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May

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Radio Journal

Established in 1922

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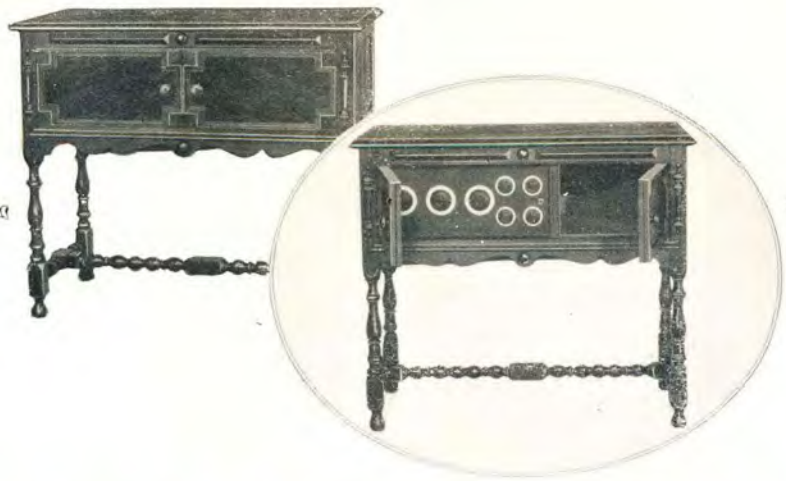

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A Thrill for Two Continents

ENGLAND has heard the Nightingale!
A million people thrilled at that note of the world's perfect singer as it floated out from the moonlit thicket of Surrey across the rolling meadows, dipping the moon-kissed surface of the myriad lakes that dimple the wooded dells.

Along the rocky shores of Scotland where the fisherman had laid aside his dripping nets that same matchless, lovely note from the moonlit thicket at Surrey found its way.

Even across the channel to the continent of sunny France where romance hovers in quaint places this lover's song of the Nightingale floated and quickened the spirit of lovers, young and old.

Stentor a Step in Advance of London

Lovely as the thrill of hearing the Nightingale was, England has not yet had its thrill in the radio world over the perfect reproduction of the Nightingale's note.

There was a great night months and months ago in the

Stentor laboratories in the city of Los Angeles when the experts listened for that same tone quality of the Nightingale's high note from the mouth of their new loud speaker unit—The Stentor. To reproduce sweetly and clearly the most difficult tone pitch of the Nightingale with its 4200 vibrations per second, required a step beyond radio accomplishment of that date. The radio world demanded an instrument that could catch this tone quality and reproduce it in the clear, sweet, melodious, liquid notes as perfectly as the bird itself, for the notes of the piccolo and the harmonics of the saxaphone particularly demand such a test in the high tone reproduction. This, experts concede the Stentor California Nightingale Unit has done. Hence its name.

Million Hear Nightingale Over Radio

By United Press

LONDON, May 20.—A nightingale sang in a moonlit Surrey thicket last night and all England heard the song.

More than 1,000,000 radio fans in all parts of the country "listened in" as the clear notes of the feathered songster were caught in a microphone and carried by land line to London whence they were broadcast.

It is planned to repeat the concert next week. It is hoped that radio fans in the United States may hear. Last night the bird's song was heard as far as Calomes in France.

The scene at Oxted, near which the experiment took place, was remarkable. Several nightingales had been coaxed to a thicket, where they were accustomed to nest.

Tiptoeing softly about the garden where the little songsters were nestling, Mrs. Beatrice Harrison played several soft notes on a cello.

Suddenly the nightingale's clear song burst on the moonlit air. The cello accompanied it for a few minutes, then ceased and the nightingale sang on alone.

Stentor Triumphs with Nightingale's Perfect Notes

And Stentor has for several months been producing this same tone quality of the Nightingale—clear, distinct, unwavering, sweet. This Stentor Super-Speaker with the California Nightingale Unit now produces the 4200 vibrations per second of the piccolo and picks up perfectly all of the difficult harmonics of the saxaphone. It may be carrying the tones of birds, yet without distortion it swings perfectly into the pondrous, even thundrous tones of a massive pipe organ.

The California Nightingale Unit Requires no Adjustment.

Once this unit leaves our laboratories, there is no further adjustment necessary—ever. Adjustments are made for perfect reproduction by the Stentorfone Company and sealed. As long as it remains sealed it carries our guarantee.

The Stentor California Nightingale Super-Speaker is an addition of note to any home for it is small, built with a beautiful polished mahogany base and with a gracefully curved horn modeled after the bell of the mellow trombone.

A rubber adaptor permits attachment of the California Nightingale Stentor Unit with any phonograph thus giving a loud speaker for dancing or concert in or out of doors.

As England heard the Nightingale the listeners would have appreciated instantly by comparison the perfection of the Stentor California Nightingale Unit which has successfully eliminated the factors that have made radio reproduction objectionable, because imperfect.

The Stentor California Nightingale Super-Speaker wins by comparison.

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Radio Journal
Los Angeles ~ California

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Radio Journal

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Editorial Comment

Making Over a Nation

Impossibilities become possibilities, then probabilities, then marvelous realities, then luxuries—and then everyday necessities. This is the nutshell story of radio. And with it has come a change in the problems of radio, together with a change in the nation's mental complex. Some of us can remember the first commercial telephones, electric lights; others can remember the first motor car, the first photograph, the first moving picture, the first aeroplane—and all of us the first broadcast receiver. Each of these, in its own way, has brought or is bringing a real change in the mental outlook of all of us, collectively speaking. Take the analogy presented by the moving picture and the phonograph. Each was at first a marvel. The idea of seeing people move on the screen, of hearing the human voice reproduced by machinery—it seemed marvelous. Then the value of art, entertainment and education to be derived from these agencies came to the fore. From mechanical marvels accomplishing the impossible they became luxuries. Folks of affluence installed phonographs in their homes and the less fortunate neighbors were permitted to listen, sometimes. Large cities began witnessing movies. And then they became necessities. But in doing so these mediums of expression, if you please, had to accomplish a very definite thing. They had to serve the public, but in doing so they widened the public's acquaintance with the best in art and fiction, as well as with much that is not considered the best, and as a result the viewpoint, the mental horizon of Mr. and Mrs. Public and the little Publics has been extended far beyond its previous range. They became acquainted with operas and with great men, visually as well as orally. And now comes radio—a super-wonder, a marvel of the age, but already a necessity. It picks its voices from the air, but already art is stepping in. Questions of distance, clarity, volume and reproduction are being solved. Now it is a question of what can be had from this music and voice filled ether (with apologies to those who do not believe in ether); and further, what should be served out by broadcast stations. The elements are altogether different, the stage is different, the medium is different. The whole thing is more complex than with either the silver screen or the phonograph. Yet already the mental horizon of Mr. and Mrs. Public and their children has been shoved farther into the distance. It promises to evaporate altogether and give them a world viewpoint and outlook. Thousands upon thousands who would not buy an operatic record, or the work of a famous violinist, or any of the thousand and one musical works so ably reproduced upon phonograph records today—have been intrigued into listening to these same things via radio, have become interested, and now they like them. Not all, of course. To like all classical music simply because it is classical is as foolish as to like all books because they are books. Tastes vary as widely as individuals, but any agency which lends itself to a wider appreciation and discrimination is a wonder factor for betterment of man, and as such an agency radio has no peer.

About Geese and Eggs

Some otherwise estimable poet once tacked the term "inconsistency" to woman—and we have all taken it for granted. What a witless lot we are. For what colossal gems of inconsistency are to be found baldly put forth by men, business men, staunch defenders of commercial integrity and greater industry. Witness one "pearl without price" in this category. In the hearings before congress on broadcasting copyrighted music etc., the so-called American Society of Authors and Composers exhausted themselves and their witnesses in trying to prove that radio ruins their songs and kills their business. And while they were tearfully pleading with congress to behold their horrible plight, their salesmen were out doing their darndest to solicit broadcast stations to become licensees, and their membership was using every known ruse to have their music broadcast. Strange as it may seem the irony of the situation registered with the law makers. One congressman observed, "If radio is as injurious to their business as they say, why don't they cancel what broadcaster's licenses they have, as they have a right to do under the terms of their license, and refuse to let any broadcasters use their music under any terms?" You bet! Why don't they? Because if they succeed in getting a world of free publicity for their music through broadcasting and can make broadcasting pay for the privilege of doing this advertising they have succeeded in bringing back to earth the nearest imitation of "the goose that laid the golden egg" ever devised.

Every once in a while we are forced to revise an opinion hitherto as fixed as our neighbor's glass eye. The other month a British broadcaster conceived the idea of holding a dog howling contest via the michrophone. Noted dogs from all parts of the tight little isle were entered. The grand howl, which won the contest, lasted half an hour. Those with ideas as to the British lack of humor step forward.

Aha! A new field, friend salesmen. We notice "by the papers," as our back fence anthologist would say, that a radio concert was insured the other day against static. Get out the little leather folder friends, and pack therein the literature of your insurance company and start calling on the trade.

Light, Energy and Radio Activity

By REX CARRELL

Just how the electron behaves, or misbehaves, what his function really is, where radiant energy comes from and what it will and can do, and numerous other correlated questions are being worked out in a remarkable way by Dr. Millikan and his associates at the Pasadena Institute of Technology. The story of their work is romance as vivid as any ever pictured by masters of literature.

AGAIN the California Institute of Technology, headed by Robert A. Millikan, is instrumental in making strides in science and, incidentally, moves the world a big step forward in the eternal search after the secret of what this world is made of. Recent discoveries made in the Pasadena laboratories are as momentous as anything that has been brought to light since Dr. Millikan himself succeeded in isolating the electron, photographing it and weighing it, for which achievement he was recently awarded the Nobel prize.

The two discoveries are, that light energy travels in definite amounts and obeys the same laws that govern matter; and second, that radio-activity comes not only from within the earth but also from its atmosphere. Both discoveries seem to bring us nearer the solution of the fundamental question "Is there one primordial substance from which all the varying forms of matter have been evolved?"

Dr. J. A. Becker, national research fellow in physics, a graduate of Cornell, designed and carried out the experiments in light energy and its travels. Dr. Russell M. Otis research fellow in physics and a graduate of the California Institute of Technology did the larger share of the experimental work on the subject of radio-activity. Work was conducted under the general supervision and direction of Dr. Millikan, director of the Norman Bridge Laboratory of Physics and head of the institute, and Prof. E. C. Witson of the department of physics of the institution.

About a year ago Prof. A. H. Compton of the University of Chicago announced his theory that the scattering of the X-rays is due to free electrons—electrons which for some reason or other have been separated from their nucleus and are roaming about in space—acting much as dust in a room does when a beam of sunlight is thrown across it. The dust particles in this latter example scatter the rays of the sun, else one would not see the sunlight at all save where it hit on the opposite wall. But when the sunlight hits the dust the dust scatters it, so some of it reaches the eye and we are able to trace the course of the beam across the room. For a long time science has been searching for the reason for the scattering of the X-ray in much the same fashion.

A quantum of radiant energy is the smallest unit of energy that can take part in a reaction between light and matter, just as an atom is the smallest unit of a chemical element that can take part in a chemical reaction. Compton predicted that the wave-length of the scattered quanta of X-rays will be determined by what they strike.

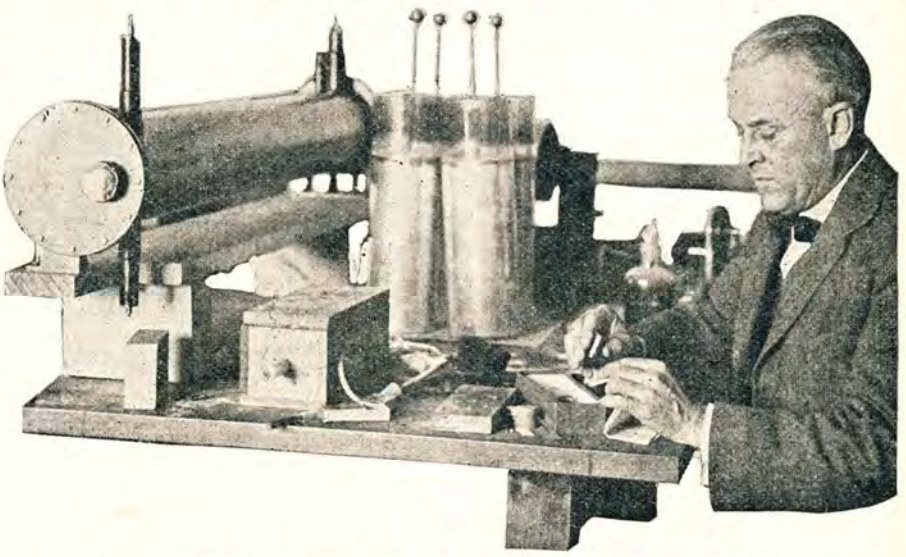
In other words, if light travels in small chunks the color with which it will come back after striking an obstacle will be determined by what it strikes. If it runs into an atom, tiny in itself but huge in comparison to the quanta, it will bounce back without any change in color. If, on the other hand, it strikes a free electron, whose mass, or size is 1800 times smaller than a hydrogen atom, or 360,000 times smaller than that of a mercury atom, it will come back with a reduced wave-length—which means a different color.

If this is correct it changes the conception of what light is and how it travels, and proves that light and matter obey the same laws. It would seem, also, that if this is correct there is no essential difference between matter and energy!

Prof. Compton shot a beam of X-rays at a piece of metal and found that the wave-lengths scattered by various elements actually changed. Prof. P. A. Ross of Stanford obtained the same results. He found that for every line that entered his scattering substance, two came out. One returned with a changed wave-length and one unchanged.

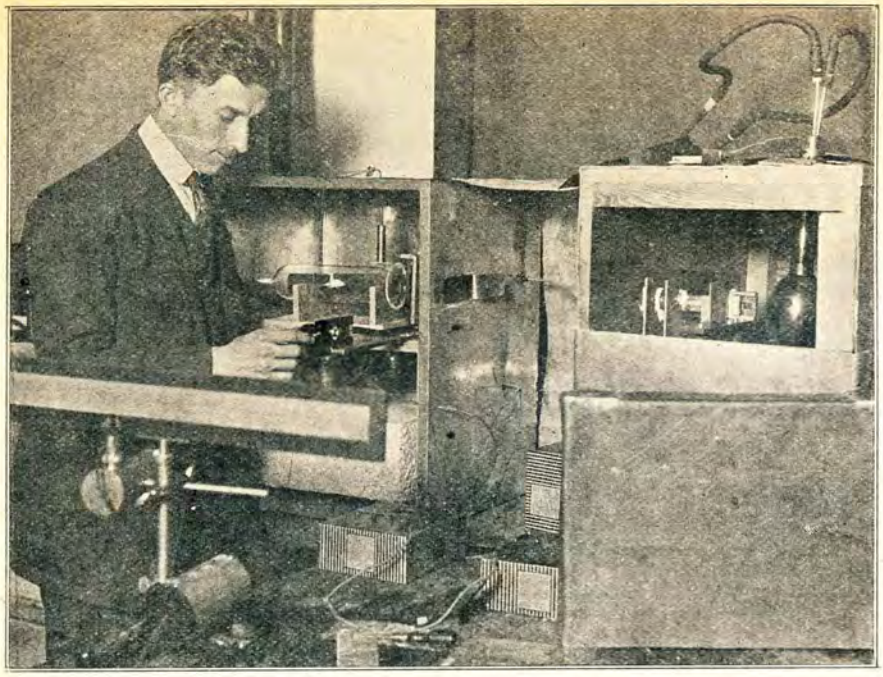
This simply meant that some particles of light—quanta—were scattered by the atoms and some by electrons.

Prof. William Duane of Harvard, pioneer investigator of X-rays in this country, announced that he had performed a long series of experiments and was able to obtain the "Compton shift." But he said he found something else. This he called tertiary radiation. Prof. Compton went to Harvard and there repeated his own experiments, and was unable to find the shift at Harvard, although he had no difficulty of obtaining his results at home.



Dr. Robert A. Millikan, famous scientist who isolated the electron, in his laboratory at the California Institute of Technology. Dr. Millikan was awarded the Nobel Prize for his recent work. (Photo courtesy the L. A. Times.)

It was at this stage of the controversy that the work at the California Institute of Technology was undertaken. The Norman Bridge experiments showed that both Compton and Duane were right. Duane probably failed to get the Compton shift because he used too low an intensity of X-rays, and the Pasadena scientists



Dr. J. A. Becker at special apparatus for testing the Compton theory. (Photo courtesy the L. A. Times.)

were able to obtain both results on the same phonographic plate!

One of the rules these experiments have confirmed is that radiant energy —light waves—does not travel in continuous streams but that it goes along in minute bundles of energy called quanta and that when these quanta strike matter they act much the same as a tiny chunk of matter.

The discoveries made by Dr. Otis and his associates in the study of what the scientists call penetrating radiations promise to be of great value in solving some of the problems confronting wireless and radio communications.

It announced the theory that gamma rays exist in the atmosphere in increased intensity in proportion to the distance from the earth. These rays have been called "nature's X-rays" and are shot out by the radio-active substances known to exist in the earth. The question then at once arose "Why, then, should these rays become stronger away from the earth?"

Scientific calculations told the physicists that if the gamma rays come from the sun they have to penetrate atmospheric resistance equal to two and one-half feet of lead. But it was an important problem, for untold possibilities lay behind the answer to this question.

The first step was to check Kolhorster's statement that the penetrating radiations—or Nature's X-rays, grew stronger the higher one went. A marvelous instrument, the electroscope, was used, and extensive tests were made by Dr. Otis and associates under the direction of Prof. Millikan.

Radiations are measured by making use of the fact that the gamma rays split the molecules of air into two parts, one charged negatively and one positively. The rays accomplish this by striking the atoms making up the air inside the can and creating sufficient agitation in the atoms to dislodge the nearest electrons from their accustomed places. And while these electrons are shot out of their orbits, the electroscope counts them.

Inside the instrument there is an air-tight chamber in which are suspended from an insulated point two quartz fibers, smaller in size than the spider's web threads. These fibers are plated with platinum to make them conducting. The fibers, now covered with the metal, are charged with negative electricity by being connected to an ordinary radio "B" battery. Negatively charged bodies, as is well known, attract positive charged bodies, and vice versa. Picture now the gamma ray—nature's X-ray—as it passes through the brass and finds its way inside the chamber of the electroscope. As it strikes molecules of air it tears out the negatively charged electrons —the ones nearest the outer rims of the atoms in the molecules of air. The molecules, having lost some negatively charged electrons, also lose their balance and become positively charged.

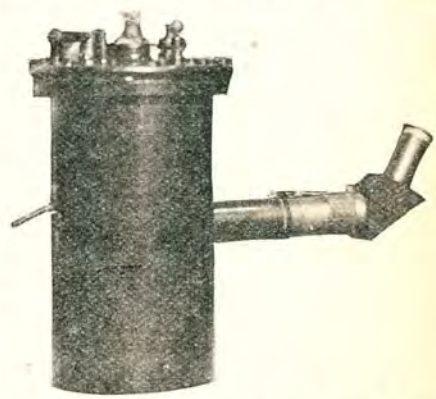
The negatively charged platinum-covered fibers now begin to attract the positively charged molecules of air. The disturbed molecules are just simply drawn to the fibers, and stream toward them. Then they will pick up the electrons, thereby reducing the charge on the fibers.

Dr. Otis has calculated that at sea-level there will be about 20,000 of molecules drawn on the fibers each second.

When the fibers are first charged they spread apart through mutual repulsion because both had negative electricity shot into them. In the meantime the impact of the molecules against the fibers—molecules that were made positive by the action of the gamma rays on them—dislodge negative electrons from the fibers, thereby reducing the charge. And as the charge is weakened the fibers come closer together. The only thing that remains is to measure with the help of the miscroscopic scale in the tube how much the fibers come together in a given length of time. This will determine how many charged molecules have been pulled on to the fibers. And the more rays penetrate the electroscope the more molecules are drawn to the fibers.

