on to the



Arrangement for the amateur who is fussy about the way in which his set functions and likes to have his plate batteries arranged so that different plate potentials may be used. Also an arrangement whereby the condition of each cell, or group of cells, may be tested by means of the voltmeter to determine their condition.

battery taps is by the use of the so-called coded wire. Coded wire is wire that is covered with insulation that is so colored and striped as to be readily identified; in other words the 18 volt tap wire could be black with a solid red stripe, while the 19½ volt tap connection could be black with a dotted yellow stripe. There are many combinations of colors and stripes, so you will experience little difficulty in getting any desired number of groups. The end negative wire should have one solid color, generally coded blue or black, while the last positive tap should be red. It is obvious with such a coding system made up and listed you can easily change your "B" batteries without going all over the wires each time. This coded wire can be purchased from any electrical store or telephone supply house; if not procurable at the former you will be sure of getting it at the latter since it is extensively employed in telephone wiring.

The "B" box will not fail to give your tubes the proper amount of plate voltage and will afford an instant check on the condition of the batteries. By closing S-1 you can ascertain the exact voltage on the plates of the amplifiers and by closing S-2 the same can be found out for the detector. Never close S-1 and S-2 at the same time because this action would short circuit part of the battery. While the "B" box has been used on some deluxe cabinet and console models, it has not been generally used by amateur builders.

Answers to Readers of Radio World

Have constructed the circuit described by A. S. Gordon in RADIO WORLD, April 14, page 4. How can I add additional amplification to this circuit?—Roy Maguire, 899 Neptune Ave., Coney Island, N. Y.

If you will refer to the Answers to Readers column of RADIO WORLD, August 18, you will find the diagram you wish. This will enable you to add another two-stage unit to your set.

* * *

I desire to study the code and the theory of radio, to enable me to enter the radio branch of the navy. Can you advise me just what course I should pursue?—Jack Laitin, Minneapolis, Minn.

The navy trains men for this service. Put in an application with the commandant of the nearest navy yard, and he will inform you of the location of the nearest radio school of the navy.

* * *

I have the standard three-circuit regenerative receiver. I want to use this circuit with a loop antenna and not use any radio-frequency. The circuit uses detector and

outdoor antenna or a loop?—J. Shultz, 3409 Benitcau, Detroit, Mich.

We refer you to page 9 of RADIO WORLD, March 17, 1923, where you will find the article you desire, written by W. S. Thompson.

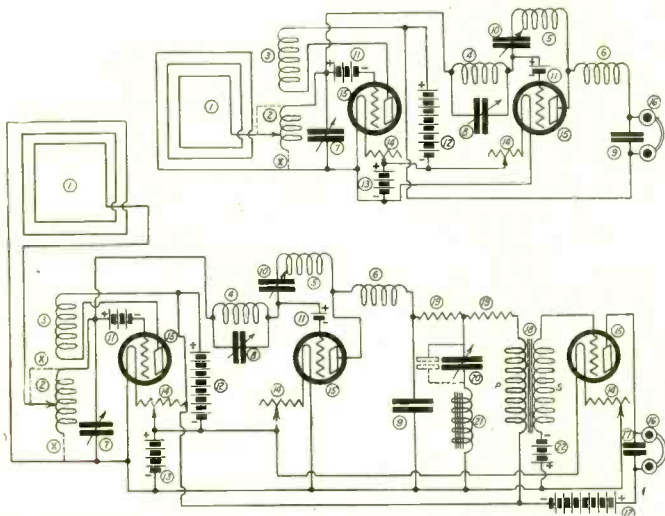
* * *

Where could I obtain a circuit diagram which would enable me to add two stages of audio-frequency amplification to the circuit described in RADIO WORLD, April 14, by A. S. Gordon? What size wire should be employed in hooking up the set? I notice that when I place my finger on the grid post of the grid condenser that the signals come in louder. Why is this?—J. Kaiser, 2208 Neptune Avenue, Coney Island, N. Y.

You will find the hook-up you want in RADIO WORLD August 18, in the answers to readers department. Use No. 14 tinned bus wire, covering it with spaghetti. Change your grid condenser for one of larger size—the one you have now is too small for your tube.

* * *

Does it matter if when using phones in a



A diagrammatic hook-up of two and three stage super-regenerative receivers. The constants of the circuit, according to the numerals on the diagrams, are as follows: 1—Loop antenna. 2—Primary of variocoupler, (55 turns). 3—Secondary of coupler (wound with 90 turns of No. 30 wire). 4—Duolateral honeycomb 1250 or equivalent. 5—Small air choke coil of 9 millihenries inductance. (A 250 honeycomb will do.) 6—Duolateral honeycomb 1500 or equivalent. 7—.001 mfd variable condenser. 8—.0025 variable condenser. 9—.005 fixed condenser. 10—.001 variable condenser. 11—Grid battery. 12—B battery (90-120 volts). 13—A battery. 14—Rheostats. 15—Tubes (hard). 16—Telephones. 17—.0005 fixed condenser. 18—Audio frequency amplifying transformer. 19—12,000 ohm resistance filter. 20—Capacity determined by experiment should be between .002 and .005 mfd. 21—Choke coil—100 millihenries. 22—Grid bias battery (3-12 volts). The constants are the same for both circuits, and should be adhered to. Diagrams by permission of S. Newman.

two stages of audio-frequency. Could I convert this into a super-regenerator? Would a super give me greater volume than the one that I have now? What wave length will the receiver respond to?—Harry Kenaga, El Reno, Okla.

You cannot operate your present set on a loop. In order to use a loop you must use radio-frequency or a super-regenerative circuit such as is herewith given. The parts are all marked. The loop you mention is O. K. for use with this circuit. The circuit will cover all the broadcasting wave lengths. You cannot use dry cell tubes with this circuit and do it justice. The best tubes for use with this circuit are the 216A or five watt tubes due to the plate voltage used.

* * *

Will you publish a diagram of a one tube super-regenerative hook-up using either an

receiver, one pair is 2000 ohms and the other is a single 1000 ohm receiver? I have been told that it cuts my volume down.—Jack Scheweiss, New York City.

This should not make any appreciable difference, if the phones are of good make and in good condition.

* * *

I have had a power amplifier for nine months. It has at times a tendency to be "muffled." I have been told that the "C" battery needs replacement. Can this be the possible reason?—Philip Domidon, Brooklyn, N. Y.

It is possible that this is the cause of your trouble, although these batteries should last for more than nine months. Renew it, anyway, being careful that you reconnect the new one in the exact manner as the old one.

Please inform me what transformers are to be used in W. S. Thompson's reflex Grimes circuit. I have read in articles that the UV199 tubes do not work well with transformer coupled radio-frequency circuits. Is this so? If so, why do they sell them for that purpose?—G. O. Halvig, Lock Box 252, Dawson, Minn.

We cannot recommend through this department any particular make of competitive apparatus. Buy the best you can. This applies to all apparatus bought. The best is the cheapest in the end. The tubes mentioned work with transformers if all the directions are carried out.

* * *

Can I use an insulated wire for my antenna? Is it necessary to use more than a single wire for receiving? What kind of wire should be used?—Eitelbert Huber, 2062 Broadway, New York City.

You may use insulated wire for antenna, as the ether waves find no difficulty in passing through the insulation. However, no advantage would be gained by the use of the wire, and the extra expense involved is not warranted. A single wire is all that is necessary for receiving. You may use copper, aluminum, copper-clad wire, phosphor bronze, or in a pinch, even iron wire will do. The important thing, is the complete insulation of the erected wire, to prevent its grounding. Aluminum is not used much now, because of its lack of tensile strength and its tendency to quickly corrode and render any joint except an aluminum soldered joint, a high resistance.

* * *

What is tuned radio-frequency amplification used for? Can I use it in a set with a loose coupler and a crystal detector? Will it help my receiver?—Joe K. Lee, Atlanta, Ga.

Tuned radio-frequency amplification is used for increasing the range of a receiver, by amplifying the minute impulses before they are rectified and therefore making signals that would be too weak to actuate the phones or amplifiers audible. In tuned (impedance) radio-frequency amplification, advantage is taken of tuning the amplifiers to the incoming wave and obtaining additional efficiency. You may use it with a crystal detector if you wish. It will help your receiver, to cover greater distances. See RADIO WORLD, July 14, for circuit diagrams and explanations.

* * *

Can radio-frequency amplification be added to the Westinghouse Radiola, Sr., using UV199 tubes? Is the new Grimes inverse better than the improved Grimes reflex as outlined by Thompson? Can a tube be used as a detector in place of the crystal? Is there any advantage to be gained by using crystal detectors in reflex circuits?—N. A. Reinhard, 548 Arnett Blvd., Rochester, N. Y.

Radio-frequency cannot be added to the Senior very well without rebuilding the set, which would not be worth the trouble. The set is not designed for radio-frequency, and should not be used with it. The Grimes you mention (Thompson) is the regular Grimes inverse duplex, with the addition of a stage of pure radio-frequency ahead of the reflexed tubes. It is not advisable to use a tube as a detector in this circuit. The advantage of the crystal is absolutely faithful reproduction of the signals and speech. The added volume gained by the use of a tube is so small that it really does not warrant the loss of clearness and tone by the use of the tube.

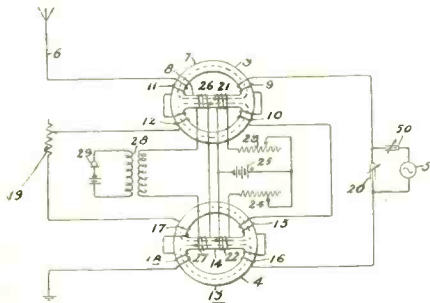
Latest Radio Patents

Modulating System

No. 1,462,038: Patented July 17, 1923. Patentee: R. V. L. Hartley, South Orange, N. J.

The invention relates to modulating systems, or systems for supplying a high frequency wave which varies in amplitude in accordance with the wave form of a signal to be transmitted.

It is well known that a wave of the high frequency f , modulated in accordance with the signal frequency a , where a is the instantaneous value of the signal frequency, may be considered as composed of three components having the frequencies f , $f+a$ and $f-a$. Considerable power is wasted in radiating the unmodulated component of frequency f , and it is desirable for efficient transmission to radiate only the pure modulated waves of frequencies $f+a$ and $f-a$, the unmodulated component being restored in any suitable manner at the receiving station.



New method of telephone modulation.

An object of the present invention is to provide a modulating system for transmitting a pure modulated wave.

The invention makes use of reactance modulators of the transformer type for controlling the high frequency output by varying the mutual inductance between the primary and secondary winding of the transformer in accordance with a signal to be transmitted. The amplitude of the high frequency currents radiated depends upon the coupling between the primary and secondary windings and by varying this coupling, i. e., the mutual inductance, in accordance with the signal, a modulation of the carrier wave is effected. The variation in coupling is effected by varying the permeabilities of the transformer cores in accordance with the signal currents. The secondary windings of the two transformers are connected to the antenna in opposition to each other, so that no high frequency power is radiated in the absence of signaling currents. The effect of signaling currents is to increase the permeability of one transformer core, and to decrease the

permeability of the other transformer core. This disturbs the balance of the opposed secondary windings, and modulated high frequency power is radiated.

The modulated wave supplied by one of the secondary windings has the three components with frequencies f , $f+a$ and $f-a$, and the opposing modulated wave supplied by the secondary winding of the other transformer has three similar components, with the same frequencies. The two opposed unmodulated components of frequency f are not varied in amplitude by the signal current of frequency a , and these components are always balanced out so that no unmodulated power is transmitted. The pure modulated waves of frequencies $f+a$ and $f-a$, developed in the transformers by the signal currents, agree in phase and so reinforce each other.

Another object of the invention is to prevent the induction of radio frequency currents in the excitation winding. This is accomplished by providing two paths in opposition for the high frequency flux, the excitation winding being linked by both fluxes so that the effect of the opposed fluxes is to induce no resultant E. M. F. in the excitation winding.

A source of steady current is used to bring the permeability of the cores to the desired point about which the permeability is changed by the signaling currents.

A further object of the invention is to use a single excitation winding for each transformer, which is to be supplied by both the steady source and the signaling source, the currents from these sources aiding in one winding and opposing in the other, and to prevent the currents supplied by each source from being short-circuited through the other source. To this end the invention provides an impedance coil circuit with the steady source and a condenser in circuit with the signaling source. The steady current cannot traverse the condenser, while the variable signaling currents cannot pass through the impedance coil, so that both currents are properly supplied to the single excitation winding.

It has been determined that best results are obtained when the modulators are energized by a generator which acts as a pure resistance. In order to provide such a generator the reactance of the same is neutralized by a reactance of opposite characteristics. For instance, if the generator has inductance, then a capacity is provided to neutralize the inductance of the generator which accordingly acts as a pure resistance.

Radiotelegraph System

No. 1,463,391: Patented July 31, 1923. Patentees: E. C. Hanson and W. C. Carlson, Washington, D. C.

Our invention relates to the reception of wireless signals and more particularly to those systems operating on the undamped wave principle.