With the electroscope Dr. Otis went up in Army Planes from March and Rockwell fields, to the altitude of 19,000 feet. Way up above the clouds, at every 3000 feet, he made tests and brought back data to show that the German scientist was correct. Captive balloons from Ross Field also were used. These experiments were made in 1922 and 1923, and left no doubt that Kolhorster was correct.

Mount Whitney, the highest mountain in the country, was selected for the tests. With Dr. Otis were Prof. P.



This is the Electroscope with which many marvelous things are accomplished in the way of finding out what constitutes matter. (Photo courtesy the L. A. Times.)

Epstein, I. S. Bowen and L. Mott-Smith. At the altitude of 13,000 feet the party had to abandon the pack animals because a large ice slide broke the trail.

Here the scientists discovered that this radio activity did not, apparently at least, come from the sun. The party found that the radio-activity was just as strong at night when the sun was on the opposite side of the earth and directly under them as it was during the day-time. They were forced to discard the sun as the source of the penetrating radiations.

Professor Millikan and Dr. Otis went to the top of Pike's Peak last summer to continue their research. This time they took plenty of equipment as they had transportation facilities. Among other things they took

a quantity of large lead sheets. Lead is the densest element so far discovered in its resistance to the penetrating radio-active waves.

This time a series of experiments in which the instrument was sheeted in lead, up to 300 pounds, were made. The gamma rays, which make up nature's X-rays, travel in straight lines only, and to get inside the electroscope where the rays can be measured they had to get through the lead barriers. These experiments showed the radiations were not penetrating enough to have come from beyond the thin layer of atmosphere which envelops the earth.

Then along came a snowstorm and the scientists noticed that the snowstorm temporarily decreased the radiations inside the electroscope. The explanation of this phenomenon, according to Dr. Otis, was that the snow acted as a huge sponge which for the time being absorbed the radio-active particles in the atmosphere, held them captive and brought them down to earth!

The fact that the snow probably originated not very far—comparatively speaking—from the earth's crust seemed to substantiate the belief that the origin of the radio-active substances giving out the gamma rays was not the sun but something else in the relatively small belt of atmosphere around this globe.

The total result of the Pasadena experiments and studies was that radio-active particles giving out the gamma rays probably come from clouds of "star-dust," heavenly wanderers that accompany us on our journey through space.

The German professor Kolhorster also went into the mountains last summer. He climbed some of the glaciers in Switzerland, and made extensive studies. Part of his experiments was to cut deep holes in the ice, and his deductions from these experiments were that the rays were penetrating enough to have come from the Milky Way or some of the great spaces beyond. The holes in the ice in which the German apparatus was placed were nine meters deep.

The American scientists believe his results can be explained by the radio-activity of the glacier itself.

Dr. Millikan and his associates hope to learn more about the manner in which electrons are torn from their parent atoms and how they spend their time before they are captured by another atom, together with some of the rules governing radiant energy and matter.

The institute, to further its work, developed a special electroscope weighing only 150 gramms, which was sent up to an altitude of nine miles with a balloon and registered on a photographic plate the radiations, atmospheric pressure and temperature. The temperature was found to be 114 degrees below zero F.

Dr. Russell M. Otis, member of the famous scientific staff of California Institute of Technology now making marvelous progress along new lines. (Photo courtesy the L. A. Times.)

It is presumed that it is the gamma rays, coming from radio-active substances, that interfere considerably with radio and wireless communication.

These gamma rays do their harmful work by ionizing the air. This means that the gamma rays in their dash through the atmosphere have struck countless molecules of air and have dislodged the negative electrons in them. And this makes the air conductive in spots where the ionization took place. As the California Institute of Technology experiments have shown that more ionization takes place at higher altitudes, and the ionization is distributed irregularly, it might result in a general deflection upward of radio waves and a corresponding loss of energy received at the receiving station on the earth's surface.

Evidence that American jazz is about to girdle the Seven Seas via radio is found in two letters which Meyer Davis, orchestra magnate, has received lately from radio fans in Vienna, Austria, who report that they picked up a concert given by the Davis Le Paradis Band in Washington a few weeks ago. These letters establish a new broadcasting record, it is said, and are an indication of what may be expected from radio in the future. Vienna is four thousand miles from Washington.

North Pole and Terrestrial Magnetism

FUNDAMENTALLY, Dr. MacMillan's polar expedition this year is to study terrestrial magnetism. The Carnegie Institute which Dr. MacMillan is representing in person, gave the "Bowdoin" its full equipment of delicate instruments for making observations and experiments. North of Etah is a little Bay known as Refuge Harbor off Smith Sound, Dr. MacMillan and his crew, although "Frozen in" for the winter, have been able to carry on their work without hindrance and have made some real progress thus far. Within easy reach of the Bowdoin stands a non-magnetic building, made of wood and tied together, and then covered with an insulation of balsam wool material and an insulation of a few layers of snow blocks. Not a nail, not a bit of metal in the makeup. Entrance is had by means of a sub-surface passage through an outside igloo. As we all know igloos are constructed entirely of snow.

The only metal on the interior is that of the experimental instruments. Those who work there have no metal on their persons—guns and knives, and the like are deposited outside.

A constant temperature is maintained in the wood structure both night and day by a non-metal heater using kerosene fuel. And at the same time, a fixed degree of very low light affords illumination.

Professor Richard Goddard, a representative of the Carnegie Institute, and one of the MacMillan party, informs us (by radio, of course—we don't have to wait for the return of explorers to get the news) that after entering this experimental structure, it takes all of 15 minutes before his eyes become accustomed to the very dull light.

February 12th, E. F. McDonald, Jr., of the Zenith-Edgewater Beach Hotel Broadcasting Station, in behalf of the Department of Research in Terrestrial Magnetism, of the Carnegie Institute of Washington, spoke the following message:

"Donald B. MacMillan, Refuge Harbor, Greenland. Radio January ten from Amundsen's ship Maud states vessel drifting east and west about 75th parallel near 157° east longitude. Scientific work progressing splendidly, having obtained 140 observations all magnetic elements first winter and 13 daily absolute series potential gradient since October. Records from self-recording electrometer during winter when referred Greenwich time shows results closely similar those obtained on Carnegie mean value

being about 120 and mean range about 50. The importance of your magnetic electric program is further enhanced since the work of the Maud will supply invaluable simultaneous data with yours thus establishing a unique record for such high latitude stations. We were interested to learn from your radiograms of January 8 of the satisfactory temperature conditions attained in the observatory by the use of Balsam Wool. Best wishes to all. Magnetism"

The occasion marks Carnegie Institute's first experience in immediately checking observations taken by representatives of the department in different parts of the world. Curiously enough observations simultaneously made by Amundsen's ship and MacMillan's ship, physically out of reach of each other, are being checked by the Institute thousands of miles away, but almost as quickly as experienced by the respective sources of information.

From Mr. McDonald, who accompanied the expedition as far north as Battle Harbor, Labrador, the last point from which he could get a mail boat back to civilization, we have it that at every port touched by the Bowdoin Mr. Goddard would go ashore with a little non-magnetic tent, set up his delicate instruments and make magnetic observations, which were immediately wirelessed back to Carnegie Institute. He made his first observation at Sidney, Nova Scotia. Others followed at Paraquet Island, Labrador. The isle of God and Mercy, Dead Man' Cove and Battle Harbor, Labrador, Jack Lane's Bay, Labrador, Nain, Labrador, Godthaab, Greenland, and at Etah, Greenland.

Aside from the few stations from Australia and New Zealand which "got across" to this country during the spring tests, as reported in last month's Radio Journal nothing has been heard from our cousins in the Antipodes. Mail reports should arrive for the next issue however. Likewise word is expected almost any time from South Africa where amateurs listened in for American signals during the recent tests.

Static Can't Stop 'em

Radio signals, that cannot be heard in point to point communication in a section where there is a great deal of static, pass through the disturbed area with great ease and are picked up by outside stations without any trouble. Radio men, especially ship operators, have known this for many years. However, it has seldom been demonstrated on so large a scale as it was during the Pan American amateur radio tests of the American Radio Relay League and the Revista Telegrafica. While amateurs in North and South America could hear each other transmitting, operators in the Central American countries had great difficulty hearing either continent.

The mere question of distance is not as much of a handicap to amateurs operating on short wavelengths as static, the enemy of all kinds of radio communication. Probably Norman R. Wieble of Collingswood, N. J., and Carlos Braggio of Bernal, Argentina, the amateurs, who first communicated between the two continents, heard one another with greater reliability over thousands of miles than the operators on two nearby ships in the Gulf of Mexico, where each letter often must be repeated many times. Meanwhile, both ship operators might be heard clearly on the Great Lakes.

During these Latin American amateur tests signals passed through the worst static belt in the world, apparently, without losing any of their strength or readability. Braggio's signals were heard equally well in North America, New Zealand and Europe. Nearly a dozen U. S. amateurs heard his call. The operator of Canadian station 1BQ reports reception of Braggio's signals, while the latter cabled that he had copied at least fifty calls of North American amateurs. From now on it is predicted South Americans will be active in international amateur radio.

Wins Radio Drama Contest

FIRST Prize in the Radio Drama Competition conducted by WGY, the Schenectady Broadcasting Station of the General Electric Company, has been awarded to Miss Agnes Miller of 150 East 72nd Street, New York, for her comedy drama of business life, entitled "A Million Casks of Pronto."

The object of the competition was to develop a type of play especially adapted to radio presentation, a type of play that will tell its story through an appeal to the ear and imagination just as the screen play is directed exclusively to the eye. Miss Miller's play was selected from nearly three hundred manuscripts as the best original drama submitted and she will receive a cash prize of $500.

Miss Miller is a native of New York. She was graduated from Barnard College and later received her masters degree in comparative literature from Columbia University. For eighteen months, during the war, she served with the United States Naval Reserve on foreign language censorship. Some of her experience in this work furnished the ground work for her successful radio play. Miss Miller is a writer of juvenile fiction and has published three books in a series known as "The Linger Nots." The books are "Golden Quest," "Valley Feud" and "Mystery House". She has also contributed many stories to Young People's Magazine.

WGY was the first station to introduce the drama to the air and the players have offered one production weekly since October, 1922. The radio drama has proven one of the most successful and popular features offered by the Schenectady broadcasting station. The Radio Drama Competition

Miss Agnes Miller of 150 East 72nd Street, New York, has been awarded first prize in the radio drama competition conducted by WGY, the Schenectady Broadcasting Station, of the General Electric Company. Miss Miller's play, "A Million Casks of Pronto," was presented by the WGY Players.

was inaugurated for the purpose of stimulating interest among writers in what is destined to become a new branch of dramatic art. Writers were advised to bear in mind that the radio audience gets a play exactly as a blind man would receive it in a theatre and they were urged to take full advantage of "Noise Effects" as a means of creating atmosphere.

Additional prizes will be offered for several other manuscripts which the judges have deemed worthy of production on the air. Announcement of these prizes will be made later.

Commander D. C. Bingham, U. S. N. in a recent speech here, said that the direction finder was largely responsible for the ineffectiveness of the German U-boats in preventing the movement of American troops to France.

The Champion Portable Set

By J. T. ROFFY

Wish we could be up in the smelly pines when you try this out. However we will probably be in the composing room with the smelly ink making up the issue which you will get away up there—Oh Boy!

SPREAD your map before you on the floor, invite your family, friends and camping cronies to sit tailor fashion in a circle, produce your photos of the high Sierras, tell about the beautiful scenery and those fish that were hook wise, etc., trace with your finger that motor road and then say, "Here is where we pack in." The point where you pack in is where your vacation begins. Without going into the psychology of what a vacation is for a Californian other than meaning change of environment, more open air, the fish or the yarns thereof, there are hours by the camp fire or the canoe where music is the essence of the evening.

You may be gifted and carry your instrument other than the piano, you may be wealthy and have forty-seven million records of canned music or you may have a good portable radio that perks. The astronomer catalogues stars in their order of magnitude and counts distance in light years but his trained mind of limitless space and ages would be wholly inadequate in the sea of circuits, sets and exaggerated claims that are rampant in the radio field. The supposed range of sets grows like fish stories, or is like trick photography, parts of a local station reading news bulletins.

The portable set for your vacation need not be a long distance set for long distance sake, but since distance and reliability of a set to function at various locations without elaborate antenna are the same, you are necessarily limited in your choice of sets to one employing radio frequency amplification,—further, the efficient functioning of a loud speaker necessitates at least two stages of audio frequency amplification and, if you take my advice, you will leave all sets with crystal detectors alone. So your set must possess four tubes of the dry battery type, at least three dry cells and 90-V B battery. So much for the number and kind of tubes and current source that can be readily packed and carried without inconvenience. Take for instance the audios. I prefer 5-1 ratio for the first step and 3½-1 for the second, American Transformer make, the Bradleystat for filament control, King sockets, Cardwell condensers, soft drawn copper wire No. 14 for wiring, protected with black spaghetti.

I am writing of the portable set and seemingly continually digress, but here is the point, the reading of extended patent claims is one of the dryest reading matters available where, after the first few lines the reader, unless specially interested, assumes a monotone ending an unscrutinizable technical verbiage and legal phraseology as "when do we eat" query. So sandwiched in with the what is and what is not I digress for you to recover your mental poise for the next shock—that it is my pet circuit No. 3 which is the one and only one for you to build, use and enjoy, until either I or some one else discovers a circuit that is more efficient, has greater consistent range or better tone quality. I have the time, the means and equipment at my command to build any circuit. I have built most all or have had others bring them for comparative test. Today the R-3 Circuit is the champion of all portable sets, I believe, and this is not an idle boast. I am sufficiently removed from the dependence of the commercial aspect of the circuit. So, if you do not mind my terse technique, follow my line of reasoning. Without a shadow of a doubt the three element vacuum tube is the greatest development of the day but without the knowledge of its use in regeneration principles radio broadcast would not be in existence today, and that some regeneration applied to detector tubes in most cases is equal in volume and distance reception as a pick up circuit to two stages of radio frequency amplification, and that the combination of regeneration and detection while, as above stated, is equal to two stages of radio frequency amplification, technically the grouping of the two functions in one tube is inconsistent, when we know that detection takes place in a three element vacuum tube, due to minute difference of amplification for seceding halves of wave train, for which condition a certain definite grid and plate voltage is best and oscillation requires the working of a tube at such grid and plate voltage that the tube should function on equal amplification of the succeeding halves of the wave train and that when regeneration is dissected and divorced from the detector tube, the circuit becomes one capable of oscillation and as a purely oscillatory circuit the tube can be operated at high plate voltage at a trigger point below its oscillation and that in this state the tube is equal to three to four stages of the older type of radio frequency amplification. The output of such highly excited oscillator is carried to a detector whose sole and only function is to detect and by being able to operate this tube at its most efficient position of its characteristic curve as a detector, three or four times greater detector action is observed. To the student of action of the three element vacuum tube it is apparent that a good detector is not a good oscillator or amplifier and that a good oscillator or amplifier is not a good detector. Then why not separate the two actions called regeneration to its two separate actions, that is, independent detector and oscillator, and with the enormous increase of efficiency gained use but small tubes where the chance radiation is inoffensive or precedes the oscillator with a stage of blocking radio frequency transfer. This latter circuit is now under development and by the time you come back from your trip the circuit will be ready for pub-

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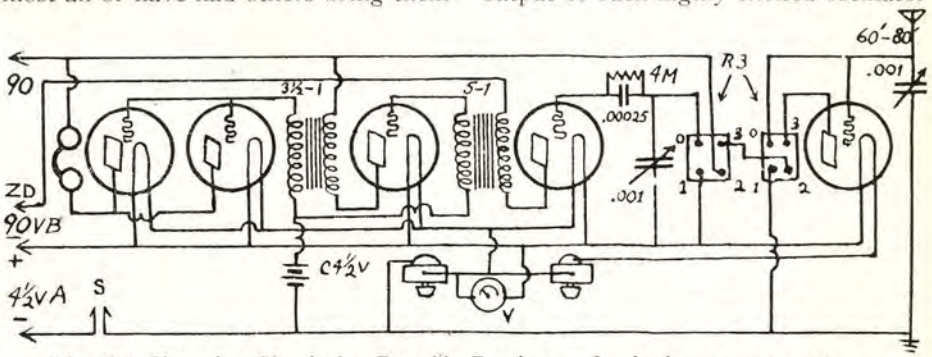


The R-3 Champion Circuit for Portable Receivers. In the latest master set, case 7x7x18, use three dry cells 90-V B battery, two Bradleystats, two R-3 transformers stage 1 and 2, Cardwell 41 plate condensers with 4-inch dial, two Amer Trau audios 5-1 first stage, 3½-1 second stage, five Radiotron 99 tubes and the all important volt-meter. Do not exceed 3 volts under any condition.

Tuning-in in the Oregon Caves

Underneath the earth so far wonder what this radio are—anyhow this reception of radio signals in a hole some miles underground with iron ladders and dripping walls makes us pause, as Patrick Henry said to his horse. There is plenty of hay here for our mental digestive apparatus.

SOME remarkable experiments in radio reception are being conducted in the Oregon Caves, near Grant's Pass. Mr. E. C. Browne, principal of the Yreka, Calif., high school, sends us this account of the work being carried on in the caves:

On Sunday evening, May 4, a group of radio experts experimented with tuning in at the Oregon Caves, situated fifty-one miles from Grant's Pass and on the highway from Crescent City to Grant's Pass. In the innermost recesses of these caves is a large room called the Ghost Chamber. This room is 40 feet high, by 50 feet wide, by 520 feet long. At the base of this chamber the altitude from the sea level is 4,055 feet. The radio set used was the most sensitive 8 tube Super-Heterodyne available, using the modulation system. The caves are situated in a solid ledge of limestone which is at this time of the year saturated with water.

The first experiments were tried with an aerial but no results were secured due to no opportunity for proper grounding within the caves. At 7:25 p.m. a Mu-rad loop aerial was connected. Within three minutes, at 7:28, K.G.W., the Oregonian, Portland was picked up. The ball score was heard and music by Olson's Concert Orchestra. Signals were weak on the speaker with good volumes on the head phones. At 8:11 p.m. Station C.F.C.N. of Calgary, Canada was picked up with preaching and choir. They signed off at 8:17. On speaker there was better volume from Calgary than from Portland. At 8:37 we picked up an orchestra which proved to be K.P.O., San Francisco, very weak on speaker. Heard selections "Sampson and Deliloh", and "'My Heart At Thy Sweet Voice". These were weak on the speaker. At 9:22 we picked up K.G.G., Halleck and Watson Radio Service at Portland, Oregon, playing Victor records. This came in with more volume than anything previously received. At 9:25 we picked up a station with a woman announcing. It was impossible to receive announcement because of code interference. We were judging by the position on the dials that it was K.L.X., the Tribune at Oakland, California. At 9:35 we disconnected the set."