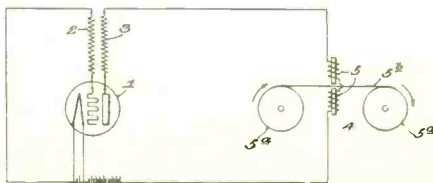
Heretofore, in order to actuate a signal responsive device it has been generally necessary to convert the received radio frequency energy directly into an audible frequency.

The object of our invention is to provide an arrangement for receiving undamped radio wave signals without first converting the radio frequency energy into an audible frequency.

Another object of this invention is to provide an electric circuit for first re-

coding radio signals and subsequently reproducing the recorded signals.

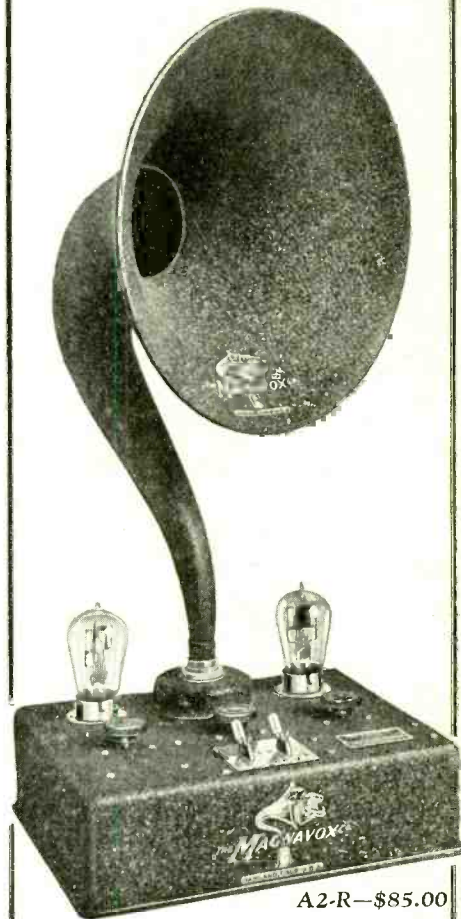
A further object of the present inven-



Method of recording telegraphic signals.

tion is to provide a circuit which will respond efficiently to sustained radio frequencies, but which will not respond efficiently to audio frequencies and strays.

MAGNAVOX
Radio Products



A2-R—\$85.00

MAGNAVOX Radio Combination Set A2-R consists of electro-dynamic reproducer and 2-stage Power Amplifier, as illustrated. This instrument insures the utmost in convenient, perfect reproduction with any good receiving set.

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

"Saving money by NOT advertising gives the sheriff and auctioneer most of their business."—F. S. C.

Radio Merchandising

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

Telephone Lakawanna 6976

Everybody Should Boost National Radio Week

ARE you doing your share towards boosting National Radio Week which runs from November 25 to December 1, 1923?

Everybody interested in the art, science and business of radio should do everything possible to make the second annual National Radio Week bigger, better and more important in every way than the first annual event of last year.

If you have any original ideas send them to RADIO WORLD and we shall be glad to pass them on for discussion and action.

Radio Show Features to Interest Public

ONE of the interesting features provided for the second annual Radio Show, at Grand Central Palace, New York City, from October 6 to October 13, will be a series of motion pictures illustrating the practical uses of radio and the principles of operation.

Open to amateurs under 18 years of age, living within 100 miles of New York City, will be a set construction competition which doubtless will attract many.

It is expected that a radio dance will be held frequently, perhaps every night, the music being received from one of the broadcasting stations.

The principal radio reception set at the show will be in charge of the Radio Club of America, who also are the constructors of the set.

The following organizations have reserved exhibition space:

Crosley Mfg. Company, Radio Corporation of America, Western Electric Company, C. Brandes, Inc., Cutler-Hammer Co., Cutting & Washington Co., DeForest Radio Tel. & Tel. Co., Dubilier Condenser Co., Electric Storage Battery Co., Fiber Products Co., Gimbel Brothers, Gould Storage Battery Co., Grebe & Company,

Inc., C. B. Kennedy & Co., Manufacturers Patent Co., Multiple Electric Products, Marko Storage Battery Co., National Carbon Co., Post Electric Co., Precision Equipment Co., Radio Digest, Radio Industries, Rocky Mountain Co., Weston Electric Instrument Co., Moon Radio Co., Neon Lamp Works, R. Mitchell & Co., Nathaniel Baldwin, Pathe Radio Co., Rasla Sales Co., Malone-Lemmon Laboratory, Eisemann Magneto Corp., Gilfillan Brothers, Willard Storage Battery, National Radio Products, Sleeper Radio Co., Horne Electric Mfg. Co., Allen D. Cardwell & Co., Sec-Tron Radio Co., Lefax, Inc., Holtzer-Cabot Company, Graham & Company, Bristol Company, Radio Dealer, J. D. Timmons & Co., New York Evening Journal, Experimenter Publishing Co., American Radio Research Corp., Acme Apparatus Company, American Radio Relay League, American Radio Journal, L. & W. Spring Co., National Airphone Co., Alden Mfg. Co., Burgess Battery Co., Pacent Electric Co., Magnavox Co., Automatic Electrical Devices Co., Federal Radio Co., Radio Publishing Co., Adams-Morgan Co., Engravers & Printers Machinery Co., Atwater-Kent Co.

Radio Sales to Farmers Should Result from Good Harvest

THAT the farmers of the United States are this year the biggest bunch of prospects in sight for the radio industry is being demonstrated almost every day. An editorial in the New York "World" is evidence of this fact. It reads in part as follows:

"The season's crops are virtually made as they appear in the Sept. 1 report on condition of the Department of Agriculture. Spring wheat suffered some little

decline in estimated yield from a month ago, but the total wheat harvest is within 29,000,000 bushels of the 818,000,000 bushels produced last year. Corn will be a larger crop than then. So of oats, barley and tobacco. White potatoes at 390,000,000 bushels are a good average if 48,000,000 bushels below last year's yield. It is a year of plenty. Only rarely in this respect has the country been more greatly favored."

Radio Code to Japan Barred

THE Japanese Government has forbidden the use of code in radio as well as cable messages sent to Japan during the present emergency. The Radio

Corporation of America was notified that on orders from Tokio no messages would be received at the Japanese Government radio station at Iwaki, Japan, which were written in any language other than plain English or Japanese.

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:

Clarence Thompson, 53 Appleton City, Missouri.
C. R. Crawford, 1006 Pender Street West, Vancouver, B. C., Canada.
L. F. Hewlett, 8713 Colonial Road, Brooklyn, N. Y.
Maybrook Radio Supply, Maybrook, N. Y. (Dealer.)
Latto Radio Service, 1937 Reid Avenue, Lorain, Ohio.
Chester Wilson, 3306 Freeman Avenue, Kansas City, Kansas.
Chas. F. Bomer, 8703 139th Street, Jamaica, N. Y.
J. S. Hagans, Box 447, Chicago, Ill.
Beardslee Radio Laboratory, 125 Scott Street, Wheaton, Ill. (Retailers.)
F. W. Kerchner, M. D., Glen Carbon, Ill.
J. D. Oakes, Flotonia, Texas.
Ray O. Townsend, Box 91, Cape Charles, Va.
H. V. Montgomery, 1715 Glendale Avenue, Detroit, Mich.
Elmer E. Martin, North Lima, Ohio.
C. A. Robinson, 917 Seventh Street, Charleston, W. Va.
John H. Allen, 1002 West Street, Wilmington, Del.
Robert S. Cook, 1426 Asbury Avenue, Evanston, Ill.
B. Weiss, 96 Watkins Street, Brooklyn, N. Y.
Wm. E. Thompson, R No. 1, Box 34, Barron, Wisconsin.
J. F. Totten, Jr., 830 Stanbridge Street, Norristown, Pa.
Robert H. Walters, R. 1, Box 40, Glidden, Iowa.
Frank Maguire, 130 Hamilton St., Cambridge, Mass.
D. J. Elliott, 161 Penna. Ave., Wilson, Pa.

Radio Trade Notes

A discharge in bankruptcy has been granted to Beatrice K. Owen, who was a partner in the Beacon Radio & Electric Co., at 246 Greenwich Street, New York City.

* * *

A petition in bankruptcy has been filed against the Electrical Corporation of America, manufacturer of radio parts, 428 Broadway, New York City, by August Heusel for \$275, Holmes & Rice \$338, Whitman Advertisers' Service, Inc., \$192. Richard Campbell was appointed receiver under \$5,000 bond by Judge Manton. Liabilities about \$36,000; assets about \$20,000.

* * *

Bankruptcy proceedings have been instituted against the Witherbee Storage Battery Co., Inc., 234 West 55th Street, New York City, by Eagle-Pitcher Lead Co., for \$1,500, Broadway Tire Jobbers, Inc., \$100, Graselli Chemical Co. \$800, Dorothy Spero \$18.

* * *

Elmer E. Martin, North Lima, Ohio, plans to sell sets and parts to the rural population in his vicinity.

* * *

The Fullerton Electric Co., 230 West Seventeenth street, New York City, has had confirmed a composition with its creditors on a 50 per cent. basis.

* * *

Wm. C. Shackett has obtained a judgment for \$173.39 against the Continental Radio & Electric Corporation of New York City.

Andrea Welcomes Patent Suit by Radio Corporation of America

UNDER the caption "Keeping in Style" F. A. D. Andrea, Inc., 1581 Jerome Ave., New York City, sends the following communication to RADIO WORLD:

"Early this year our friend and worthy competitor, A. H. Grebe & Co., announced 'A New Spring Suit,' bearing reference to litigation instigated by the Radio Corporation of America.

"We take pleasure in advising the trade that within the past few days 'A New Fall Suit' has been filed by the Radio Corporation of America against F. A. D. Andrea, Inc., the substance of which is alleged infringement of the Rice & Hartley patents Nos. 1334118 and 1183875, respectively, through the manufacture and sale of radio receivers embodying the Hazeltine Neutrodyne circuit, in accordance with the patents and pending applications of Hazeltine.

"This action is most welcome as it affords opportunity for early adjudication of the validity and scope of the Rice & Hartley patents and the alleged infringement of these patents by apparatus manufactured and sold under the Hazeltine patents and pending application.

"This 'New Fall Suit' will be defended by F. A. D. Andrea, Inc., with the cooperation and support of the Independent Radio Manufacturers, Inc., of which organization F. A. D. Andrea, Inc., is a member.

"The Independent Radio Manufacturers, Inc., is a group of radio manufacturing companies who are prominent factors in the radio industry and whose interests are pooled as regards the use of certain patented inventions and the prosecution and defense thereof.

"The trade will no doubt recall the work of this organization last year in connection with the crystal patent litigation, instituted by the Radio Corporation's associate, the Wireless Specialty Apparatus Company, and the commendable action taken by the organization, both as regards the defense and the prosecution of its rights in this situation.

"The Independent Radio Manufacturers, Inc., are represented in patent matters by the firm of Penny, Davis, Marvin & Edmonds. They advise that there is a good and valid defense to the suit started by the Radio Corporation of America on the Rice & Hartley patents.

"From our legal advice we are lead to the independent and firm belief that the defense of our 'New Fall Suit' will result in absolutely no change in our activities in connection with the Hazeltine Neutrodyne receivers, and therefore both at present and in the future the manufacture and sale of this receiver will continue unabated.

Very truly yours,
F. A. D. ANDREA, INC.

WEIGHS ONLY 8 OZ

The Scientific

SEND NO MONEY!

20,000 TURNS EQUIVALENT TO 3,000 OHMS

2.95

THE PHONE IT TOOK A SOLID YEAR TO DESIGN

POST-PAID

LOUD SPEAKER UNIT '195

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

Order TODAY by Postcard and Pay Postman on arrival

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. Circulars on request. Dealers wanted.

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

RUSONITE

CRYSTAL RECTIFIER

(Patent Pending)

THE PERFECT SYNTHETIC CRYSTAL DETECTOR—SENSITIVE OVER ENTIRE SURFACE
No Humming for "Spikes" and Clear. Endorsed by Thousands of Satisfied Users.

Sensitivity Guaranteed Price Mounted **50c**

14 K Gold Supersensitive RUSONITE CATWHISKER. Price Permanent. Will not Oxidize. **25c**

RUSONITE REFLEX CRYSTAL
Manufactured Expressly for Reflex Circuits. Will Stand Up Under Heavy Plate Voltages.

Price Mounted **\$1.00**

Guaranteed

Order from your dealer or direct from **RUSONITE PRODUCTS CORP.**
15 Park Row New York, N. Y.

Kansas Telephone Company Gives Radio Broadcast

THERE are ever and anon new ideas popping up in some quarter or other, be it radio or telephone or the pruning of hedges. The latest radio wrinkle that has proved to be of a real service was tried out by J. A. Gustafson, manager of the Fredonia Telephone Co., Fredonia, Kansas.