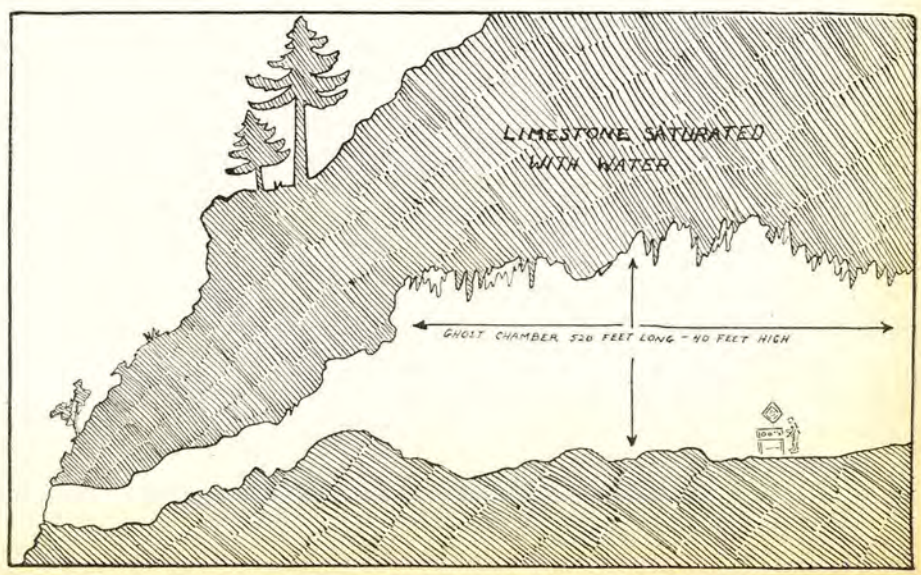
No static could be detected within the caves but fading was quite noticeable. The experiment was witnessed by the entire party of twenty-eight people composed of the senior class of the Yreka High School, Yreka, California, chaperones and Mr. W. M. Virgin of Medford, Oregon. The party under the leadership of Principal E. C. Browne of Yreka High School made an extensive exploration of the caves and the radio experts, Mr. Brice Rohrer, Edson Foulke, Jr., and Mr. Virgin succeeded in tuning in for the first time under these apparently impossible conditions. This experiment is unique and the only other of its kind known to the party was the experiment conducted in the Hudson River Tunnel. Considering the depth of the caves at the point of experimentation the above results undoubtedly stand out as a most wonderful accomplishment. The trail into the part of the caves is very irregular, turning at sharp angles and varying in altitude many times before the Ghost Chamber is reached. Water is dripping down in the caves constantly and iron ladders are placed at different points in the trail. These conditions plus the nature of limestone would tend to make reception very difficult.

The Oregon Caves are rapidly becoming one of the wonders of America. Over 15,000 tourists were guided through them last season and some 25,000 tourists are contemplated for the coming season. The caves are filled with beautiful and grotesque limestone and marble formations and from two to three hours are taken to go through them. Efficient guides are always at service and a splendid resort has been established to accomodate guests. The caves are reached by a few hours drive from Grants Pass, Oregon. Further radio experiments are contemplated as soon as different equipment is secured for the experiments. Screening the entrances to the caves is planned in order to discover whether the waves come through the entrance or straight through the limestone.

Radio fans are willing to share a part of the cost of programs which are growing more expensive since musicians are refusing to take part without pay.

A Kansas City station broadcast an invitation to those listening in to purchase "seats" in the "invisible theater" and in this way help defray the expense. To date $10,000 has been received from many fans in virtually every State, Canada and Mexico, in addition to 80,000 requests for further information.

Almost swamped a year ago with applications for patents for radio devices and circuits, the radiant energy division of the Patent Office is gradually catching up on the inventors and at present is only about seven months behind in its work, according to C. D. Backus, examiner.



Illustrating how reception was carried on in ghost chamber of the Oregon caves, using a loop aerial. KGW, CFCN, KPO, KGG and KLX were tuned in clearly. Twenty-eight students were present. The limestone rock surrounding the cavern was saturated with water.

Essential Instruments for the Amateur's Laboratory

By ARCHIE WADE, Jr.

"What's the tune?" asks the inspector. Hanged if I know, says many an amateur. Archie Wade, 6XAH, who has built a reputation as a real amateur and experimenter, here tells how to build things for your laboratory which will remove the guesswork.

NOT one amateur in ten "tunes" his set. At first glance, that statement probably seems rather broad. Well, here's where the catch comes. You probably just adjust your set to "resonance" and let it go at that, like the other nine do. A set can no more be tuned without a wavemeter and other essential instruments than a model can be designed without proper measuring instruments. A key may be in the right proportions and yet not fit the keyhole. Your set may be in resonance and yet not be tuned to work the most efficiently. You can't convince the Radio Supervisor that resonance means tune either.

There are still two types of amateur; the one who just assembles his set and gets it to put amps in the air and is satisfied, and the one who designs his set intelligently, and who knows before he presses the key that it will put watts in the air, and where it will put them, and why. The former is the one who gets good results with four fifty watters or a half kilowatt. The latter is the one who hangs up world records with a couple of five watters.

Which one of these classes are you in? Do you know your exact fundamental wave-length? Do you even know exactly what wave you are sending on? Do you know your radiation resistance, and many other things that must be determined before you can work your set intelligently? And more important than all, do you know that any ordinary amateur has enough unused and discarded apparatus lying idle in his shack to build most of the instruments that he needs without the expenditures of more than a very few dollars?

An oscillator and a wavemeter are the only two necessary instruments for making all the measurements you have been aching to make on your set so you could get lots of miles per watt. Here is a list of all the instruments for making these instruments.

1 *Excellent* variable condenser. Total Cap. somewhere between .0002 and .0005.

2 A coil of wire about 4" or 5" in Dia. with a few turns of No. 20 wire on it.

3 A Glow Light resonance Indicator.

(A 3 cell flashlight lamp is good.)

For the Oscillator:

1 A tube that will oscillate.

2 An "A" batt.

3 A "B" batt or any kind of D.C.

4 A receiver. 90 ohms or up.

5 A variable condenser. About .0003.

6 Another coil about the same size as the one used on the wavemeter. 50 turns tapped every five. And a center tap.

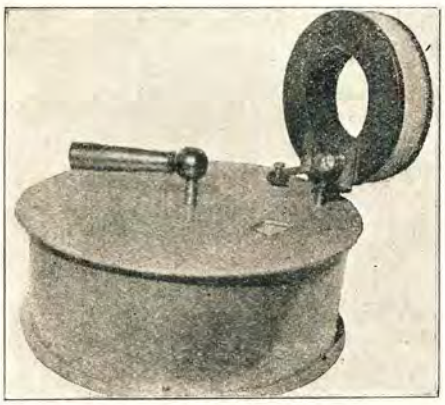


Figure No. 1—Showing arrangement of wavemeter with lamp as resonance indicator. The lamp is mounted on the side of the coil to facilitate the use of short leads. This is a very essential feature in short wave wavemeters.

7 (optional) Glow lamp, same as above.

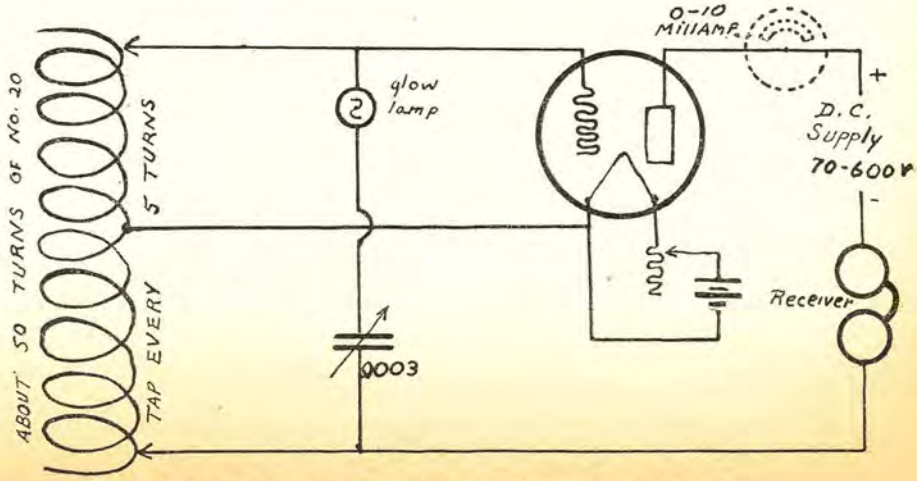
8 (optional) A millameter 0 to 10.

I have yet to find the ham without that much "junk" in his shack.

The oscillator is nothing more than its name implies. It may be draped on a board, or mounted on a fancy cabinet, but its only function is to oscillate so that when any circuit is inductively coupled to it and brought into resonance with it, the milly will give a jerk, or the phone will click, or, if the lamp is used, it will light brilliantly. If low voltages are used on the oscillator, the millameter will give the best results. For medium voltages of from 100 to 300, the receiver is preferable. In any case, the coupling between the two circuits should be as great as possible and still get a perceptible indication. The greater the coupling, the sharper the tuning and the greater the accuracy. All three types of indicator may be used at the same time if so desired. The oscillator is tuned the same as a miniature sending set with the Hartley hookup. The range of the one described herein is from 50 meters to 300. For higher wavelengths, just put another condenser in parallel with the one already in the circuit.

The wavemeter is the only instrument that is apt to reduce the wallet any. An *excellent* condenser must be used. Enough articles have been written on condensers lately, so that no one should be troubled as to what a good condenser is. Sufficient to say, get one of rigid construction. Hard rubber. Pyrex glass and quartz are the only permissable substances to use for insulation. The total capacity should be between .0002 and .0005 for best results on wavemeters to be used from 200 meters down.

The coil should be made of well seasoned mahogany lightly varnished.



Hookup of oscillator used as a driver or heterodyne.

Figure No. 3—Here is a picture of one of the corners in the 6XAH laboratories, showing a few of the standards and other instruments used in their design and calibration work.

No other "dope" should be administered. Figure 1 shows the usual form of coil used. It may be seen that the lamp is mounted on the side of the coil. This arrangement of the lamp shortens the leads materially, and makes the wavemeter more sensitive. It has also been found that space wound coils on skeleton forms increase the sensitivity considerably, as their capacity and high frequency resistance are thereby decreased,—see Figure 2.

If lathes, and other facilities necessary for the construction of these coils are not handy, the coils can be designed or constructed to order by persons specializing in that work.

An approximate table is given here for condensers of different capacities, showing the turns necessary to use for a range of from 200 meters down. A coil 4⅜" in Dia. was used in these experiments.

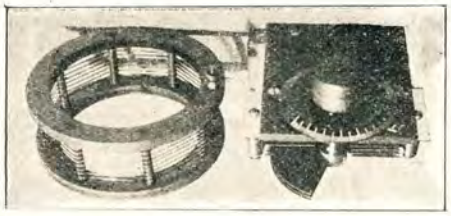


Figure No. 2—This is a combination of a laboratory condenser and space wound inductance used at the 6XAH laboratories for chasing 50 meter harmonics.

Capacity	Turns of wire
.0001	26
.0002	19
.0003	14
.0004	12
.0005	11
.0006	9
.0007	9
.0008	8

As the inductance of a coil is nearly directly proportional to the length of the wire thereon, the number of turns may be calculated for a coil of any size. For example: if you have a coil 3" in dia. and a condenser of .0004 capacity the number of turns may be calculated in the following manner. It may be seen from the table that for a condenser of .0004, 12 turns, or 4⅜ times pi times 12, or 163 plus " of wire were used. So that for a 3" coil, 163 divided by 3 times pi, or about 18 turns should be used, or continuing all the terms into one formula to make quick calculation easier:

$$X=\frac{\pi DN}{\pi d}, \text{ simplified } X=\frac{DN}{d}$$

where X=the number of turns to be found, D=the diameter of coil as shown in the table and d=the diameter of coil that is to be used.

Any number of different sized coils may be used with the same condenser. This will give a large range to the wavemeter. One coil might be used for 200 meters down, and another made to use from 200 up to 500, or any other combination that you may wish. As soon as the coil and condenser are mounted, they may be calibrated by anyone who has a standard wavemeter and oscillator.

As every one knows how to use a wavemeter, and as volumes have been written on how to measure the antenna resistance and the high frequency resistance and other constants with the use of an oscillator, the only uses to be enlarged upon in this article will be the determining of the natural period of the antenna and the calibration of capacities and inductances.

It will be noticed that the use of a counterpoise instead of a ground will shorten the natural period considerably. If ground and counterpoise are both used they should be tuned with the antenna separately first, and connected together afterward.

To determine the fundamental, first connect the antenna directly to the ground or counterpoise,, and put one turn in one of the leads. Just twist a turn in. Then bring the inductance of the oscillator into inductive relation to the one turn coil in the antenna lead and adjust the condenser in the oscillator until resonance is indicated by click of the phone or the meter, or whatever device is used. Then put the inductance of the wavemeter in inductive relation to that of the oscillator and adjust the condenser of the wavemeter until resonance is again indi-

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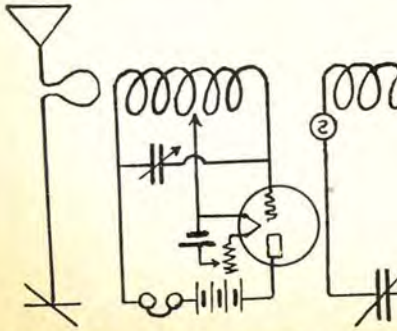
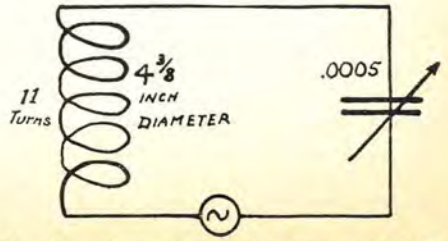


Hookup showing use of oscillator and wavemeter in determining the natural period or fundamental.



Hookup of wavemeter showing one of the many possible combinations for 200 meters down.

Electrical Units and Fundamentals

By PROF. H. LaV. TWINING

In this issue Professor Twining continues his discussion of the values involved in various elements of a radio set. While the discussion involves considerable mathematics Radio Journal is convinced of its value from the endorsement received from many readers for this splendid series of articles.

IN the last issue the effect of pure inductance in an electric circuit was shown, and the mathematical formula expressing this relation was developed.

When a condenser is placed in an electric circuit, the current flows into it just as water flows into an empty pail. The following diagram illustrates its action: $W=2\pi f$.

Let AB be the vertical cross-section of a tank, C the cross-section of a pipe leading from it to a stand pipe ED. If water be poured into E it flows through the pipe C and rises to the same level in AB as it does in E. If the water is at a different level in AB and ED then there is a difference of pressure between them and a flow will take place until the impressed pressure in one is exactly equal and opposite to the counter pressure in the other. We generally regard the term capacity as defining the quantity that a device holds, but in electricity the term capacity has a different meaning entirely. As an analogy the area of the bottom of the tank is regarded or defined as its capacity; then the quantity of water that the tank holds is

$$Q=EC$$

Where Q is the quantity C the area of the bottom or its capacity and E the depth of the contained liquid.

Since the pressure increases directly as the depth, E can be quoted directly as a pressure. Thus:

$$C=\frac{Q}{E}$$

and the capacity is the ratio of the quantity to the pressure.

Electrically a condenser acts in the same manner. When it is put in an alternating circuit the electrons flow into it. In Fig. 7, April issue.

When the conductor is at K, the pressure is passing through the Zero values but a condenser in the circuit offers no opposition to the flow of current hence I is a maximum at K. As K reaches F, G, etc., in succession the current decreases since the electrons that have flowed into the condenser press back like so many compressed springs. This back pressure is known as the counter electromotive force due to capacity and it is represented by —Ec. As the conductor moves from A to H the impressed pressure E and the counter pressure —Ec are always equal and opposite, and at H the current I is Zero, while —Ec and E are at a maximum.

Since E and —Ec are zero at K where I is a maximum and since E and —Ec are at a maximum at H where I is zero, the current and E are 90° out of phase, and since I is a maximum at K where E is zero the current leads the impressed voltage by 90°. In the previous issue it was shown that the current in a purely inductive circuit lags E by 90°, hence the current due to capacity and that due to inductance are 180° out of phase.

When both capacity and inductance are in an alternating circuit, the currents due to each are always opposite and opposing, the one leading and the other lagging E by 90°.

The mathematical relation between

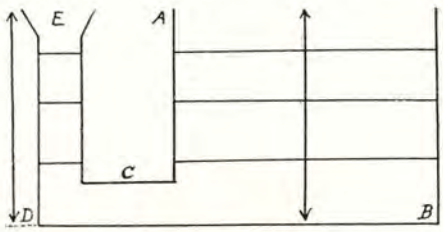


Figure No. 1

current, voltage and capacity is:

$$\frac{d(Q_1)}{d(-Ec^1)}=C$$

That is the ratio between the instantaneous values of the quantity Q_1 and the counter voltage $-Ec^1$ is a constant C.

Since $Q_1=I_1t$

$$\frac{d(I_1t)}{d(-Ec^1)}=C$$

or

$$\frac{I_1dt}{d(-Ec^1)}=C$$

but $I_1=Im \text{ Sin } Wt$

hence

$$Im \text{ Sin } Wtdt=cd(-Ec^1)$$

and

$$-Ec^1=\frac{1}{C}\int Im \text{ Sin } Wtdt$$

or

$$-Ec^1=\frac{1}{C}\int\frac{Im}{W}\text{ Sin } Wtd(Wt)$$

$$-Ec^1=\frac{Im}{WC}\text{Cos } Wt$$

$-Ec^1$ is a maximum when Cos Wt is 0° or 180° and Cos Wt=1 at 0° or 180° hence

$$-Ecm=\frac{Im}{WC}$$

but $-Ecm=-Ec\sqrt{2}$ and $Im=I\sqrt{2}$ as will be shown later, hence

$$-Ec\sqrt{2}=\frac{I\sqrt{2}}{WC}$$

or

$$I=-EcWC$$

This is ohm's law for the effects in a purely capacity circuit.

The relation between the maximum value of the current or voltage and the effective value or the value as measured by an ammeter or a voltmeter is found as follows:

In Fig. 2, let MNOP be a sine curve representing the fall and rise of an alternating current free from capacity or inductance in which NK is a maximum value and ab and cd are successive instantaneous values. Let dA represent the infinitely small angle between ab and cd, then the area of abcd is I_1dA and the sum of all these instantaneous values is the area of the

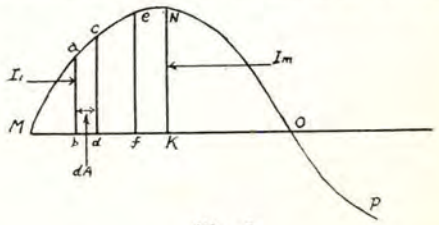


Fig. 2

lobe MNO. Since the distance MO is 180° and since 180° equals π radians the average ordinate is the total area divided by π hence

$$Iav=\int_0^{\pi}\frac{I_1dA}{\pi}$$

Since $I_1=Im \text{ Sin } A$

then

$$Iav=\int_0^{\pi}Im \text{ Sin } AdA$$

$$\text{and} \quad Iav = \frac{Im}{\pi}\left\{ -\text{Cos } A \right\}_0^{\pi}$$

When the angle $A=\pi$ Cos $A=1$
When $A=O$ Cos $A=-1$

$$\text{hence} \quad Iav = \frac{Im}{\pi} - \left\{ \frac{-Im}{\pi} \right\}$$

$$\text{or} \quad Iav = \frac{Im}{\pi} + \frac{Im}{\pi} = \frac{2Im}{\pi}$$

This is known as the average value because the sum of all the instantaneous values is divided by their total number as expressed in the line MO. This value is not measured by ordinary ammeters or voltmeters.

The deflection of these instruments is proportional to the energy flow in a circuit. The idea is this

$$E=IR$$
$$P=EI$$

where P is the power or rate of flow of energy. Substitute IR for E in the second equation then

$$P=I^2R$$

i.e. the flow of energy is proportional to the square of the current. Hence to get the effect of a current on ammeters or voltmeters in order to have them express the rate of flow of the current, the square of the current must be taken into consideration hence the instantaneous value ab is squared so that an element of the area MNO is I_1^2dA

$$\text{so that} \quad I^2 = \int_0^{\pi} \frac{I_1^2 dA}{\pi}$$

Since

$I_1=Im$ Sin A and $I_1^2=Im^2$ Sin ^2A

$$I^2 = \int_0^{\pi} \frac{Im^2 \text{ Sin }^2A dA}{\pi}$$

By trigonometry

$$\text{Sin } 2A = \left\{ \frac{1}{2} - \frac{1}{2} \text{ Cos } 2A \right\}$$

hence

$$I^2 = \int_0^{\pi} \frac{Im^2}{\pi} \left\{ \frac{1}{2} - \frac{1}{2} \text{ Cos } 2A \right\} dA$$

$$I^2 = \frac{Im^2}{\pi} \left\{ \int_0^{\pi} \frac{dA}{2} - \frac{1}{2} \int_0^{\pi} \text{Cos } 2A dA \right\}$$

$$I^2 = \left\{ \frac{I^2 mA}{2\pi} \right\}_0^{\pi} - \frac{1}{2}\left\{ (-\text{Sin } 2A) \right\}_0^{\pi}$$

When $A=\pi$ or O we have

$$I^2 = \left\{ \frac{I^2 m\pi}{2\pi} - O \right\} - \frac{1}{2}\left\{ \frac{1}{2} \text{Sin } 2\pi - 0 \right\} \quad (1)$$

but Sin 2π is O hence

$$I^2 = \frac{I^2 m}{2} \text{ or } I = \frac{Im}{2}$$

or $Im = I\sqrt{2}$.