Being a radio enthusiast he thought he could make the telephones serve some other purpose than the regular line work. He therefore hooked up a power amplifier to the regular lines, and informed the subscribers that for the nominal sum of one dollar a month he would furnish them with radio programs over

the telephone. He does not furnish loud speakers, but he furnishes the programs, which he picks up "in the air" and relays over the land lines. The programs start early in the morning with the market and crop reports and continue all day long, time signals, and dance music being given. A lot depends upon Mr. Gustafson's ability to satisfy the multitude, so he must pick out the programs that he thinks will please the entire list.

It might be of interest to state that there are 75 installations made to date, and that none of them interferes with the regulation traffic of ordinary everyday telephoning.

Compact Loop Antenna

A NEW form of loop antenna, or more properly compact folding loop antenna, has been devised by the Rocky Mountain Radio Company, 9 Church street, New York City. Instead of using many consecutive turns of wire this new antenna consists of a spiral spring which is really 80 feet long, but due to its construction, the loop itself is simply one turn of this spring.

The loop can be erected or taken down in 30 seconds, due to its peculiar construction, and when folded, occupies an exceedingly small space. The present construction as regards the spiral wire has been tested and found to equal any of the other form of loops of the solenoid variety, which take up quite a bit of space even when made in the portable form.

Radio Birthday Party

VAUGHN DE LEATH has extended a special invitation to all Station WDT fans to listen in to a special birthday program which will be broadcast from that station on September 26th.

There are many novelties and exceptionally fine numbers to be provided for the occasion.

The hour is an early one—seven to eight p. m. In fact, Vaughn says she does not think many people know about that early hour on Wednesday night. But she hopes everyone will be listening in on September 26th to attend her birthday party.

New Radio and Electrical Firms

Ajax Electric Hammer Corporation, New York City, tools, \$100,000; S. B. Howard, R. K. Thisle, H. C. Hurd. (Attorney, S. Ryan, Albany.)

Leff Electrical Co., Brooklyn, N. Y., \$20,000; D. Leff, H. Albert. (Attorney, J. H. Leff, 499 Hart St., Brooklyn.)

Post Radio and Electric Corp., New York City, \$10,000; M. Silberman, S. Modell, S. S. Lef. (Attorney, S. B. Leff, 200 Fifth Ave.)

Bensal-Bonis Co., New York City, to make radio devices, \$10,000; H. Bonis, D. Bensal, M. Hetterich. (Attorneys, Goodman & Werner, 51 Chambers St.)

The Marvelous

ERMCO STAT

The only compression rheostat on the market recognized by manufacturers of sets—who are using it as standard equipment. Constructed to take care of all the latest tubes, such as U. V. 109, U. V. 201A, W. D. 11, W. D. 12, etc., and also anticipates many possible future improvements. Sealed container assures uniformity and permanency. No possible loss of mixture in handling. The most expensive construction at the lowest retail price.

A Quality Product!

ALL RADIO DEALERS.

Type "A"—1 Amp., 75 ohms.....\$1.80
5 Amp., 30 O. (4 or more tubes)... 2.25
Type "B" for "B" Battery..... 1.80

Manufactured by
ELECTRIC REGULATOR MFG. CORP.
Woolworth Bldg.
N. Y. C.

CONTACT CLIP FOR BREAKING CIRCUIT.

CENTER WIRE TAPER POINTING NO NEW HOLES TO DRILL.

COMPRESSION CONNECTION OUTSIDE OF CONTAINER.

SEALED CONTAINER RESISTANCE MATERIAL CANNOT ESCAPE.

Radio Canoeists on Portage Lakes Hear Fight Returns

AKRON, Ohio.—Radio equipped canoes have become an essential part of the duffle of the modern camper, according to two local amateurs, who, while experimenting with a portable set on the Portage Lakes, heard fight returns from Eastern broadcast stations and amateur transmitters as far away as Philadelphia and Chicago. D. A. Hoffman, of the American Radio League and operator of the amateur station 8UX, and Fred Ash agree that radio installation on canoes is entirely practical.

A compact home-made single regenerative receiver, using a detector and one stage audio amplification with C299 tubes, was available. This set, with a motor-cycle storage battery and the necessary B batteries, was placed on the bottom of the canoe. Two six-foot bamboo poles were stuck in the flag sockets at each end and a spiral aerial, consisting of 150 feet of insulated fixture wire, was looped between the two poles on a piece of clothes-line.

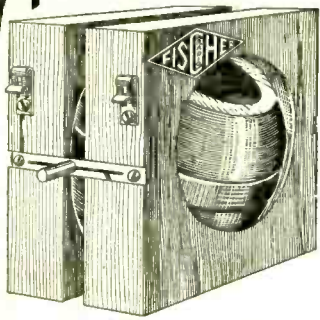
The ground consisted of a ten-foot piece of bare wire which was connected to the set at one end and dropped overboard.

Each of the two experimenters wore a headset and the first station copied was 9AJA, Chicago. Other amateurs heard were 9EKU, Devil's Lake, North Dakota; 9EKF, St. Louis, Mo.; 8DGX, Pittsburgh, Pa.; 8OK, Lewisburg, W. Va.; 8SF,

Sharpsburgh, Pa., and 9AWK, Elgin, Ill. All but two of these were CW stations and came in with good intensity.

Fight returns from KDKA and concerts from WLW were also heard plainly. Other canoeists who witnessed the experiments were envious. Hoffman says he will make other experiments with a transmitter in an effort to establish two-way communication with amateur stations within 100 miles of his canoe. The stunt of transmitting from such a small craft presents a big problem, but it is just such problems that the amateur fraternity are always eager to solve.

Approved!



The Champ—VARIOMETER NO. 53
Approved as a Record Breaker

Approved because it makes 600 Meters
Approved because it has a genuine mahogany stator and a kiln dried rotor
Approved because of Fahnestock spring clip connections and non-conductive adhesive
Approved because—you'll know when you

GET ONE FOR \$3.50

20 Diagrams FREE with Each

For sale at your dealer's—otherwise send the \$3.50 directly to the manufacturer and you will be supplied postpaid.

G. H. FISCHER & CO.

123 Liberty Street New York City

Original Nathaniel

Baldwin

Type C

HEAD SET

Complete

SPECIAL
PRICE

\$11.75



Free with each pair of these world's best phones I give absolutely free a \$5.00

SHELTONE LOUD SPEAKER

This is a wonderful Loud Speaker. Both for less than the regular price of the phones. Head set can be used in the regular way as well as on Loud Speaker.

Cash with Order or C. O. D.

WALTER SCOTT

1157 BROAD ST. NEWARK, N. J.

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 resistance, vernier rheostat, socket, double jack, dials, switch, contact points, posts, busbar, wire, spaggetti, 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

Sell Shirts

Sell Madison "Better-Made" Shirts, Pajamas, and Nightshirts direct from our factory to wearer. Nationally advertised. Easy to sell. Exclusive patterns. Exceptional values. No experience or capital required. Large steady income assured. Entirely new proposition. WRITE FOR FREE SAMPLES. MADISON SHIRT CO., 503 B'way, N.Y. City

Station WBZ Broadcasts City Chimes

ONE of the new features on WBZ's interesting and varied program is the broadcasting of the chimes located in the lofty "Campanile," the Madison Square Tower of Springfield, Mass. These chimes, which can be heard for miles round the country, are broadcast every Sunday night before church services at 7:30 p. m.

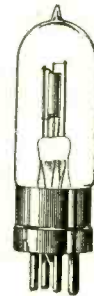
The selections open with the playing of "America," and end with "Taps." Because of their great beauty and variety, it is possible to play many fine musical numbers and selections. Several tests have demonstrated the beauty of music from chimes, which is particularly adapted to radio broadcasting.

It is an interesting and unusual fact that listeners at their radio receiving sets located thousands of miles away receive the music from the chimes several seconds before the strollers in the municipal park near the Campanile or by the men in the fields about the city. It takes actually less time for the electric impulses carrying the music to make the journey over the wires to the Westinghouse broadcasting plant in East Springfield, and to send them broadcast for thousands of miles, than it does for the sound waves themselves to reach the ears of the listeners in the park, several hundred feet below. In fact, the radio waves could circle the earth seven times before the sound could go 1,000 feet.

This is due to the fact that sound waves travel much slower than radio waves, which cover a thousand miles in one one-hundred-and-sixty-sixth of a second.

Proposed Broadcasting in Southern France

AN attempt is being made by local business men in Marseilles, France, to establish a broadcasting station in collaboration with the newspapers of the city. A local dealer in French-made sets is said to be the prime mover in the project.



WE REPAIR RADIO TUBES

WD-11... \$3.50	UV-199... \$3.50
WD-12... 3.50	C-299... 3.50
UV-200... 2.75	UV-201A... 2.50
UV-201... 3.00	C-301A... 3.50
C-300... 2.75	UV-202... 4.00
C-301... 3.00	C-302... 4.00
DV-6A... 3.50	

Mail orders solicited and promptly attended to.
Dealers and agents write for special discounts.

H. & H. RADIO CO.

P. O. Box 22-B

Clinton-Hill Station

Newark, N. J.

Acmedyne Circuit

Tuned Radio-Frequency at Its Best

Described in detail by Mr. Lawrence Cockaday in the August "Popular Radio" and recommended by experts in all parts of the country.

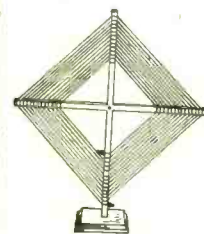
We carry all parts in stock. Write or call for complete information.

Also write for our price list on other standard quality radio apparatus.

Rametra

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23 Warren St.
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\$1.25

Loop Antenna

Post Paid in U. S. A.
A highly efficient complete indoor aerial.

Write for literature describing Radio Cabinets and other products.

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Woodworking Co.**
LIBERTYVILLE, ILL.

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We Sell New Tipless Electric Bulbs for Home and Store

Also Miniature Bulbs for Automobile and Decorative Purposes at CUT prices. BEST GRADE ONLY. Agents Wanted.

Vacuum Electric Wks.
Station C Toledo, Ohio

10c

Brings you our new catalogue and radio information booklet illustrating and describing the Super-Regenerative and other latest and popular circuits. Our technical staff is at the disposal of our customers. Make use of their knowledge. Merchandise shipped immediately on receipt of order.

U. S. Bureau of Standards "Radio Book." Special 65c.
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227 FULTON STREET, NEW YORK CITY

RADIO WORLD

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 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.

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 Half, Quarter, Third and Two-thirds pages at proportionate rates.
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 On four consecutive issues, 10% discount.
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 Cover and preferred-position rates made known on application.
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Five cents per word. Minimum, 10 words.
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While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

Life Would Be Brighter If

THE ham next door would learn to stay in one place all evening instead of running around footloose with his single circuit squeaker and ruining all your programs with a Wheeeeeeeeeee-squack—Wheeeeeeeeeee, every time you think that you are going to have a second's peace.

Static wasn't sure to ruin all chances of distance just the night you bring your friends from the office up to hear "some real DX on the loud speaker."

You could tap your blown out tubes the same as you do the electric lights and make the filament last "just a few weeks more."

Every time you had your receiver finished and working some friend wouldn't pop in and tell you about "the wonderful results I got last night on the Doo Diddle Dum dum circuit" and make you unhappy that you can't do the same.

Every time you got in trouble when making a set you had the expert advice of the inventor—and the inventor himself right at your elbow.

You could get the average salesman in the average radio store to give you his real opinion of the apparatus he is trying so hard to sell to you at a bargain price.

You could make a set using a crystal that would actually bring in the broadcasters over a radius of 1,000 miles every night.

TELEPHONE NUMBER CHANGED

The telephone number of RADIO WORLD has been changed to LACKAWANNA 6976

Do You Want LONG DISTANCE on Your Set?

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WDAP—Chicago
 CFCN—Calgary
 WWJ—Detroit
 FWX—Havana
 WSB—Atlanta
 And Many More



The COAST COUPLER is a necessary part of your radio hook up. Manufactured of the best materials obtainable and thoroughly tested before leaving the factory, it has immediately won recognition in the radio market.

ANYWHERE IN THE UNITED STATES—\$5.00

Dealers and Jobbers Investigate

COAST COUPLER COMPANY

245 EAST SEVENTH STREET

LONG BEACH, CALIFORNIA



SUNBEAM

COCKADAY COILS \$2.50 A SET

17-Plate Vernier Condenser.....\$3.25

PANELS—GRADE A RUBBER

7 x 10.....65c 7 x 12.....80c 7 x 14.....90c
 7 x 18.....\$1.25 7 x 24.....\$1.65

Parts for Neutrodyne set

Complete line at special prices

23-Plate Vernier Condenser.....Special, \$3.25

Send us your address—Get our Special Weekly Offerings.

SUNBEAM ELECTRIC COMPANY

71 THIRD AVENUE

NEW YORK

207 EAST 14TH STREET



Tubes at One-Half Cost

IT HAS HAPPENED TO ALL OF YOU IN A FRACTION 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 receiving tube. All our tubes are TESTED and GUARANTEED to function as well as when new.