Where I is the value of the current measured by an ammeter in an alternating current circuit.

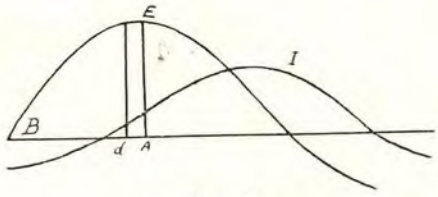


Fig. 3

The form factor is the ratio of the effective value to the average value i.e.

$$\frac{\frac{Im}{\sqrt{2}}}{\frac{2Im}{\pi}} = 1.11 \text{ for a sinusoidal wave}$$

The power in an alternating circuit is found as follows:

When in phase

$$I_1 = Im \text{ Sin } Wt$$

and

$$E_1 = Em \text{ Sin } Wt$$

hence

$$P = E_1 I_1 = EmIm \text{ Sin}^2 Wt$$

but

$$\text{Sin }^2 Wt = \left\{ \frac{1}{2} - \frac{1}{2} \text{ Cos } 2Wt \right\}$$

by trigonometry

hence

$$P = EmIm\left\{ \frac{1}{2} - \frac{1}{2} \text{ Cos } 2Wt \right\}$$

or

$$P = \frac{EmIm}{2} - \frac{EmIm \text{ Cos } 2Wt}{2}$$

The power represented in the second term is zero since there is just as much plus power as negative power on the average as shown in equation (1) in the previous problem so that

$$P = \frac{1}{2} EmIm = \frac{E\sqrt{2}I\sqrt{2}}{2} = EI$$

When the current and voltage are out of phase then

$$E_1 = Em \text{ Sin } A$$
$$I_1 = Im \text{ Sin } (A-B)$$

Where B is angle of lag or lead and A—B is the difference in phase at any instant. Taking the product (2)

$$P_1 = E_1 I_1 = EmIm \text{ Sin } A \text{ Sin } (A-B)$$

$$\text{hence} \quad P = \int_0^{\pi} \frac{E_1 I_1 dA}{\pi} \quad (3)$$

Substitute (2) in (3)

$$P = \int_0^{\pi} \frac{EmIm \text{ Sin } A \text{ Sin } (A-B) dA}{\pi}$$

by trigonometry

Sin (A—B)=Sin A Cos B—Cos A Sin B hence

$$P = \frac{1}{\pi} \int_0^{\pi} EmIm \text{ Sin } A (\text{Sin } A \text{ Cos } B - \text{Cos } A \text{ Sin } B) dA$$

$$P = \frac{E\sqrt{2}I\sqrt{2} \text{ Cos } B}{\pi} \int \text{Sin }^2 A dA - \frac{E\sqrt{2}I\sqrt{2}}{\pi} \text{Sin } A \int \text{Cos } A \text{ Sin } A dA$$

$$P = \frac{2EI \text{ Cos } B}{\pi}\left\{ \frac{1}{2} A - \frac{1}{4} \text{ Sin } 2A \right\}_0^{\pi} - \left\{ \frac{2EI}{\pi} \text{ Sin } A \int \frac{1}{2} \text{ Sin } 2A \right\}_0^{\pi}$$

When A=O all terms reduce to O.

When $A=\pi$ all terms except the first reduce to O

hence

$$P = \frac{2EI\pi}{2\pi} \text{Cos } B$$

or

$$P = EI \text{ Cos } B$$

where B is the angle of lag or lead.

Broadcasting alternately between two studios, WTAM, radio station of the Willard Storage Battery Company, here, set a new type of broadcasting record on the night of May 28. An average of three seconds was maintained between numbers on the program in spite of the fact that alternate selections were rendered at two points, seven miles apart.

The stunt was worked between the Cleveland Plain Dealer studio and the Willard studio of WTAM. Half of the artists were at one place and the rest at the other. All the announcing was from the Plain Dealer studio.

Antenna for the Teledyne

By H. S. WILLIAMS

Last month Mr. Williams told Radio Journal readers how to build the Teledyne. This month we present hints on the proper antenna and next month he will give further instructions on tuning the Teledyne.

UP through the various stages of rapid progress in the science of radio reception, from the early commercial application by Marconi to present-day "radio in the home" the importance of the aerial, as a collector of feeble radio impulses has been of supreme importance to the results obtained.

Too often the radio fan depends on an antenna that he thinks is "good enough." There is the "freak" aerial. We'll pass that by. A freak aerial is a thing in the category of everything else notional and freakish. It soon passes.

Granted that there is a certain thrill in "getting so and so" with a wire out the window, across the room or under the carpet, the results are always greater if the antenna is carefully built. The most authoritative radio engineers agree that there is no substitute for a good antenna and ground. For this reason the Teledyne is designed to operate on an aerial in conjunction with a good ground instead of many of the more or less inferior devices put forth as substitutes. Although it will operate surprisingly well on small and poor antennae, the Teledyne's sensitivity increases when connected with the average good antenna.

An analysis of the radio wave easily explains this. The energy emitted from a transmitting station, as is commonly known, is radiated in ever widening circles, becoming weaker and weaker as the distance it travels increases. The impulses picked up by the distant receiving station are so very minute that the most efficient collective device should be utilized if the maximum amount of energy is to be brought into the receiving set.

The ideal antenna is one well out in the open having a minimum of resistance and the best of insulation. The lead-in should be short and direct, well insulated, and clear of the sides of buildings. In actual practice, however, the ideal antenna, like any other ideal, is only approached. Space and convenience considerations are very important limiting factors in the erection of a suitable antenna. Thus, since we can only approach the ideal the greatest care should be exercised in planning and constructing.

The average antenna has an effective height of about twenty feet, although its actual height may be somewhat greater. The effective height may be called its electrical height, and it is this that largely determines the antenna's efficiency as a collector of radio energy. The higher the effective height, the greater the signal strength.

In contrast with the average antenna, the average loop has an effective height of about *three inches*. Thus the average antenna compared with the average loop collects, roughly, about eighty times as much energy. Obviously, such an initial advantage is not one to be ignored.

For the best results under ordinary metropolitan conditions, an antenna with between 60 and 100 feet between the receiver in the far end, should be used. The antenna may be longer if there are no stations within 50 miles.

The ideal ground would be a large circular copper disc, insulated from and supported several feet above the earth underneath the antenna, having an area greater than that enclosed by the aerial. The nearest approach to the ideal ground is a network of wires underneath the antenna and insulated from the earth. In actual practice, however, the receiving set is ordinarily connected to water pipes, radiators, rods driven in the ground, pumps, and gas pipes. The greater the resistance of radio "ground" the less the signal strength, hence the importance of securing a low-resistance ground connection.

This, folks, is N. E. Brown, radio engineer and president of the Southern California Radio Association.

Next !

If the battery gets "charged" will the crystal detector? (So. Cal. Ass'n. Bulletin.)

Possibly not, Watson, but the tube may get its feed back. Pass the pancakes. (Radio Journal).

True enuf. However, will the plate condenser or the coil oscillator? (W. B. Cunnanne, Jr. Houston, Texas). Next!

Radio equipped automobiles with loudspeaker attachments have been put into active use by the police department in Detroit, Mich. Three big touring cars, reported to be capable of making a speed of more than eighty miles an hour, have been equipped with five tube Neutrodyne sets. These fit in a compartment in back of the driver's seat. Outwardly, there is nothing to show that the cars have radio sets as the antenna is concealed in the top and the frame of the car acts as a counterpoise. Each car has a windshield seven-eighths of an inch thick, made of bullet proof glass. Two gun racks, on the heel-boards of the front and rear seats, each carry a sawed-off shot gun. The cars will be in service twenty-four hours a day and will be in touch constantly with the Headquarters Station which broadcasts on a wavelength of 286 meters.

An experiment to test the value of amateur radio for news gathering is being made by the radio department of the "Milwaukee Journal" in co-operation with Charles S. Polacheck of the Milwaukee Radio Amateur's Club, Inc., and representatives of the American Radio Relay League. The newspaper prints a daily column under the heading "News By Radio." Robert E. Knoff, radio editor, originated the idea of having amateurs act as unofficial correspondents. It is not the intention of the paper to make the plan a permanent feature of its news gathering system, as this would conflict with the regular established agencies for carrying on this work. The object is merely to demonstrate the reliability of amateurs stations should they be needed in an emergency.

What Should Broadcasting Consist of?

A CONTEST

WHAT do you think broadcasting should consist of? What should it bring into the American home? What should the directors of broadcast stations put on their programs? Are they doing a good job as it is, or are they falling down in meeting the demand? Should they lead the public or should they follow the dictates of the public?

Write out your ideas as to "What Broadcasting Should Bring to the Home", make it snappy, no longer than 500 words, and mail it to "The Contest Editor, Radio Journal, 113 Stimson Building." The first prize in this contest is any course offered by the Western Radio Institute of Los Angeles; the second and third prizes will be a year's subscription to Radio Journal. The contest will close at midnight, August 15.

The first prize is given by the Western Radio Institute, a new radio institution of learning just opened under the direction of E. A. Farnsworth, School and College Building, 625 So. Hope Street, Los Angeles. The winner of this prize can take any of the courses offered; complete course for commercial radio operators; complete course in radio salesmanship; course in radio telegraphy for amateurs; or course for broadcast listeners, which involves a thorough study of the principles of radio, their application to the receiver, how to get the most out of the receiver and how to locate troubles which may develop in the receiver.

So hop to it, folks. During the past year we have been buttonholed at every turn by someone who has very definite ideas as to what should and what should not be broadcast and why. Undoubtedly you have some ideas of your own.

Radio Journal and the Western Radio Institute want to find out what the public really does want. Not only what the public wants but what the public believe the broadcasters should offer for the good of the community and the home.

Don't just say you favor jazz and object to classical music. That will not be a good letter—unless you define what you mean by jazz and what you mean by classical music and why you believe the one better than the other as a means of radio entertainment. If you believe that radio should give more instructional matter and less entertainment, say so.

But "por l'amour de Michel" do not stultify yourself by advocating any type of broadcast to which you, yourself, would not listen. We know of such cases. In fact we patiently listened to a lengthy harangue the other day from an acquaintance who insisted that broadcast should consist of a certain type of entertainment which, we happen to know, this acquaintance shuns. He advocated it much as we might advocate castor oil, for the other fellow.

Remember the problems the broadcast directors are up against. The director may be certain that a certain type of program would be the best possible thing for the country at large—if folks would listen to it. But he is almost as certain that if he staged such a program they would not listen. His station would become a voice lost in the desert, he believes. Other station directors analyze the public taste and the public's wants differently. Yet each launches his program with ear attuned to the voice of his public.

What do you think the broadcaster should broadcast? Now hold on—don't tell us you want him to have Galli Curci, Schumann-Heink, Tetrazzini or Geraldine Farrar on the program every night. Can't be did, unless you have bank role enough to finance the next presidential campaign and then some, and a persuasive manner with operatic stars of temperament et al. Have a heart. Think the thing over seriously, read the details of this prize contest, and then tell us what your verdict is.

The day has come when broadcast programs mean much. The novelty of getting music through the air, wonderful as it is, is wearing off. Just as the novelty wore from the first phonographs and the first movies.

We are no longer satisfied with the novelty of seeing pictures which appear to make people move about as in life. There was a time when we marveled at it, regardless of the subject. We no longer "Oh!" and "Ah!" at the sound of the human voice coming from a little box called the phonograph. We want pleasure, entertainment, education, or mental stimulation from these instruments of art. We are beginning to want the same thing from radio.

Some of us are even tiring of distance, because of the difficulty of getting perfect reception. "Just as good programs at home" is the favorite expression in many households.

So there is your problem, readers. Give us your ideas in 500 words or less—and send them in as early as possible. But none later than August 15. We will publish those which seem to be of merit, although we will be unable to publish all. The replies however will be used as the basis for the compilation of information which may be highly useful to the fraternity of broadcast directors. Mail your letter to the "Contest Editor, Radio Journal, 113 Stimson Building, Los Angeles, Calif.," before August 15.

This explanation of the principle of the vacuum tube, which the Western Electric News attributes to Professor Von Orfle Garbler, is as lucid and sane as some more sober efforts elicited by radio:

If you don't know anything else about vacum tubes you anyhow know what it is shaped and priced. Now a lot of scientists, real and self-anointed ones have at different times tried to explain it, how it works and why. It seem to me, however, that there explanations were about as intrickate and obtruse, however, as too the principle and true inward operation of the major acutalites as the things they preported to elucidade themselves. I am abcessed therefore from the conviction that if we are to arrive at anything it desolves upon me to supply a simple explanation just for the benefit of the large number of the un-understanding majority.

The vacuum tube as at present was involved from the Automac theory. Starting from the prespesition that the whole is the equivalent to all of its parts put together, physicsists undertook to assertain how many parts of a given thing were demanded to make up any given whole and so to accomplish this endeavor they divided the given whole into as many parts as were diviseable and these parts were again divided and so on ad infantum. The result finally simmered itself down to the regrestration of the autom which is the smallest indiviseable part of anything after it has been divided up as many times as it is possible to divide anything up and it can't be divided any farther, but this autom is, it was proven itself, made up of still smaller particles which cannot be divided or separated one from each other. These are known as electrons and morons. Now the morons, it seems have an infinity for the electrons but the electrons have an abborrence for the morons. As however these cannot be divided apart a force is therefore engenerated which is non-stimatable. So much for the principal.

The vacuum tube, itself, is a piece of empty glass out of which all air has been subtracted and after that is done, three devises are injectured in it known as the griddle, the plate and the fillament.

The Function of a Loudspeaker Horn

By C. R. HANNA

"Toot thy own horn, lest the same be not tooted." Our interest now thoroughly aroused as to horns, wind, cow or dilemma variety, we publish herewith most of an article on the "Why of the Horn", by C. R. Hanna of the Westinghouse laboratories, which appeared some months ago in the Electric Journal.

THE popular conception of the function of a horn on either a loud speaker or a phonograph is erroneous. We hear that a horn "resonates", or it "concentrates the sound," or it "amplifies," and many other explanations, all of which are vague and most of them incorrect. It is true that a horn resonates at certain frequencies, and for that reason increases the amount of radiation at those frequencies. Any form of resonance, however, is undesirable because it is impossible to increase the amount of radiated energy uniformly at all frequencies within a wide range by this method. If a horn is not to distort, its walls should be non-vibrating and its air column resonances, within the range of frequencies used, should be slight.

If we think of the term "amplification" as meaning the increasing of any form of response by supplying energy from another source, we see at once that a horn cannot amplify because it cannot supply energy. It should be evident, therefore, that a horn merely loads the diaphragm in such a way as to cause more sound energy to be radiated into the surrounding space from the diaphragm. The horn may be thought of as analogous to a lever which gives the diaphragm a better grip on the surrounding air. And so the term "radiator" more accurately describes the action of a horn.

A good horn, therefore, is one which causes the diaphragm to radiate almost uniformly at all frequencies within the desired limits. The condition is more easily attained in a phonograph than in a loud speaker. In the phonograph the diaphragm is forced to follow the vibrations of the record for the slight spring of the needle; while in the loud speaker the diaphragm is not impelled to follow the variations of current in the windings because there is no rigid connection between the two. In the phonograph it is necessary only that the horn shall radiate uniformly at different frequencies for a given root mean square velocity of the diaphragm. In the loud speaker the horn must fulfill this condition, and also help to cause the diaphragm to vibrate at a nearly uniform velocity when the same current at different frequencies is passed through the windings.

The first problem is to find a horn shape such that with a given air velocity in a traveling wave at its throat, the same amount of power will be radiated at different frequencies over a wide range. By air velocity in a traveling wave is meant the instantaneous average velocity of the molecules at a given point. It is this velocity that transmits the pressure to the air ahead. Also, it is pressure that gives velocity

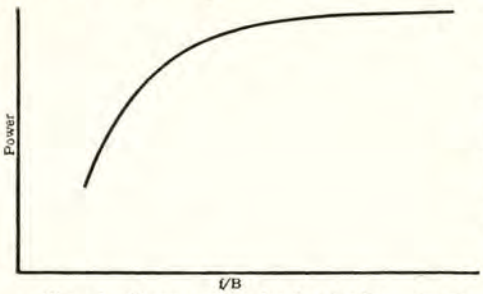


Fig. 1—Horn on a loud speaker—curve showing the power transmitted by a horn as a function of the frequency and rate of increase of horn section.

to the air ahead. The velocity and pressure are thus dependent upon each other: neither can exist without the other. A frictionless straight tube of infinite length has this uniform radiation characteristic. We must get the sound into the surrounding air, however, and this necessitates cutting the tube off somewhere. The tube would then no longer have this characteristic, because of the effect at the end known as reflection, the cause of all air column resonances. This effect becomes less pronounced if the tube is flared out gradually so as to make the final opening quite large. Later it will be shown that the initial opening should be small. These two requisites are the reasons for a flaring horn.

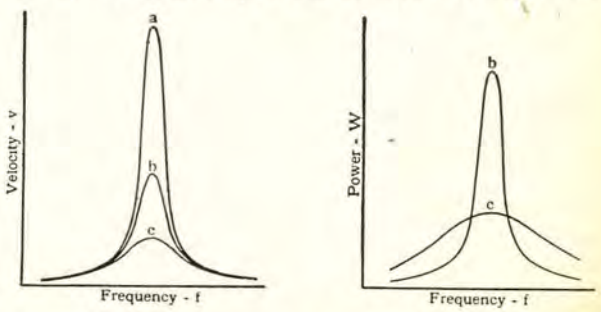
Now we must consider how rapidly and according to what law the area shall be increased. It looks reasonable that a horn in which the area is doubled during the first inch, and increased by only a few percent during the last inch would not be the best, and yet there are many horns on the market having this kind of a flare. Suppose we have a horn such that, in advancing an inch along its axis, the area is increased by a certain percentage. If this percentage increase per inch is the same all along the horn, we have what is known as the exponential shape:—

$$A = A_0 e^{Bx}$$

Where A_0 = the area at the beginning, A = area at a distance from the beginning, and B is a constant depending on the rate of increase of section. It can be shown mathematically that between two openings of different size, the propagation of air pressure in a traveling wave will be the most complete if the rate of increase of area is according to the exponential law.

Let us disregard the end effect for the moment, and consider only the effect of changing from a straight tube to a horn having the exponential shape. If a given air pressure (in a sound wave) is applied to the throat of the exponential horn, the amount of power transmitted is a function of frequency and also a function of the rate of increase of section which is determined by B in the equation. Mathematically it can be shown to vary with f/B according to the curve in Fig. 1, where f is the frequency of the wave. If B is zero, the power corresponds to that of a straight tube. If B is finite, the power is somewhat less and decreases with decreased frequency. If the allowable variation in power is fixed, the minimum value of f/B is determined. Knowing the lower limit of f, we can find the greatest value that B can have. Usually this will correspond to not greater than 20 per-

Fig. 2—Horn on a loud speaker—variation of diaphragm velocity with frequency. Fig. 3—Horn on a loud speaker—variation of power radiated with frequency.



cent increase in area per inch travel along the horn. Smaller rates of increases make for more uniform radiation at all frequencies.