All tubes returned P. P., C. O. D.

HARVARD RADIO LABORATORIES

BOSTON

P. O. BOX 1781

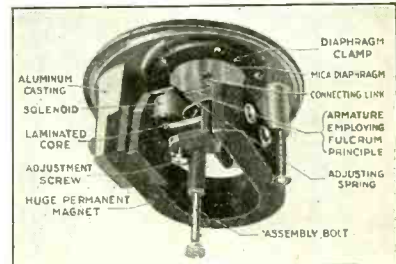
MASS.

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.

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Radio World wants a representative in every grammar, high and preparatory school in the United States and Canada.

We have a special proposition that will enable representatives to make money. Appointments made now. Give name of school you will attend in the Fall.

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AMATEURS! FANS!
ATTENTION!
ALL BROADCASTING STATIONS—Complete with the call, location, wave length, frequency of the station, and power used started in Radio World of June 9.
 This list is most complete, and no amateur or fan should be without it. It will be completed in following issues, and as revisions or changes are made the list will be kept up-to-date, so that you will always have an up-to-date list to which you can refer. Don't miss any issue. Send 15c to
RADIO WORLD, 1493 BROADWAY
 New York City, or start your subscription with that number.
DO IT NOW—DON'T DELAY!

Why Tubes Sometimes Blow

JOHNNIE JONES tells the fellows down at the office that he has just put in the new radio set and invites them all up to hear the fight. Of course, they acquiesce and he sets a date for them telling friend wife that she had better prepare a few sandwiches.

That night they all gather around the radio set, which is going fine and dandy, and the stations are just coming in great. Suddenly Station BUNK opens up, and the announcer speaks something like this: "Good evening, ladies and gentlemen of our unseen audience. Before going on with the program we have an important announcement to make. Just stand by for a few seconds, please."

Every one holds his breath in expectant excitement and not a few offer suggestions of what the forthcoming announcement will be. "—er. Kauff—kauf—. This is Station BUNK. Due to the fact that unforeseen difficulties have arisen, we will not broadcast the Bennard-Battling Murphy fight tonight. In place of this we have arranged a program of very excellent talks on 'The Importance of Proteins in Your Daily Diet,' to be given by Professor Fulla Josh. I take great pleasure in introducing Professor Josh."

Now isn't that enough to make any tube just fold up and commit hari-kari?

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Como Duplex Transformers
 Send for literature immediately.
COMO APPARATUS COMPANY
 446 Tremont St. Boston, Mass.

To Radio World readers who may have missed recent numbers
 The newstand sales of Radio World have increased so rapidly for several weeks past that some of our readers were disappointed to find their regular newsdealers had sold out their supplies. This is for you! If you are among the disappointed ones, send 15c per copy and we will mail you any of the recent issues that you may have missed, so that you can complete your files.
RADIO WORLD
 1493 Broadway New York

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 Send old tubes with \$1.50 and receive by return mail a guaranteed tube. Be sure and state in your letter type wanted; detectors or amplifiers.
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 If you wish you may send us \$6.00 for Radio World for one year (52 issues), and Popular Radio or Wireless Age, or Radio News or Radio Dealer, or Radio for twelve months, both postpaid. This offer good only if mailed by October 1, 1923.

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Mr. Shaw Believes in Long Aerials

EDITOR, RADIO WORLD:

Referring to my letter in your number of September 8th, I regret extremely to have to ask you to correct two errors.

I stated that I could not get broadcast stations with my four-tube crystal detector reflex receiving on my single wire antenna, 250 feet long (50 feet high). This was due to B battery trouble. I am now getting as good reception of broadcast stations as could be asked for on the above antenna on a three-tube regenerative circuit, a six-tube radio-frequency circuit, and a four-tube and crystal detector reflex circuit and a five-tube neutrodyne circuit.

I might add that this is my first experience with the neutrodyne circuit and I find it wonderfully satisfactory. It tunes very sharply and is the most powerful of all my circuits above mentioned.

The other mistake was to put a period in the wrong place, making it appear that I could get the shortest amateur stations better on a short 100-foot single antenna (30 feet high) than on the 250-foot antenna at Seal Harbor, Maine, which antenna is also 30 feet high. As a matter of fact and greatly to my surprise, I got 200 meters and below very much better on the 250-foot single wire antenna than on the 100-foot antenna.

My experience would lead me in putting up a new antenna to make it as high and as long as conditions would permit and if more convenient to use plain copper wire rather than multiple strand, I would not hesitate to do so. As far as I can see the reception on one is as good as on the other.

In conclusion, I would repeat—make your antenna as long as you can and as high as you can. Yours very truly,

160 State Street, W. K. SHAW.
Boston, Mass.

He Enjoys Radio, Anyway

JONESY: "Say, Bill, what do you enjoy most on your radio?"

Bill: "Well, when the wife is in I have to enjoy opera selections or fashion talks. When daughter has a caller it is generally ballads or jazz. When son is around, he goes DXing. So I generally enjoy what I get—like ordering hash in a restaurant."

TELEPHONE NUMBER CHANGED

The telephone number of RADIO WORLD has been changed to LACKAWANNA 6976

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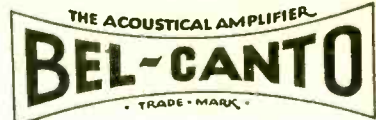
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44 West 117th Street New York City

**Arctic Trading Posts Enjoy
American Radio Concerts**

THOUGH ice-bound and in darkness through the long winter months, trading posts in the Arctic zone will not be entirely isolated from civilization and life. According to plans made by the Hudson's Bay Company, lonely posts will be provided with radio receiving sets so as to secure entertainment at any time. Two north-bound ships, the S.S. "Bayeskimo" and the S.S. "Nascopic" are carrying Westinghouse radio receiving sets to six of the posts above the Arctic Circle.

In order to determine whether or not these posts will be able to hear the concerts from the United States next winter, the ships are listening in on their way north to the broadcasts as they steam to the frigid zone. Several nights ago, the Westinghouse Station WBZ in Springfield, Mass., gave a special concert at 11 p. m. and radiograms received from the steamship "Bayeskimo" state that the music has been heard with great success.

There are hundreds of posts spread throughout Canada and North America, from above the Arctic Circle into James Bay. The ships have left for these trading posts and the factors will have their sets for next winter. Although the reports received so far from the ships are very encouraging, complete information on the results secured will be obtained upon their return. The posts are so far removed from civilization that this will be the last news from the outposts until spring. The lanes of travel to these posts are entirely blocked on account of the heavy ice which accumulates.