It was stated that a large final opening is necessary to reduce the reflections at the end. Reflections are the cause of air column resonances, and these should be small above the lower limit of frequencies to be reproduced. The rate of increase of area of the horn having been fixed by assigning a value to B, it can be shown that the reflection diminishes rapidly as the horn is extended to the point where the final radius r = 2 ÷ B. This corresponds to a 45 degree slope between the sides of the horn and the axis. If extended farther, little reduction of reflection may be expected. When B is very small, however, the final opening may be too large for good appearance if carried to the 45 degree point. If the final diameter is over 14 inches, good results may generally be expected.

What has been said up to this point applies to loud speakers and phonographs alike. The correct initial opening is a problem which concerns the loud speaker to a greater extent than the phonograph. Without a horn, the velocity of the diaphragm in a loud speaker plotted against frequency, assuming a given current in its windings, is as shown in curve a, Fig. 2. If we attach the average well-designed horn having, say, a five-eighths inch opening at the throat, the diaphragm will be loaded a certain amount, and the velocity will be reduced to that of curve b, Fig. 2. At very low frequencies and very high frequencies the velocity will be affected only slightly because the diaphragm stiffness and inertia, respectively, are the main factors which limit the velocity in these regions. At and near resonance, however, the damping is the factor which limits the velocity, and so to increase this is to reduce the motion, as shown. Damping is an opposing force proportional to and in phase with the velocity of the diaphragm. We shall represent the component of damping per unit velocity due to the loading of the horn œ. It represents sound radiation, the power being given by, —

$$W = V^2 œ$$

This is shown in Fig. 3 b. Now if the horn could be designed to make œ larger, v would be as shown in curve c, Fig. 2, but W would be as in curve c, Fig. 3, i.e., greater than before at the low and high frequencies and less at resonance. Thus by increasing œ a more uniform response is obtained without sacrificing the average response over the whole frequency range.

The quantity œ can be increased by making the initial opening of the horn smaller. It can be shown that œ varies inversely as the area of the throat. Improvement in quality of reproduction is very noticeable with horns made in this way. Below one-quarter inch diameter, however, the frictional losses apparently become so great that further improvement by reduction of opening is not justified because of the lessened average response.

With such small throat areas it is necessary that the volume of the air chamber immediately above the diaphragm be reduced to as small a value as possible. If the chamber is large, the air, instead of being forced out into the horn, will be compressed in the chamber. This effect is greater at high than at low frequencies. Hence a small air chamber is more necessary if the high frequencies are to be reproduced accurately.

Primary Inductance

By J. T. ROFFY

IN Radio, like in the tailoring business, first the pattern then the shears. Having decided on a set either portable or otherwise, outdoor aerial or loop, local or long distance, the question of primary inductance is of prime importance. The matter of portability is simply the use of small or large tubes, the former with its small current consumption makes for neatness, while the other with its clumsy storage cells, large B batteries, charger, etc., is a trial on the temper of the neat housekeeper, so your set is decreed to be a portable case, and whether you are to use a loop or straight aerial you have but one choice I believe.

The writer was a firm believer in loop aerials and using a two foot loop consistently received concerts 500 miles but it required five of the old one-ampere tubes with a Magnavox. The drain on the A and B batteries required the continuous operation of the charger. A slightly larger loop for reception permitted the cutting out of one tube, a four foot loop permitted the cutting out of two tubes, but the un-wieldiness of a four foot loop in the house need not be discussed when a small honeycomb coil used for inductance with ten feet of aerial run in the picture moulding and a ground connection equals a four foot loop for reception, and an outdoor aerial in comparison to the ten foot indoor aerial saves at least two tubes at radio frequency for distant reception. So there remains no further discussion in regard to aerials other than its capacity or length. The best electro-static capacity for aerials depends upon the type of primary inductance of the set.

First to consider is the untuned primary or shock exitization where the aerial is connected through eight to ten turns of wire to the ground. An inductance of this type offers the least tortuous passsage for good, bad or indifferent radio impulses. The magnetic field set up by such inductance is of remarkable strength but unfortunately it responds to the shorter wave lengths and therefore code to a great extent, necessitating loose coupling of the secondary inductance to maintain selectivity, and since loosening of coupling is at the expense of signal strength, such exited primary inductances require long aerials or large antenna capacitance (150 feet or more). The most efficient signal receptor however, is the single circuit where the aerial is directly connected to the grid of the leading tube as well as to a suitable compact inductance direct tuning of which is either by reaction of the turns (variometer) or condenser shunted across the terminals of the coil. This latter method can not stand over 80 feet of aerial without blasting the tube and 60 feet of hard drawn solid wire is preferable. The latter statement also solves the perplexing query as to what is the best height and length of aerial.

The best height of course is the greatest height, but since the lead-in is part of the aerial and we have but say 60 feet in all a wire extended vertically 60 feet must be the best aerial but it is subject to the formula that a straight wire aerial perpendicular to the ground has but two thirds of its lengths as effective height, therefore nothing is gained in deploying 60 feet of wire over 40 feet above the ground and having a 20 foot span of aerial proper. It is reasonable therefore to assume that a lumped capacity equal to 20 feet of straight line aerial 40 feet above the ground should give ideal reception. These theoretical deductions follow actual experiments. The Roffy aerial was described in one of the preceding issues. Therefore whatever set or circuit you consider, the single circuit with short aerial is of the greatest efficiency. For instance the neutrodyne can be improved to a marvelous degree by some slight modifications in keeping with the above reasoning.

An intercollegiate Radio League, composed of the principal colleges in the East, was formed at a conference of the College of the City of New York. Richard Carlisle, of the City College, was elected president. The purpose of the league is to disseminate college information such as results of chess, rifle and other intercollegiate matches by radio.

Ahoy for the Desert Mates!

By DON McGREW

We know some broadcast listeners who think the desert would be a good place for amateurs. Here are some genuine "hams" who found the desert not so bad after all—providing it is filled with movie queens and water carrier and things.

AMATEURS of the southwest have broken into the movies! Also into the desert and several other places not hitherto broken into. They did it by going out where water is more precious than kilowatt tubes and setting up a radio communication station for a batch of movie queens, extras, managers et al. And they operated it successfully too.

First National Pictures had planned to shoot a film, across the line in Mexico, and Russell Reid and Harry Leighton were engaged to build it. This was some months ago. They got started and one of the frequent revolutions came up for immediate consideration so First National decided to re-locate the picture about 100 miles northeast of El Paso, Texas. The location was twelve miles from the nearest water—no place for an amateur to get thirsty about 2 a. m.

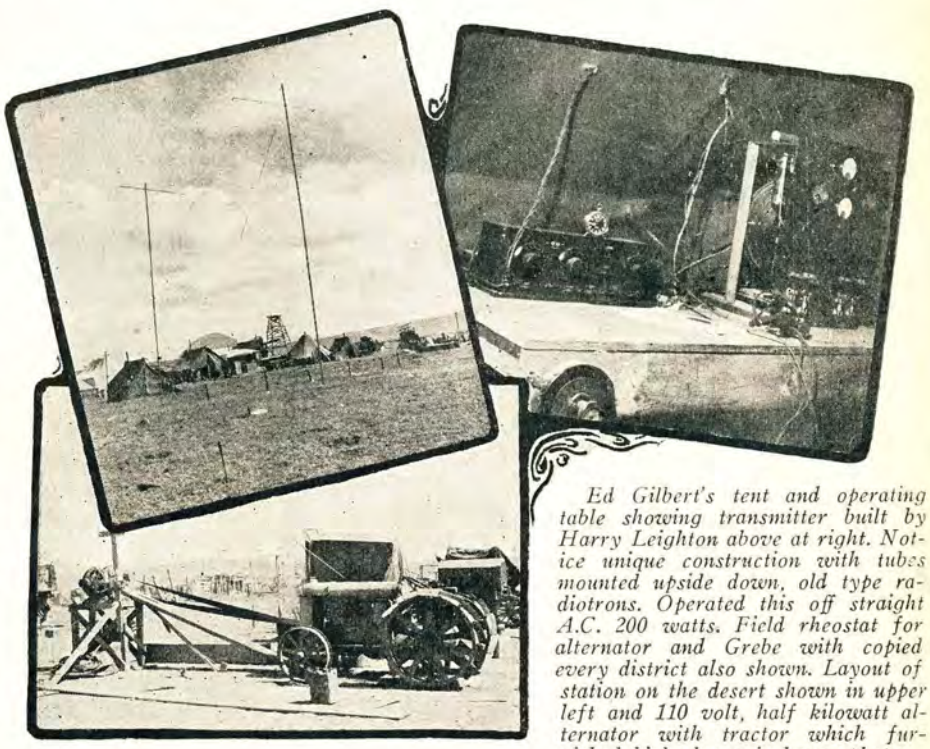
And the name of the place was Sundown.

Harry Leighton built the set in two nights and a day, 200 watt modulated Hartley transmitter. Through the efforts of Mr. Leighton and M. E. McCreery, coast manager for A.R.R.L., Ed. Gilbert, 6AIC, was secured as operator. Mr. Gilbert is a converted spark hound.

In the first ten minutes after the set was put on the air it raised 60L and communicated with KGV the same night. The station's call was KFZ, on 146 meters. Russel Reid, also of Los Angeles, was operator of KGV.

During the nine weeks operation of this station an average of 4,000 words were handled every night, between Los Angeles headquarters of First National and the desert location. There was practically no interference save on one night. On that night a Texas "Norther" or high wind hit the camp. Mr. Gilbert reached over to throw the switch as the storm hit when a spark discharge knocked him over.

The receiving aerial was a single wire 25 feet long and 10 feet high. The transmitting aerial was 50 feet high, four wires, with a counterpoise directly under it.



Ed Gilbert's tent and operating table showing transmitter built by Harry Leighton above at right. Notice unique construction with tubes mounted upside down, old type radiotrons. Operated this off straight A.C. 200 watts. Field rheostat for alternator and Grebe with copied every district also shown. Layout of station on the desert shown in upper left and 110 volt, half kilowatt alternator with tractor which furnished kick shown in lower photo.

Amateurs Quiet Extra Hour

THE changes in radio transmitting schedules caused by the observance of daylight saving time in some sections and standard time in others have prompted the American Radio Relay League, at the suggestion of the department of commerce, to agree to the temporary expansion of amateur "quiet hours" from 7:00 to 10:30 P.M., standard time, 8 to 11:30 P.M. daylight saving time. Amateurs are being advised of the expansion by the department and are asked to attach the notice to their station licenses.

Amateur telegraph operators have been observing the period between 8:00 and 10:30 P.M., standard time. This new arrangement which allows the broadcast listeners an extra hour of quiet during the evening is regarded by the Department of Commerce and the A.R.R.L. as an emergency measure which will be in effect only until October, 1924, the period that daylight saving time is in force. With the resumption of the observance of standard time in the fall, the regular "quiet hours" of 8:00 to 10:30 P. M. will again be recognized by the Department.

While many of the states in the western and northwestern part of the country are not at present observing daylight time, it was thought that the change of hours should be made uniform throughout. The "quiet hours" were first designed for the benefit of broadcast listeners, but with the advent of daylight saving time this spring, much of the protection which they had been receiving was offset by the change in transmitting schedules and interference resulted.

In continuation of its policy of cooperation on behalf of the broadcast listeners, the A. R. R. L., the national association of transmitting amateurs, has readily agreed to the new measure and is urging its members to conform cheerfully thereto, particularly in view of the fact that at most it is only a temporary regulation.

Concerts are broadcast every Wednesday afternoon at 4 and Sunday nights at 8:15 for the special benefit of shut-ins, from the Crosley WLW studio. The programs are broadcast on 309 meters.

Big Broadcaster on Battery Power

THE Storage-Battery Station of the "East" is the new designation of Broadcasting Station WDAR, Lit Brothers, Philadelphia, which recently changed its source of transmission power from motor generators to storage batteries. The results obtained, in increasing strength and clearness of signals, are reported as astonishing. Letters and telegrams commenting on the vast improvement were received by the station from "listeners in" all over the country.

Station WDAR is one of the first big broadcasting stations in the East to equip for operation with storage batteries. Heretofore the universal practice has been to use motor generators for supplying the large filament current and high plate voltage required by the main oscillator and modulator tubes of the transmitting set. Lit Brothers, who have led the way in making other recent innovations in broadcasting, decided that the time had come for improving the quality of broadcasting by eliminating the commutator hum and other objectionable features of motor generated power. They employ Philco Diamond-Grid Batteries made by the Philadelphia Storage Battery Company of Philadelphia.

By using storage batteries the commutator hum of the motor-generator is eliminated from the carrier wave. This hum is the result of disturbances set up by the high-voltage direct-current generator every time one of the commutator segments makes or breaks connection with the brush which carries the current to or from it.

In other words, the direct current delivered to the plate circuit of the transmitting tubes, if represented by a line would be a line made up of small ripples. On the other hand, the direct current delivered by a storage battery is free of ripples and may be represented by an absolutely straight line.

The new broadcasting power equipment of Station WDAR consists of a 1760-volt battery made up of 880 cells of a new type of Philco Diamond-Grid Battery designed especially for radio broadcasting and receiving services.

The cells are made up in pressed glass containers mounted in supporting trays of 20-volt units. The glass containers have high and low water-level lines molded on the sides so that a glance tells whether or not cells are in need of water. The cells are tightly sealed with a new form of cover having a spray-proof filler-vent which condenses and feeds back into the cell any spray that tends to pass out during charging.

One cell in each 10-cell tray is provided with a visible built-in charge indicator. This charge indicator, which does away with the usually sloppy hydrometer, consists of two balls of different densities enclosed in a hard rubber cage. These balls rise and fall as the specific gravity of the electrolyte solution changes during charge and discharge of the battery. This accurate and reliable charge indicator removes the uncertainty and guess work from the charging and use of a storage battery.

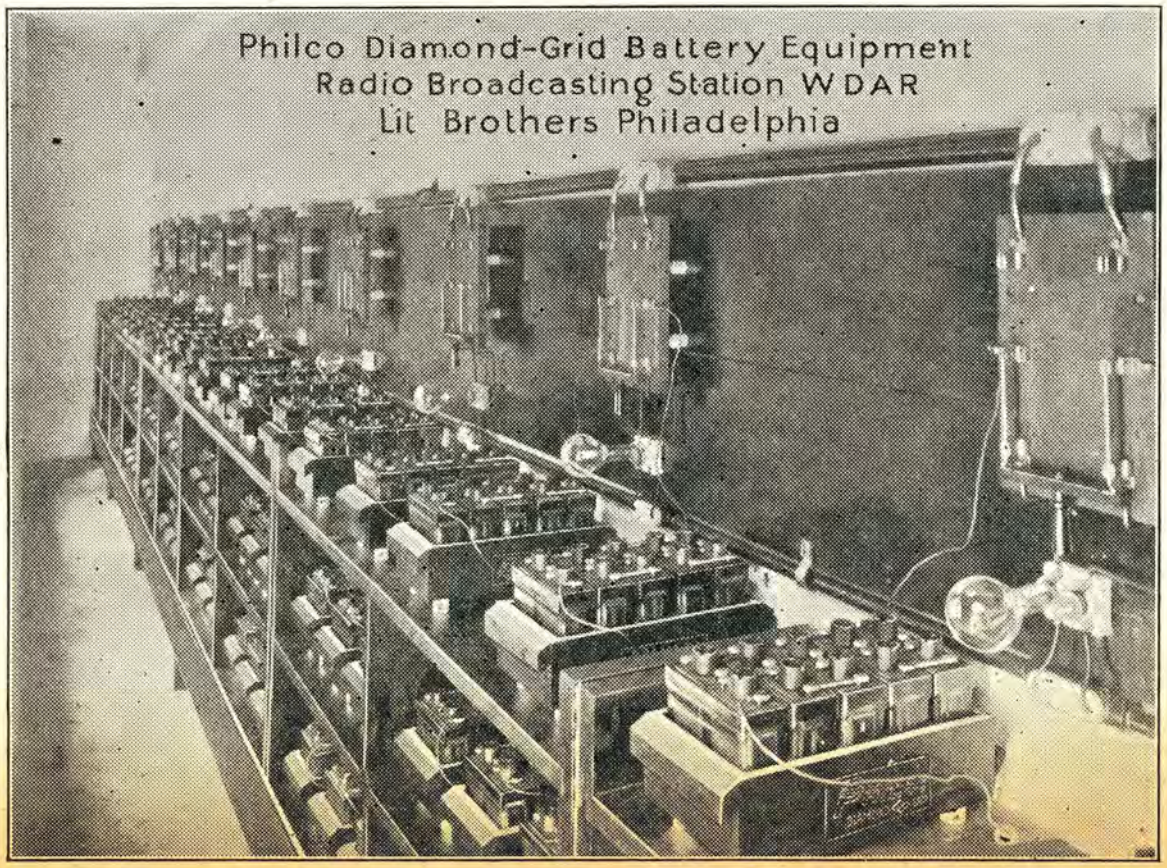
The "A" battery used in the Lit Brothers installation for heating the filaments of the oscillator and modulator tubes consists of 20 large cells of the Philco Diamond Grid "PMS" Type. The same type of battery has been used extensively for ship wireless and other marine uses as well as auxiliary power emergency purposes in large purposes in large electric light and power stations.

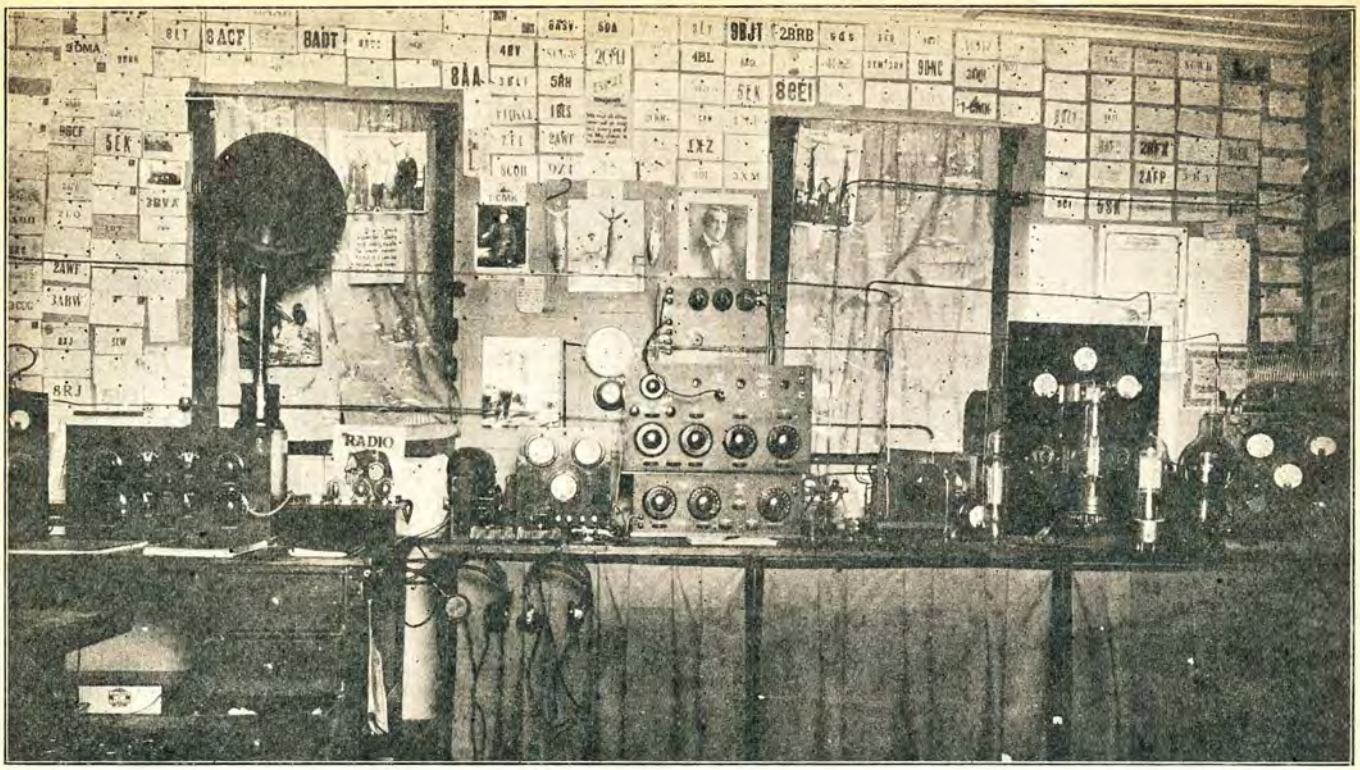
Schools Try Radio

If experiments now being made by the Oakland public schools are successful, a single speaker may inspire and instruct hundreds of teachers and classes assembled under normal conditions in public schools scattered over a wide area in city and country. This is to be accompanied by a radio broadcasting station transmitting especially for public schools.

Instead of traveling from one school to another, counseling instructors of the Oakland schools now speak in the studio of KGO, the Pacific Coast broadcasting station of the General Electric Company on Tuesdays and Thursdays at 10:20 a.m.

The movement for the teaching of radio in French schools has become so strong that the city council of Paris has decided to open a credit of 20,000 francs on the 1924 budget for this work.





Description of 6XAD—6ZW owned and operated at Avalon, Catalina Island, Calif., by Lawrence Mott, Major-Signal ORC U. S. A. From left to right: 1st, The edge of the famous 20-watt transmitter, whose DX is every District and every State; 2nd, Grebe CR-7. Almost all Hi-power stations of the world are heard on this receiver. Next to it is a Western Electric 7-A amplifier, and above it the WE loud-speaker; 3rd, 100-watt transmitter—with 2-WE-50 watt tubes; 4th, Above, another ***WE-7A amplifier. Below: a Grebe CR-6 and below that the*** *Grebe 13—that did such yeoman service in working WNP; 5th, Special antenna and power switches—that by one motion throw power, antenna, ground and counter poise from one transmitter to another; 6th, Transmitter using either GE-250, McCullough 500 or Mullard 500-watt tubes. A WE-250 is shown between the Mullard, at right, and GE—in circuit; 7th, Transmitter using 500 watts—2 Western Electric 250-watt tubes. This latter set is on 195 meters at present, radiating 8.1 amperes. The reaching-out powers of the stations are so well known that it is a waste of space to set them down.*

About Crystal Contests---Let's See?

WE are still hearing from that crystal contest. Anyone thinking crystal set interest departed has more laborious thinking to do. Here's a letter:

Editor, Radio Journal: Being a "dyed-in-the-wool" radio-fan I get a great deal of pleasure and education from your valued paper.

I was particularly interested in the "crystal contest" that you held some months ago, and as I have been trying out an unlimited number of crystal "hook-ups" I really expected to get some help from these, but really I can not see as any of them are any improvement on the ones I have already tried.

I would like to see a contest of this sort run frequently, but I would suggest that those having "hook-ups" to offer would decide upon one that has some outstanding feature, and if possible explain why this feature is attained.

Now regarding the recent contest I would like to inquire why the first prize was awarded as it was? What outstanding feature of this particular "hook-up" seemed to recommend itself to the judge or judges? I have tried it repeatedly with the most inferior results. Not long ago I succeeded in making a crystal set that was loud enough for a room 10x10ft. but it was not a practical "hook-up". The coils had to have a "flock" of taps, and I found that it would not work on any other aerial except the one I tried it out on. I do not consider that a set of this type is worth a "hoot".

Who wants another crystal hookup contest? We feel one coming on folks. Seriously this letter simply brought us right up to the trough and we may drink. So anyone who seconds this motion let us know at once.

Then later I noticed quite an article by the author of the winner in the contest, in answer to some inquiry about the "hook-up", and instead of telling more about the circuit that he won with, he goes on to tell how he would build another, thereby acknowledging the inferiority of the "hook-up" that he won with. In contrast to this I have recently tried a "hook-up" that meets all the desirable requirements for a practical set, works on any good aerial, is very selective, and can be heard on a "Baldwin unit" speaker, though not loud, of course. There are of course changes that might be made in this, but if any one should ask me concerning it I would not recommend some thing with entire change of windings etc.

I also noticed another circuit by the winner in this contest, in the March issue, in which he claims "Results extraordinary", but fails to tell what these extraordinary results are. In the first place the ten turn coil in my opinion is nothing more or less than a "link" and I found that by cutting the turns down to three very much louder signals were received. This idea of a link, while a good one, is sure an old one. And also if the 75 turn coil is cut down to 46 or 48 much better results were made. So in these contests let us try to get some new ideas, and some that are practical, that there is reason for that can be explained.

The second in this contest, in my opinion is very much superior for in this circuit there is simply a variometer with a condenser introduced between the stator and the rotor, and I know this to be a good feature for utmost selectivity, although in my case

(Continued on Page 243)

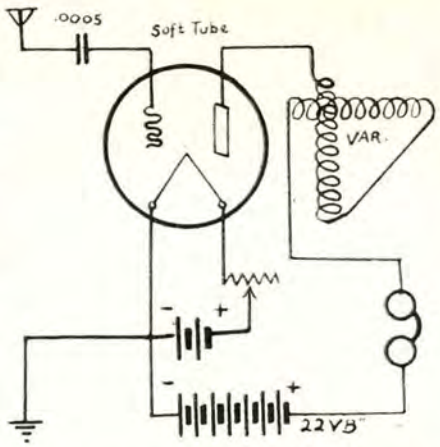
A Circuit that Will Not Re-radiate

A. L. MUNZIG

IN diagram here shown is given a circuit that will give extremely satisfactory results for local reception. It is very selective and yet will bring in fair distance. If used with two stages of audio-amplification will give all the volume a person would want.

Most experimenters have the parts for making this and will no doubt want to try it. A list of parts necessary is given below:

1 .0005 MFD Micadon condenser.
1 C300, C301A, UV199, C299, WD11, WD12, etc.
1 Rheostat depending on tube used.
1 Variometer.
1 22½ v. B battery
1 pr. Headphones.
1 Socket.



Most any type tube will work with this circuit, but of course a soft detector tube will give the best results, such as C300.

General Harbord on Radio and the Farm

GENERAL James G. Harbord, President of the Radio Corporation of America, in a most unusual article in the May Farm and Fireside, makes some startling predictions about the radio. "You will sit before your radio set out there on the farm", he writes, "and hear the President speak while you watch his gestures and the crowds about him. Opera and drama in a distant city you will both see and hear. You may have almost ringside seats at the world championship match, and thrill to the swat of the 'Babe' Ruth of that day—all in your own sitting room."

"I believe that radio's greatest opportunity lies in its usefulness to the farm", he continues, "I believe that radio broadcasting is destined to become a greater boon to the farm than to the city home. It can be made a thing of greater benefit and more practical use to the thirty-nine millions of you who live on farms than to the rest of us who live in cities. And this very soon.

"We point to the automobile industry as having experienced an amazingly rapid growth. In about twenty-five years the motor has come into such general use that there are now 14,000,000 automobiles in the country, or two for every three homes in the country. But radio broadcasting is only two years old and already there is one radio set to every seven homes!

"We have been riding in automobiles for so long that we have forgotten, almost, the day of the horse-drawn carriage, while it was only day before yesterday, one might say, that we learned we could have an inexpensive radio telephone in our homes. Yet as against 4,000,000 cars made last year for us, we bought and constructed 2,000,000 radio sets.

"The phonograph had a startlingly abrupt leap into popularity. Offhand, it is likely that you would say that it will take radio many years to catch up with the phonograph. The Department of Commerce estimates that we have spent a little less than $150,000,000 in a year for phonographs and records. We estimate that "radio fans" spent $150,000,000 last year for sets and parts.

"'Here is a summary which shows how big radio already has grown. At the beginning of 1924 there were in this country approximately:

"3,000,000 radio receiving sets; 10,000,000 listeners; 543 licensed broadcasting stations; 250,000 persons directly and indirectly connected with the industry; 3,000 manufacturers of radio apparatus; 1,000 wholesale dealers in radio sets; 20,000 retailers of all kinds who handled radio equipment; 1,000 newspapers carrying radio programs and radio news departments; 2,500 country weeklies which featured radio; 50 exclusively radio periodicals; 50 magazines with radio sections; 250 popular and technical books written on radio, and 7 trade papers devoted exclusively to radio.

"But of the 3,000,000 radio sets now being used in the United States we estimate that only about 150,000 are on the farm. Although farmers constitute a third of the population, you are as yet using only one twentieth of all the radio sets in existence in America. There is only about one set to each forty farm homes.

"If we pick up and retransmit a message, it is possible to-day to speak to 10,000,000 persons with a single voice. No such thing has ever been possible in the history of the world before.

"Personally I believe that radio development is going to continue at such a rapid pace that in a period of three to five years it will be possible for one man to speak to 50,000,000 persons in the United States, and to many millions in Canada, South America, and Europe, if stations there relay his voice.

"Generally speaking, we have progressed so far now that almost anything that can be done by wired telegraphy can be done by wireless. Pictures have been sent by wire, as we all know. They have also been transmitted through the air by wireless. Wireless transmission of photographs is yet, however, a slow and imperfect process.

"It seems probable, judging by experiments already made, that, in the course of four or five years of research, engineers will have perfected methods of rapid, accurate, and detailed transmission of photographs by wireless.. They will then work on the more difficult problems of reproducing at a distance moving pictures of moving bodies.

"Judging by past progress it ought to be a safe prediction that we will get a solution of this transmission problem in time. This will mean, then, that some day we may witness a current event, radio transmitted, as it is occurring.

"You will sit before your radio set out there on the farm and hear the Presidential address while you watch his gestures and the crowds about him. Opera and drama in a distant city you will both see and hear. You may have almost ringside seats at the world championship match, and thrill to the swat of the "Babe" Ruth of that day—all in your own sitting room. This will never be a complete substitute for seeing and hearing the opera and the play or the great political or sporting event—but then indeed will the farm cease to be "isolated."

The demonstration of broadcasting by the Technological Trade museum have made radio very popular in Austria. Assistant Trade Commissioner F. M. Zwickel reports to the department of commerce. In view of the great economic and social importance of broadcasting, which has created a new industry in Austria, a permanent service has now been undertaken by the Oesterreichische Radio-Verkehrs-Aktiengesellschaft. At present this company cooperates with the Austrian Postal authorities in the matter of transmission on the building of the War Ministry for the first broadcasting station.

More About the Super Heterodyne

By A. L. MUNZIG

Where one super-heterodyne was in operation a year ago a hundred are in operation today. Like a famous matutinal drink, there's a reason. Consequently the discussion upon which Mr. Munzig has launched should be doubly interesting.

IN the March issue of Radio Journal the writer described the construction of a Super-heterodyne Receiver which used the "modulation system".

Several requests have come in for a circuit showing the use of a first detector with oscillator pick-up coil. It is the purpose of this article to describe the construction of a Super-heterodyne having such arrangements. This method is much more sensitive than the "modulation system".

Fig 1. shows an eight tube Super-heterodyne having a first detector, heterodyne, three stages of intermediate frequency amplification, second detector and two stages of audio- frequency amplification. The inductance L1 shown in the antenna and ground circuit consists of 8 turns of No. 24 DCC copper wire wound in the exact center of a bakelite tube or other material, 3" diameter, 3" long. This winding is given a light coat of shellac to hold it in place. Directly over this 45 turns of the same size wire is wound. This is the inductance shown as L2 which is tuned by C1, a 23-plate variable condenser. The double jack shown is for connection to loop. The loop connections are connected to a standard type plug and when inserted in jack automatically disconnects the antenna circuit, and connects the loop across the variable condenser C1.

The OSC. COUPLER is made as follows:

L3 : 35 turns of No. 24 DCC copper wire.
L4 : 35 turns of No. 24 DCC copper wire.
T : 10 turns of No. 24 DCC copper wire.

All windings are on a bakelite tube 3⅛ inch in diameter and 3 inch long. The coil "T" which is the tickler pick-up coil, is arranged so that it rotates within the coil L3. The Ray-Dee-Artcraft Osc. Coupler is made exactly as the above specifications, and is recommended for this circuit. There are couplers on the market that will serve this purpose also. The coil "T" when once adjusted need not be touched again. Consequently it is mounted in the rear of panel and adjustments made from rear.

The Long Wave Intermediate Frequency Transformers are of Ray-Dee-Artcraft make. Three type 10-A and 1 Special input transformers are used. All four of these transformers are filters themselves and can be used in conjunction with any untuned Intermediate Frequency Transformers as a filter. The special input transformer was used in this case because it was designed especially for the first radio-frequency input and consequently has a difference in winding.

All of these transformers are mouted at an angle of 60 degrees (Neutrodyne style) on sub-base to cut interstage coupling. Each transformer is mounted 6½ inches apart and at an angle of 60 degrees. All transformers lie flat on sub-base.

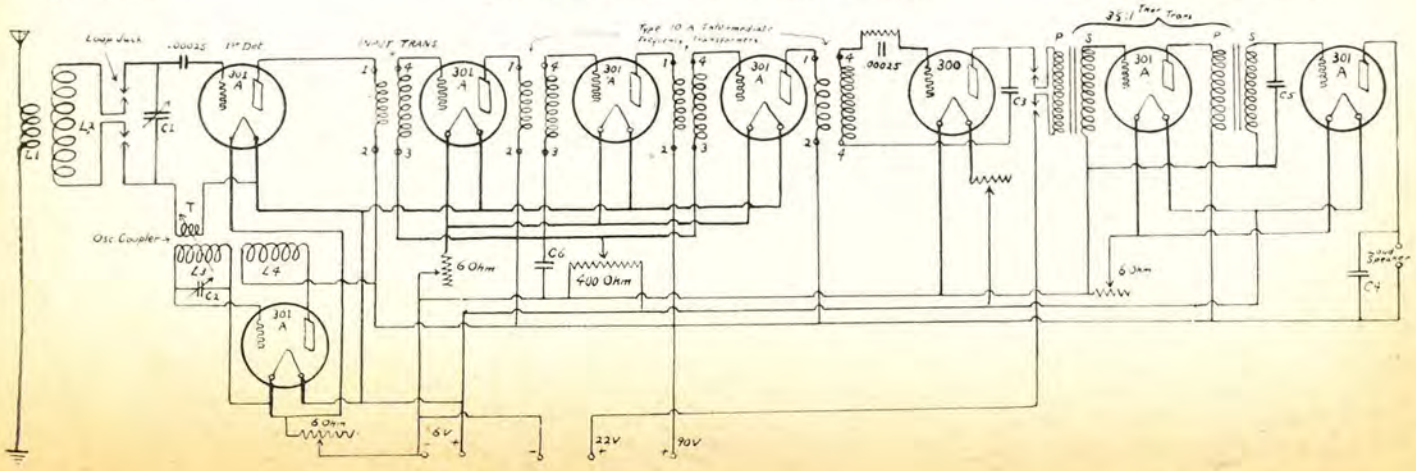
Condenser C2 consists of 23-plates Both this and C1 should be of some low-loss type and be very rugged in construction. Grid condensers both have a capacity of .00025 MFD. A grid leak is not used on the first detector but one of about 2 megohms should be used on the second detector. By pass condensers C3, C4 and C6 have a capacity of .002 MFD. C5 has a capacity of .0005 MFD and is used to bypass noises in the audio-frequency amplifiers for different types of audio frequency transformers this may vary. However, it is a very close estimate for most types. The writer uses Thordarson type transformers which are exceptionally good amplifiers.

All rheostats have a resistance of 6 ohms. This is sufficient since each one with the exception of the second detector, is operated in parallel. With each one on about one fourth way the "A" type tubes do not receive too large a current. A 400 ohm potentiometer is recommended for biasing the grids of amplifiers.

A list of parts necessary are as follows:

1 7" by 36" Radion, Formica or Bakelite panel.
2 4" dials.
4 6 ohm rheostats.
3 doube jacks.
1 Single jack.
2 23-plate variable condensers.
8 Vt Sockets.
1 400 ohm potentiometer.
2 .00025 Micadons.
3 .002 Micadons.
1 .0005 Micadons.
2 3½ : 1 Thordarson Audio-frequency amplifying transformers.
1 3" by 3" bakelite tube.
1 Special Input Transformer.
3 Ray-Dee-Artcraft Intermediate-frequency RF Transformers Type 10-A.
1 Ray-DEE-Artcraft Osc. Coupler.

Shielding Unnecessary



Since the Intermediate-frequency Transformers are mounted at an angle of 60 degrees it will not be necessary to shield. However, it will be necessary to keep the Input Transformers away as far as possible from the Osc. Coupler. This precaution is necessary for otherwise a too close coupling of these parts will tend to throw the Intermediate-frequency amplifier into oscillations thus causing instability. Keep these two units referred to about 3" apart.

In the next issue of RADIO JOURNAL the writer will describe the construction of an 8 tube receiver having a stage of *tuned radio-frequency amplification* ahead of the first detector and reflexing this same tube in the audio-frequency amplifier. DON'T MISS IT! The same parts are used with one addition.

The Place of Radio in Advertising

By J. C. McQUISTON

RADIO has no place as an advertising medium. Newspapers, magazines and other accepted media of advertising are the natural methods of getting a product before the public. Radio has no place in this scheme and will ever be only supplemental to the service of the great publications.

Will radio serve the advertiser? My answer is "No". The home is a sacred place and whatever enters the home should be invited. The newspaper, the magazine, or any other vehicle that has been used for advertising has entered the home with the consent of the owner. However, radio has given us a new problem to solve. This problem is that of intrusion. The radio advertising message would enter uninvited; therefore it would be unwelcome. There might be a few who would incidentally derive benefit from such advertising but all of the million that might be listening in would have no interest at all in the particular message.

I have but one opinion on the subject and that is that the newspapers and magazines are the natural vehicles for our advertisements. As stated before, the newspaper confirms and gives authority to whatever may be said, and regardless of where we say it, whether man to man, or by radio to the millions, still we need some confirmatory evidence as to the facts, dates and incidents that come to make up the story.

Even publicity as such should be discouraged over radio. It will be a pitiful day when broadcasters permit people to fill the air with matter intended to tickle the palate of individuals whose company seeks personal or corporate recognition. However, in contrast with advertising and publicity you may have real worth while information to impart, but it must be information that makes the matter worthwhile as a feature for broadcast.

Mr. McQuiston, manager of publicity and director of radio programs for the Westinghouse Electric and Manufacturing Company here discusses a subject which is of growing importance. Plans have already been launched for radio stations to disseminate pure advertising. Radio Journal would be glad to hear from any of its readers on this subject.

Put the Set in Shape for Summer

YOU want to get the most out of your radio set this summer. Here are seven suggestions which may be of assistance in getting it. Remember the old story about poor reception in summer does not apply this season because your set is better and the broadcasting is better than it was a year ago.

Put your set in the pink of condition. Whether your radio receiver is to be used at home, at the seashore or in the mounains, see that the connections are gone over and tightened up, that old batteries are replaced and that a good set of tubes are installed.

In camping with a radio, if your receiver is one of the antenna type, erect your aerial wire from the camp to a branch of one of the tallest trees in the immediate vicinity. If thunderstorms are prevalent, it will be found advisable to erect an additional antenna not over ten to twenty feet off the ground. That type of aerial is not so readily influenced by atmospheric disturbances. An aerial of this character can be of any length from 100 to 200 feet.

Whether you use a receiver which operates from a loop, or a receiver which operates from an antenna, the sensitiveness of the receiver should be reduced in times of atmospheric disturbance either by reducing the filament temperature or by "loosening the coupling," so that the best results might be obtained from your local stations. On the other hand if atmospheric conditions are good the filament temperature should be readjusted to normal so that the sensitiveness of the receiver might be increased and reception obtained from broadcasting stations located at greater distances. The long low aerial or the loop type of receiver will give marked relief this summer from atmospheric disturbances.