**WBZ Fans to Compete for
Short Story Prizes**

PERSONS who like to write, or who want to learn how, will welcome the announcement from Station WBZ that a course in short story writing will be broadcast at regular intervals.

Dr. J. Berg Esenwein, probably the best known national authority on short story writing, has been chosen by Station WBZ to give the course. Every Thursday evening, at the same hour, and continuing for ten weeks, Dr. Esenwein will give ten separate and complete lectures on the elements of writing, development of plots, climaxes, treatment, etc., which will cover the subject in a most thorough manner.

At the conclusion of the course, any person who has been listening to the series of lectures will be eligible to enter the contest of short story writing, for which a first prize of \$25, a second and third prize of \$15 and \$10 respectively will be awarded. Dr. Esenwein will outline briefly, at the beginning of the course the conditions for the contest and fans will listen in carefully, as the stories will have to be written so as to show that the course has been followed.

The introduction of this feature in the program of the Westinghouse station at Springfield, Mass., is an innovation in broadcasting. It is the belief of the station that such a course will accomplish more to justify broadcasting that the miscellaneous talks which have been so current at most stations. The outcome of this experiment is to be watched with interest.

Lakes Radio Bulletins

WEATHER bulletins and hydrographic information will be broadcast twice daily by the Intercity Radio Company, located in Cleveland, on Lake Erie. The service is intended for the shipping on the Great Lakes, and will be broadcast on a wave length of 706 meters, spark. The call of the station is WTK. This station also is licensed to communicate with Rogers City, Mich., on a wave of 1,764 meters.

**The Condenser
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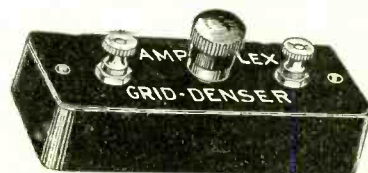
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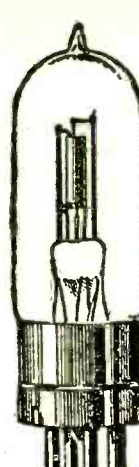
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To the DX Nite Owls

and anyone else interested in radiol If you missed RADIO WORLD, dated Feb. 24, with the famous Flewelling Circuit, get it now and get your EARS WET! Send 15c or start your subscription with that number. RADIO WORLD, 1493 Broadway, New York.

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YOU CW BOYS!

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Then you will want these back numbers of Radio World: March 31. A Low Power CW Transmitter, by C. White. April 31. Hiass Transmitter, by John Kent (circuit used by 3VK). May 5. Combined CW and Phone Set of M. Beaubat at Radio Central. May 26. A Simple CW or Phone Set That Works. E. W. H. Decker, 3UA. These numbers describe in detail all the various parts, with complete instructions as to how to operate. No AD to date amateur should be without them. 15c a copy. The four copies for 60c. or start your subscription with any number.

Salesmanship Behind the Counter

WHAT does it matter if the manufacturer produces the best goods in the world, if he advertises them under a trade-marked name so consistently that they are known from coast to coast, if he puts them on the shelves of practically all the retailers; the spiders will merrily spin webs around them if they are not sold by the retailer—the ultimate salesman. That's why economists, researchers, and investigators on the trail of "cost of distribution" have followed the goods of the world into the retail store and have told the retailer—that is, the average retailer—that his turnover is too low, says Arthur W. Little in "Forbes" Magazine.

In scores of smaller stores in America and particularly in the more progressive smaller retail establishments in the Middle and Far West, the investigator finds little classes in salesmanship established by the proprietors and conducted by methods similar to the training methods of the metropolitan stores. Sales forces assemble in the stores in the evenings and study merchandise analysis and stage mock sales.

Often these evening sessions are addressed by the traveling salesmen of concerns from whom the stores buy goods. Manufacturers and wholesalers whose products are marketed by retail stores are training their salesmen in all branches of retail merchandising; these road men often are former retail salesmen; they know how to sell and they go out into their territories with orders from headquarters to impart their knowledge of salesmanship to their customers.

In Lawrence, Kansas, is the store of a retail clothier who, among clothiers everywhere, is considered a big-league merchandiser.

"Listen" this man confided to me, "the best source in the world for selling ammunition is the traveling salesman. Me? I never buy a bill of goods that I don't demand, along with the goods, enough information about them to sell them. When I put in a new line, I kidnap the salesman. Then I call my own men together and say to them, 'Boys, this fellow here just sold me some goods, and he gave me a danged good selling talk about them. Now I'm going to ask him to repeat that talk to you. I want you to make notes and ask questions; so that when the goods come in, you can sell them.'"

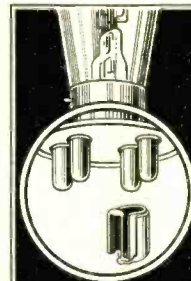
Radio Penetrates Grand Canyon

THE Geological Survey party carrying a radio set on a trip through the Grand Canyon of the Colorado, has arrived safely at Bright Angel trail. Notwithstanding the predictions of experts that it would be impossible to receive radio messages while in the bottom of Grand Canyon, Colonel Birdseye reports that he is in daily receipt of messages broadcast from Los Angeles, Salt Lake and Chicago. He received the news of President Harding's death within 45 minutes after it occurred. Reports of his progress will be sent out for broadcasting when he reached Basstrail about September 10, Supai Creek September 20 and Diamond Creek October 15.

TELEPHONE NUMBER CHANGED

The telephone number of **RADIO WORLD** has been changed to **LACKAWANNA 6976**

PROTECT THE HEART OF YOUR RADIO SET



Vacuum Tubes are costly and extremely delicate. B battery or any other excessive current applied for only the fraction of a second to the filament leads will burn out your tubes. You have probably already had this experience and it is apt to happen again at any time. A burnt out tube means money lost—the set out of commission —inconvenience to you.

Why Take These Chances When RADECO SAFETY FUSES

will absolutely protect your tubes. Applied in an instant to the filament terminals. Will fit any standard tube or go in any standard socket. Fully guaranteed. 50 cts. each. Sent Postpaid. Delay may be costly. Write now. Specify type of tube used.

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Resembles a peanut in size and shape.

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A Real Business Getter This Year

LOWER COST		List Price
BETTER RESULTS		\$2.00

Sockets40c
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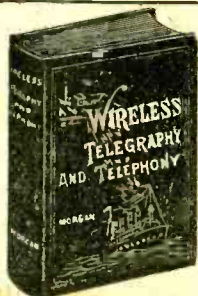
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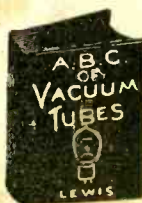
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