See that you have a good ground connection when the aerial is used. If such cannot be obtained at the camp or at the seashore, the equivalent of a good ground connection can be had in the use of a piece of wire 100 to 200 feet in length laid over the surface of the ground and directly underneath the aerial.

Receiving apparatus in the camp should be duly protected from moisture and dampness. A moderate amount of moisture and dampness may not interfere with the operation of the average type of receiving set, but at least the set should not be allowed to get wet by exposure to rain or inclement weather.

Broadcast listeners should bear in mind that the electrical constant of aerials erected at the seashore or in a camp, may be quite different from the electrical constant of the aerial used with the same set at home. This means that stations formerly heard at home will not come in at the same point on the dials in the camp. It should not be difficult to locate new positions for such sets after the first evening's operation.

With regard to head telephones be sure that the headset cord is not worn, that the connections are tight at the back of the headphone and the caps are also screwed down tight.

To summarize: Install fresh batteries, and new tubes; tighten up all connections; protect the receiver from dampness; use a lower aerial when atmospheric disturbances are present and a longer aerial when reception conditions are favorable and see that your headset is in good condition.

U.S.S. Scorpion, stationed in Turkish waters, is equipped with a 300-watt tube set. This vessel cruises around Constantinople and at times is stationed at Piraeus, Smyrna, Constanza, or other places in the eastern Mediterranean. She is usually at a place with cable or telegraph connection. The call letters of the Scorpion are NTT and the general call for United States naval vessels in Turkish waters is NTTX. Both United States naval vessels and United States Shipping Board vessels in Turkish waters relay messages for American ships when they are in a position to do so.

Are Radio Impulses Transmitted by Line of Force?

By. R. G. DUNDAS

Along with the famous query "how old is Ann?" we must rank the query, "how does radio travel?" Only probably a bit more rank. Be that as it may, as the conductor said when we stepped on his foot, Mr. Dundas here offers a novel explanation of the why of radio.

IN presenting this article to the public I wish to make quite clear that I am advancing a theory which offers to myself a logical solution of a subject which has been somewhat of an enigma to both scientists and laymen for many years, at the same time it is with great diffidence that I do so for the theory, which I believe to be correct, and to the best of my knowledge original and supported by facts as far as my personal investigations have tested it, is so extremely simple that I wonder no one has previously advanced it.

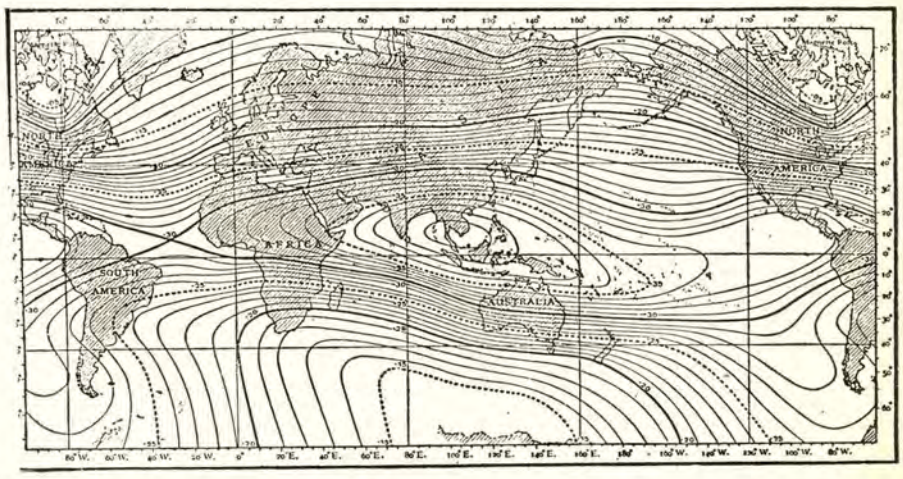
Ever since Marconi startled the world by the production of the first widely advertised and commercially practicable means of radio communication in 1898, the layman has asked for a simple and logical explanation of this phenomena. From 1898 to 1923 is quite a step down the corridors of time, and the transition from Marconi's long caterpillar spark and imperfect coherers to the vacuum tube sending and receiving sets of today is indeed a marvelous achievement; still the explanation of how the signal produced at the sending station reaches the receiving station leaves something to be desired. Some scientists have held to the existence of an "all pervading imponderable something" to which they gave the name of Ether, which serves as a connecting link between the stations in question, others have hotly disputed the existence of this something and have advanced other theories equally complicated and to most people equally unsatisfactory.

Any text-book on radio generally begins with throwing stones in a pool of water and ends up with complicated mathematical formulae which really prove nothing for the unknown quantity has been expressly made to fill the bill and it's foregone conclusion that the problem will work out OK. Now I want to stress a point right here which I have found in the thirty odd years of my terrestrial existence, twenty years of which commencing with a visit to Marconi's experimental station at the Needles on the Isle of Wight in 1900, have been spent in radio work, to be of some value in unravelling the tangled webs of thought through which we find our way to the truth; and that is, when anyone can not give a definite logical explanation of any particular matter, couched in fairly simple language, there is an element of doubt concerning the matter which he is attempting to explain.

As an instance of how scientists can explain the profound science of astronomy which entails the most precise and difficult mathematical problems, in simple language I would draw your attention to a book written by Sir Robert Ball entitled "The Story of The Heavens". Almost any person of ordinary intelligence can read and understand this work, it is written so logically and convincingly.

One asks the question, why cannot the theory of radio transmission be given in a similar manner, and I think the correct answer is; that whereas astronomy is founded on proven facts the theory of radio is based on a doubtful hypothesis.

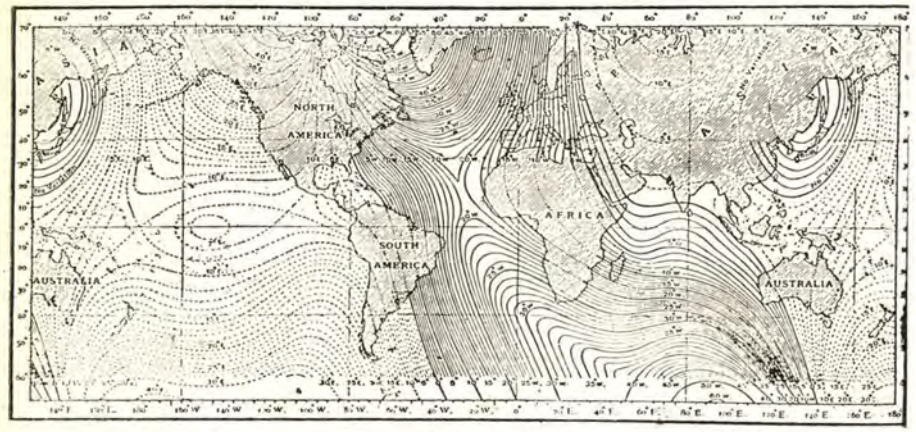
The theory which I outline involves no unknown quantity, and no mathematical knowledge is needed to grasp its explanation. It is based on fundamental and well known laws of physics and until a better theory is advanced I find that it meets my views and those of many other radio men whom I have consulted, so perhaps it is an approximation of the truth. Time alone will tell.



Isomagnetics, lines of equal horizontal force.

Let us turn our attention primarily to the receiving set consisting of an aerial of some sort, a tuner, detector, head phones and ground or counterpoise. It is unnecessary to go into precise details regarding this set as practically any crystal or tube set will serve for purpose of illustration. The tube or crystal as we all know is in reality a rectifier of oscillating current, permitting it to flow more freely in one direction than the other. The real detector which uses electrical impulses to vibrate the diaphragms which produce the audible signals we hear, is the head-phone. Now the primary cause of the electrical impulses round the magnets of the head-phones is a current of electricity which flows back and forth in our aerial when signals are being received. There is nothing imponderable or intangible about this electrical current, it is very real and active and capable of measurement. Having accepted this fact, namely that an electrical current flows up and down our aerial when radio reception is in progress let us consider first, what is an aerial? As we all know, it is a wire or similar capacity insulated from the earth at all points except through the receiving set. For purposes of illustration let us make our aerial a single strand of wire as there is no use mentioning all the different forms of aerials in use, as their principal is practically the same in every instance. Now we may ask the question, what known causes will make a current of electricity flow in a conductor? I think we can in the instance of our aerial safely put aside without further explanation three of the known causes of electricity current, namely chemical action such as we observe in storage batteries and dry cells, thermic action such as we obtain by heating the junction of two dis-similar metals and frictional action as obtained by a

static machine, or stroking the cat's back. We now have left only one method discovered by Farraday and on which practically all commercial electricity is produced today. Farraday discovered that when a conductor is moved in a magnetic field of force in a manner that the lines of force interlinked, or cut the conductor at the rate of 100,000,000 per second a difference of potential of one volt was produced between the ends of the conductor, and given a circuit, a current flows conversley he discovered that if the magnetic field is moved in a similar manner about a conductor the result is the same.



Isogonals, or lines of equal magnetic declination.

Now to return to our aerial. It is a conductor and stationary but around it and around the entire world and extending as far as we know into illimitable space there exists a real and appreciable field of magnetic lines of force. By means of the compass we are able to discern these lines which on earth run between the North and South poles in a somewhat irregular manner. By carefully carried out magnetic surveys the daily variation in the strength of these lines, the seasonal variations and declinations have been carefully computed in practically every quarter of the globe. Now our aerial is surrounded and interlinked with these lines of force and if they move so that their interlinkage with our aerial is varied, a current of electricity will flow in the aerial and a signal will be heard if the movement is sufficient.

As all radio men know, static or atmospheric electricity is a common source of annoyance. Any storm in the electrical magnetic field sets these lines of force in irregular motion and they, cutting our aerial cause currents of various strength to flow in it and our reception is marred by the well known hisses, splotches and blurs, which we curse as QRM. Now the aerial of the transmitting station is also surrounded by lines of force, and during actual transmission when the aerial of the transmitting station is charged and discharged, it apparently sets up a magnetic storm whereby the entire field of the earth is disturbed. This regulated charge and discharge causes the earth's magnetic field to move and cut any aerials with a degree of intensity varying with the distance of the receiving station from the transmitting station primarily. We have now established a definite link between the sending and receiving stations and it is well to remark here that throughout the whole range of mechanics there is one law among others which is absolutely incontrovertable and that is "Between the force applied and the object moved there must *always* be a connecting link". In the case under consideration the force applied is the oscillations in the aerial at the transmitting station, the objects moved are the diaphragms of the headphones, at the receiving station and I personally think the connecting link is the earth's magnetic field. In fact place an aerial in a state where it is not in contact with terrestrial magnetic lines of force which can be freely affected by the movement of the earth's magnetic field and I doubt very much if you will hear any signals.

Let us consider how we can explain certain well known phenomena in relation to radio reception by means of this theory. For instance it is generally well known that much greater distance can be covered at night than in the daytime. It has been proven that the strength of the earths magnetic field is greater at night and also that the declistrength of the earth's magnetic field is greater during the hours of daylight. Therefore at night we have a straight well known defined link between two stations. In the daytime a weak distorted one. Again reception is generally better in the winter than in the summer months and magnetic surveys prove the earth's magnetic field to be more stable and well defined during the winter than in the summer.

In different quarters of the globe radio reception is much more difficult than in others, also the strength of the earth's magnetic field varies on different locations. Take a look at the Isogonal Map of North and South America where the lines of equal declination are marked. See the variation between different points on the Western Coast, especially in the southern portions. Does this account for the difficulty with which we receive signals from South America? Note the eddies and dead spots where the movement of the compass is sluggish, due to local magnetic conditions. It seems reasonable to me to suppose that there must be some connection between these and the great difficulty which is met in receiving radio signals at certain points. The working out of this theory has been of great interest to me and as far as I have gone I am supported by fact. But of course there is a world of intensely interesting scientific research work to be done to establish this theory as an actual explanation of radio transmission. With this in view I trust that the many men of far greater intellect than myself who read this article may be suffiiciently interested to devote some time to its study.

Before long, it is possible that Eskimo igloos will resound with the strains of "Somebody Stole My Gal," and that the citizens of Shanghai may at last hear the "Shanghai Lullaby". Or the American business man travelling in foreign climes, and homesick for his own people, may sit him down beside the radio and be cheered up by the strains of United States jazz, the finest in the world. This last is exactly what happened according to one of the letters mentioned above which was addressed to Mr. Davis by Mr. C. F. Knight, an American residing temporarily in Austria. Mr. Knight describes graphically his surprise and delight at picking up American music several thousand miles away. The second letter received was from Mr. Y. E. Kriz, evidently a native Austrian. Mr. Kriz states that he picked up Le Paradis music on March 13 about four o'clock in the morning, while Mr. Knight gives the time as about four a.m. on March 14. It seems probable that both American radio fans are referring to the same concert in spite of the slight discrepancy in date.

Larchmont is the third municipality in the United States to establish a radio broadcasting station in the village hall. The set, valued at $2,500, is the gift of Frank E. Campbell of Bay Avenue. When its installation is completed it will have a sending radius of more than 600 miles. A receiving set also is being installed. The Larchmont police expect to use the radio in sending out and receiving general alarms to and from police throughout the country.

Why Shut Up Shop and Go Fishing

By ROBERT J. CASEY,
the Vest Pocket Anthologist

WHY should radio be a seasonable affair—like the flue and the winter coal bill?

It seems to be the accepted psychology in the radio business to shut up shop and go fishing at the first breath of spring. But why? That, Oswald, is one of the real mysteries of radio. It ranks in interest with static, body capacity, and the proposed tax on broadcasting and it outclasses them in importance. But it is undeniably a mystery.

According to the popular conception of the thing, the entire world goes deaf in the summer time. All the stations quit broadcasting simultaneously—or simultaneously quit broadcasting, depending on your particular situation. All the batteries die. And all the Gyp distributors have their annual fires.

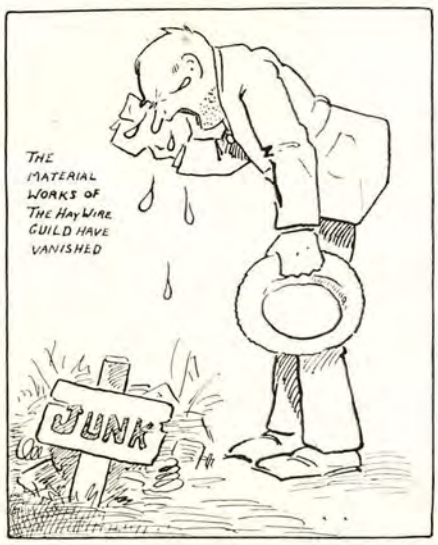
A survey recently completed by the Electrical Research Laboratories of Chicago may furnish a clew to the causes of this phenomenon. Two years ago the hard summer followed a particularly soft winter. Many a manufacturer sighs at the memory of that glorious period when a brace of static-sifters euphemistically called headphones brought an unquestioning $15 and a wooden variometer was considered cheap at $7. Every second-hand clothes dealer who could make a Chinese copy of a piece of wireless apparatus went into the radio manufacturing business and took out more fire insurance.

Along about spring the great mass of radio pioneers had become convinced that radio was a myth. But why go on? The story of that fearful summer is written in records of the bankruptcy courts of every county in the United States. The public had suddenly become convinced that short-circuited coils and contact-less rheostats are an expensive attic decoration. That radio ever recovered from this period of disillusionment is proof enough of its permanence, and of American adjustability.

A manufacturer of loud speakers referred to those days last week as he paid off the last of the loan that had saved him from wreckage.

"Our loud speakers were good," he said. "They were just as good then as they are now, and we rate at present among the foremost in our branch of the industry. But there were no good receiving sets. I doubt if in the entire city of Chicago there were three radio sets as good as our demonstrator. Naturally, the amateur constructors who bought loud speakers in the hope that they would correct all the deficiencies of a 1919 circuit were disappointed at the outset. About 75 per cent of our output came back that year. We'd have sold our patents for $5,000, but we couldn't get a taker. It looked as it radio would never be revived."

Radio revived because it changed. The Gyps are always with us. But their numbers are decreasing and it has become possible for a fan to buy standard parts with fair assurance that they will work. The elementary telephone circuits are fairly well understood by a majority of amateurs. And the sounds that come over the radio are quite similar to those sent out by the broadcasting station. Prospects for continuous popularity should be good. But in the background is the memory of that terrible summer.



Because of one "silent summer" it seems likely that all summers are doomed to the gag rule. A matter of psychology, Oswald, that only the nimble of wit can explain.

A summer evening on the front porch or the lawn certainly is no less enjoyable for a radio concert, and a radio set more than once has been known to take the curse off a summer resort vacation.

As for static, most of it disappeared with the wooden variometer and its rough looking cousins. Inbuilt crackles in radio sets went out of style with switch arms and taps and Mexico City sounds just as bad in summer as it does in winter.

The canvas shown that distributors and set builders throughout the country see no good reason for a warm weather depression and look upon the annual vacation from broadcast as a tribute to the memory of the inefficient sets of two years ago. The material works of the hay-wire mechanics' guild have vanished. But only a patient and honest campaign of education extending over a period the length of which no one can forecast will destroy the psychological bugaboos that Gyp built.

Listen to the Nightingale

A NIGHTINGALE sung in a moonlit surrey thicket the other night and all England heard the song. More than a million radio fans in all parts of the country "listened in" as the clear notes of the feathered songster were caught in a michrophone and carried by land line to London whence they were broadcast.

It is planned to repeat the concert. It is hoped that radio fans of the United States may hear them. The scene at Oxted, near which the experiment took place, was remarkable. Several nightingales had been coaxed to a thicket, where they were accustomed to nest.

Tiptoeing softly about the garden where the little songsters were nestling, Mrs. Beatrice Harrison played several soft notes on a 'cello.

Suddenly the nightingale's clear song burst on the moonlit air. The 'cello accompanied it for a few minutes, then ceased, and the nightingale sang on alone.

Eskimo Kids Interested

When an interesting KGO radio program is being received in their home, Eskimo children are just as hard to keep in bed as any other children. Discovering this in an orphanage for Eskimo children at Teller, Alaska, the matron has reported to KGO, the Pacific Coast radio station of the General Electric Company, that during a recent broadcast of KGO, she found "several of the girls out of bed with their ears to the floor just above the loud speaker enjoying the program".

"We have 36 Eskimo children here", writes E. H. Dahl, manager of the orphanage. "You cannot imagine the pleasure we get from air programs. We live at Port Clarence, the only harbor on Seward Peninsula. Only ships going into the Arctic stop at our door. They get fresh water from our creek".

With time at their disposal for enjoyment of radio programs only after the day's work is done, Mr. Dahl explains that they set their clocks three hours ahead so they could listen in on KGO programs.

Saving Micro-Watts Manufacturers' Aim

By M. P. CARDIFF

ONE of the indications of the progress of the radio art is increased attention which is being paid to the design of the individual parts which are used in radio receiving sets. Until quite recently most of this care was focussed on the design of the coils and condensers alone. However, it is now realized that there are mile-wasting losses in poorly designed tube bases, tube sockets and other parts, as well.

A modern fairly efficient radio receiver will receive signals which have as low a pressure as .001 volts. Even in a very good antenna this will not produce an energy of more than .0000001 watts. It is hard to imagine such a small quantity of energy, but forty million receiving sets would produce just power enough to light one ordinary 40 watt tungsten light.

The oldest manufacturer of vacuum tubes has recently greatly improved its product by eliminating the traditional metal shell which surrounds the base of their tube. This change reduces the internal capacity of the tube and at the same time eliminates the losses from eddy currents in the metal shell itself. While the saving of power thus accomplished is quite small when expressed in figures, it becomes of importance when compared with the minute currents received on the antenna.

Second only in importance to the vacuum tube itself, is the tube socket, for all the energy must pass through the socket before it reaches the tube. Indications are that the metal shell socket will soon become obsolete as the single slide tuning coil. The best radio engineering practice of today calls for the elimination of as much material as possible in the neighborhood of the parts of the radio set which carry the radio frequency current. This applies not only to metallic substances, but to insulating materials as well. The socket of the future will undoubtedly consist merely of a comparatively thin shell of some high grade insulating material, and a base only sufficiently large to accomodate the necessary contact springs and connecting posts.

Some manufacturers are already marketing sockets of this type. The necessary strength and durability is being secured by the use of Bakelite or similar material of uniform cross-section which assures thorough curing of the material, giving it the highest possible di-electric properties, as well as making it mechanically strong.

A further interesting fact that has been developed through research conducted by one of the largest battery manufacturers, is, that the "hissing" and "frying" noises often attributed to B batteries are in reality caused by poor connections, usually between tube terminals and the socket contacts. Their research shows that there are no noisy B batteries.

To prevent such noises and the shortening of many otherwise good concerts there are manufacturers who have not only provided sockets with the high insulating properties but have devised contacts that are of a wiping nature with dependable tension for each and every type of tube. In certain instances they have also provided dual wipe contacts on both ends and sides of the tube terminals, eliminating all possibility of trouble from this score.

ONE TYPE OF SOCKET SHOWING DUAL WIPE CONTACT ON TUBE TERMINALS

A SOCKET DESIGN SHOWING UNIFORM CROSS SECTION

It is interesting to realize that only a few years ago we were thrilled at the thought of receiving broadcasting at distances of a few hundred miles, while today coast to coast reception is by no means uncommon. While a large part of this progress has no doubt been due to new circuits and to the refinement of old ones, we must not forget to give due credit to the radio engineer who has been silently but busily engaged in saving the micro-micro watts which add the mileage to our receiving sets.

The Coming Discovery

By BISHOP F. H. DuVERNET

A MOST interesting race for a great discovery is being run. Strange to say the contestants face opposite directions. The scientist experimenting in the physical world is earnestly striving to break up the atom and so release its latent energy. The electron revolves round the proton as a nucleus. If the experimenter can succeed in splitting off the one from the other he may set free the radiant energy which causes electronic activity, and so give to mankind a marvellous new power. This is the race in the one direction. The scientist experimenting in the psychical world is none the less earnestly endeavoring to discover the higher unity between mind energy and radiant energy, the one spiritual and the other physical. If the experimenter can succeed in demonstrating how mind energy blends with radiant energy so that the one is the inward aspect and the other the outward expression of the same reality a great mystery will be solved and human life will be revolutionized. This is the race in the opposite direction. It is most significant that the one is trying to divide what seems indivisible and the other to unite what seems divided. Apparently the two are racing in opposite directions but when they both reach their goal they will find themselves face to face, because mind energy and radiant energy flow from a common source.

It is in vain for the materialist to say that there is no problem because all is physical and mind is only a function of the brain. It is equally vain for the spiritualist to say that there is no problem because all is mind and matter is only a delusive appearance. The philosophy of common sense accepts without question the facts of experience. Our experience of material things as physical objects is a reality. Our experience of consciousness, intelligence, pure memory, and reflective reason as spiritual activities is also a reality. The attempt to deny the reality of either the physical or the spiritual is out of date. Only a higher synthesis which does full justice to both will lead to the great discovery which seems almost within our grasp.

While according to mind energy its true spiritual value it can be scientifically demonstrated that it functions for us through radiant energy. In countless different ways our mind energy overflows our physical brain and, therefore, cannot be identified with it, and yet at the same time our conscious mind responds in spiritual harmony to our vibrating brain cells which in their vibrations manifest radiant energy. A thousand times a day we practically demonstrate that our conscious mind, which intelligently chooses and directs, causes our motor nerves to react, and nerve force is a form of radiation or electric energy.

In telepathy the interaction of mind energy and radiant energy is very manifest. By a series of experiments ranging from two feet to over five hundred miles we have demonstrated this psycho-physical interaction hundreds of times with scientific accuracy. This is why I do not hesitate to use the word "radio-mind" because psychic waves correspond in rhythmic harmony with radiant waves producing mental radiation. It would be most unscientific to try and identify the psychic waves of thought and feeling

(Continued on Page 243)

With the Western Amateurs

A Department Conducted by A. L. Munzig

5OG Comments

The following interesting letter is from 5OG. Am a consistent reader of your paper and as we central hams are very much alive would like to bust in to your circle. Am enclosing a photograph of my "shack". The panels are a couple of well known outfits but the circuits are very different from the original.

I have to take exceptions to most magazines, yours included, of exploiting some "freak" or wonder circuit—most of which work well—to the disgust of all other receivers in a radius of five miles. Now I do except and heartily endorse your work on Trap circuits of the non-radiating variety. This transmitter works both coasts—Mexico and Canada—yet B.C.L. in the same block never know I am working—the 4-5 watters are putting 80 watts into the air by actual measurement. and are over eighteen months old, but the circuit is homemade and designed to do certain things efficiently.

I have tried all kinds of "dynes'—"formers" and am still using the resistance coupled—all the way—12 tubes of it. Why? Well the "formers and dynes" would give freak reception by amplifying energy from an oscillatinng set that was DX 'ing a distant station—that is why! Quite a lot of records are established that way: In fact some of my best DX records were made with a 5 watter for detector and 140-180 volts on plate biased with 80 to 100. She sure do oscillate merrily but the advantage is you don't hear the 90 volt "experts" at all.

Therefore I heartily endorse the stand of W. T. Anderson. He writes a very sensible article. Why not more like it.

A word about my circuit—It is the old "Godley" resistance coupled, with measured and matched units, extra good condensers and lots of 'em extra good soldering, and extra short leads well shielded. Great big wire well separated and the six microfarad bypass condensers tell the tale. It is just balanced that is all, even to the smallest detail.

For fear you may get the idea that I am a radio engineer permit me to state that I am a beginner. Yep! I started back in 1903 but I understand the first fifty years are the hardest. Details and drawings on either circuit would not help the average fan. He would not take the time to do it right any way. Sincerely, O. S. KELLEY, Oklahoma City.

Club Meets by Radio

An experiment to determine whether it is possible to hold a club meeting by radio, with all members seated comfortably in their homes, has been tried out successfully by amateur radio fans in this vicinity of Dallas, Texas. The meeting was called to order by the resident, motions carried and all business transacted with as much ease as though the members were gathered in one room. The idea was conceived by members of the West Gulf Amateur Fone Club which organization was started recently by representatives of the American Radio Relay League. Practically all members have installed radiophone transmitters in their homes. Due to bad weather the suggestion was made that the members hold their meeting "in the air". Notices were sent to all club members suggesting a wavelength of 190 meters.

At the appointed time all members were at their sets when the president started up his radiophone and called the meeting to order. The roll was called by the secretary and, as their names were spoken, the members picked up their microphones and answered "present".

As each set had been carefully tuned in advance all members of the club could hear everything that took place. Amateurs in nearby towns had been invited "to attend", and it was interesting to hear the voices of these out-of-town members since they seldom had the time and facilities to attend the regular meetings. The session lasted two hours.

Pan American Tests

The breaking of a world's record coupled with other long distance work, during the Pan American amateur radio tests just concluded by the American Radio Relay League in co-operation with the Revista Telegrafica, demonstrates that the South American amateurs are becoming as efficient in short wave transmission as those in this country.

Carlos Braggio of Bernal near Buenos Aires, operating amateur station CB8, is the outstanding figure of the Latin American tests through his successful two-way communication with J. H. O'Meara at Gladstone Road, Gisborne, New Zealand. This is the farthest two-way contact ever made on amateur waves.

In addition Mr. Braggio's station is reported to have been heard by Everett H. Gibbs of Framingham, Mass. Mr. Gibbs reported that no code word was received, so a check-up of operating schedule is being made by F. H. Schnell, A.R.R.L. traffic manager. These two events give Mr. Braggio the distinction of being the first South American to be heard outside his own continent.

Amateur of Sweden

Radio Journal is read in practically every country on the globe, in addition to the thousands who read it in America and Canada. Recently the editor of this department furnished some information to an amateur in Sweden. His reply, which illuminates the radio situation there, follows:

A few days ago I received your kind letter and I cannot tell you how glad I am. No man here has given me such good information as you. I do not think it will be a difficult problem to do a variometer when I have your very fine information. Here in Sweden broadcasting has begun this year. For the present it is only trial.

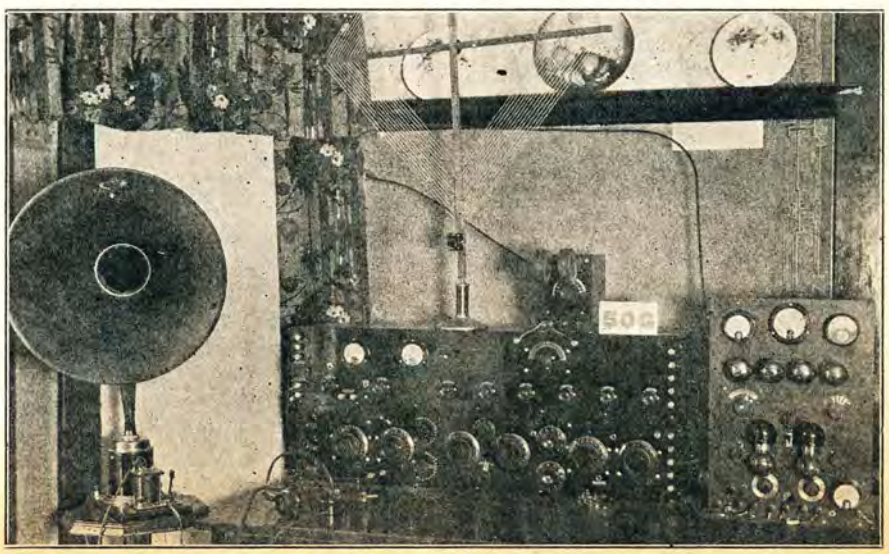
There are many who sell sets but it will be too much to buy, therefore a radio amateur must do as much as possible. I am very glad to hear that you have been in Norway. It is no long way from Norway to Sweden.

A friend of mine who lived in St. Paul sent me a magazine and I send him Swedish newspaper. For a Swede $3 is too much to pay for a paper, all the more as the salary here is not so large as in the United States. With best regards, M. NETTERSTROM, Stockholm, Sweden, April 10.

Hear New Zealand

Amateurs in Eureka, Kansas, and Bridgewater, Mass. have reported hearing a New Zealand transmitting station. Rev. Chapman, a missionary at Anvik., Alaska, claims to have heard a New Zealand call.

As New Zealand and the Phillippines are about equally distant from the center of the United States, it is expected that communication with the islands will be possible in the near future. However, the local receiving conditions are by no means as good as they are in New Zealand where atmospherics are at a minimum. Fred Elser, operator of the Philippine station 1ZA, is making an effort to communicate with the U. S. with two 50 watt tubes.



This is 50G owned and operated by Dr. O. S. Kelly of Oklahoma City. It has an enviable record.

World League Boost

Further impetus to the movement for uniting transmitting radio amateurs into a world association was given in the recent visit to the American Radio Relay League Headquarters of Gerald Marcuse, secretary of the transmitters section of the radio Society of Great Britain. Mr. Marcuse is making a tour of the United States and Canada to study amateur methods.

While in Hartford as an unofficial representative of the radio amateurs of England, he told Hiram Percy Maxim, president, and other officers of the A.R.R.L., that he would give his personal support to the International Amateur Radio Union. The initial plans for this world association of amateurs were drawn up during Mr. Maxim's recent European trip. The final organization will take place at a special Congress in Paris during the Easter holidays of 1925.

Major William C. Borrett of Dartmouth, Nova Scotia, manager of the League's Maritime Division, visited Hartford at the same time. He declared that Canadian amateurs were ready to become connected with such a union and predicted that it would be invaluable as a means of establishing friendly relations among the people of the countries represented. He cited the present intimate relations between amateurs of Canada and the United States as an example of what could be done.

French Tests

Any amateurs who heard NKF, NKFI or FL on special tests with France, should report reception at once to F. H. Schnell, traffic manager, A.R.R.L., or to the district manager.

Visiting Hams

Here is a photo of Mr. Don Harris, op. "DA" of 7SC with 6EA and 6EB, while the former was visiting the latter's home. Mr. Harris is at the Naval Radio School at San Diego. He hopes that he'll "ship out" down to Panama Canal, where the fleet will have a big sham battle this summer. Several months ago, Seefred Brothers were visited by Mr. Fensky, 7DG of Cordova, Alaska, who is going in the "auto laundry" business (washing cars. Hi!) with his brother in San Diego. 5ZZ, 6FN, 9DQ, and 9BJK have recently visited or now staying in Los Angeles.

W. S. Wiggins, 6CHZ, better known to the ham fraternity of the Southwest as "Wiggy." He is secretary of the Southern California Radio Association.

Canadian Relay

The following is a letter to Radio Journal from R. D. Lister, associate editor of the Radio Bug, Winnipeg, Canada: I suppose that nothing has been heard as regards the South African test. There are about four of our best Eastern station which were in on this test, all of which have been QSO Europe a number of times this winter.

You will no doubt be interested in the recent achievements of some of our Canadian stations in handling a trans-Atlantic-transcontinental relay from England to Vancouver, B. C. However this has been beaten all hollow for real DX when 4FZ at Winnipeg worked 1BQ at Halifax, N. S. a distance of over 1,800 miles and mostly over mineral ore country. 4FZ used a five watt tube at that.

Coast Manager

M. E. McCreery, 6LJ, received this message the other day from F. H. Schnell, Hartford,Conn. Congratulations. Gang elect you Manager Pacific Division (A.R.R.L.) by large majority".

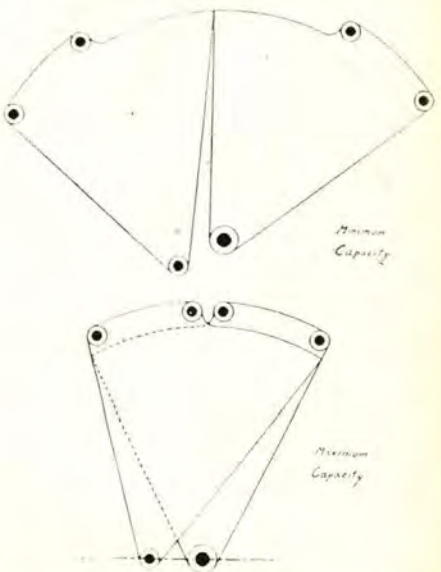
We opine that Mr. McCreery will make a real manager.

Radio Tours Canada

In order to stimulate interest in Radio throughout the rural districts of the Province of Quebec, and to convince, on the spot, the incredulous, a car of the "flivver" type, equipped with the latest receiving devices, will cover every district populated by French-Canadians, travelling a distance of over nine thousand miles. Station C K A C, owned and operated by "La Presse" Publishing Company, Limited , Montreal, will be picked up and supply the daily entertainment. The villagers will be shown how radio works, what it does and brings to even the most isolated homes.

The Car, which is known as "Car-A-Van", left May 20 morning on its first lap, heading East. When Quebec Province has been entirely covered, the "Car-A-Van" will head south and cover those parts of New England and New York where hundreds of thousands of French-Canadians are residing.

The "flivver" has four speeds and the dimensions of the Pullman are 27 feet long, 7 feet wide and 6 feet high. The sets aboard are of the Super-Heterodyne and Neutrodyne makes, to which are coupled a couple of power-amplifiers and loud-speakers. There are four passengers on board. The manager of the cruise expects to interest at least half a million people in radio, through this medium.



Merton Cuthbert of Los Angeles, Calif., designed this type of condenser plate with three point contact. Its advantage is rigidity of plates and consequent ease of maintaining accurate spacing.

Broadcasting stations call letters usually have no other meaning than simply to designate a radio station. However, some stations are fortunate enough to have assigned to them letters that do mean something. For instance the Chicago Tribune, whose slogan for years has been "The World's Greatest Newspaper," has the call letters WGN. Whether this was by luck or by good wire pulling does not matter. WFAA at Dallas, Texas, had to stretch it a little but finally evolved the slogan, "Working for All Alike," out of their call letters. WAAW, station of the Omaha Grain Exchange has been translated to mean "Where Agriculture Accumulates Wealth" and then there is the station of the Detroit Police Department, whose call letters are KOP.

Trade Talk from Radio Dealers & Manufacturers

Western Radio Moves

Western Radio, Inc., will move into its new home within the next thirty days, when it will occupy an entire building at 1224 Wall Street, Los Angeles. The new building will be known as the "Home of Cutting and Washington". Western Radio, Inc., under the management of L. E. Taufenback, is the oldest radio establishment in Southern California.

No Pre-Announcements

At a luncheon of the Talking Machine and Radio Men's Association in New York City it was decided to suggest to radio manufacturers that no announcement be made of new, improved sets until the apparatus actually is ready for distribution to dealers and for sale to the public.

It was said that announcements of new sets caused the public to defer buying those now offered for sale and that retailers were having difficulty in disposing of their present stock.

Used Radio Mart

Now comes the used radio market; a step parallel to that taken years ago in the motor car business. A. C. Trobert and R. G. Neifert have opened "The Radio Exchange" at 507 Grosse Building, Sixth and Spring Streets, Los Angeles, and will make a specialty of buying and selling or exchanging used radio sets and parts. They will take in on trade or for sale anything that pertains to radio. Used sets will be rebuilt and offered to the buying public.

Special Radio Bats

"Why must I have a special radio 'A' battery for my set when I have an automobile battery that ought to work just as good?" Is a question that many a battery and radio experts heard when radio first became the rage. Today, however, they do not hear that question so often because the set owner with the impression that any old battery will do, is rapidly disappearing. "Any old 'A' battery will certainly not give best results in radio 'A' service", said Mr. C. T. Holcomb, Manager of the Western Auto Electric Co., Distributor of Willard batteries. "An 'A' battery to give results, must be built for its job, with the particular characteristics called for on that job. "Some set owners have been using automobile batteries in 'A' service, many of them rebuilt, although the requirements which an automobile battery is designed to meet are entirely different from those for radio 'A' battery work. In radio 'A' service, there is need of a constant voltage, otherwise frequent re-tuning is required because of the sensitive character of the apparatus.

"In automobile service, on the other hand, ordinary fluctuations in voltage are not perceptible in results. In automobile starting and lighting batteries there is need for a comparatively high rate of discharge. In radio 'A' service the rate of discharge is comparatively low. This means that it is possible to use thicker, heavier plates in a radio 'A' battery and so greatly increase battery life.

"All of these and other facts were recognized by the Willard Company and they were no less concerned with developing thoroughly satisfactory and economical 'A' batteries than they were with producing the right kind of automobile batteries.

"The outstanding results of Willard efforts is the Willard All-Rubber Radio 'A' battery, designed and produced especially for radio service and showing many evidences of exceptional battery-building ability and experience. Not a bit of wood is used in this battery. The insulation is of Willard Threaded Rubber and the case is of moulded hard rubber."

Homcharger Conference

Twenty-one Homcharger salesman assembled for a three-day conference at the factory of the Automatic Electrical Devices Company, Cincinnati, Ohio, on April 23, 24 and 25. These representatives were from coast to coast, and during the conference they learned of many new products to be distributed by this company. All of those present reported that prospects for a good, substantial summer radio business are very bright, and it was learned that the company is preparing to do a greater radio business this summer than in any other period of the year.

Inventors Manual

"The Inventor's Manual" or "How to Work a Patent to Make it Pay," is the title of a book by George M. Hopkins just issued by the Norman W. Henley Publishing Company, 2 West 45th St., New York. The book is designed as a guide to inventors in perfecting their work, taking out their patents and disposing of them. The volume in its new and revised edition also contains a host of charts, tables, etc., of interest to inventors.

Radio World's Fair

The First World's Fair Radio which is to be held in Madison Square Garden, New York City, Sept. 22 to 28, under the auspices of the Radio Manufacturers' Show Association, with U. Herrmann as Managing Director and James F. Kerr as General Manager, is attracting universal attention. Managers Hermann and Kerr fully expect the coming fair to excell their big Chicago Radio Show of 1923 in almost every respect, in spite of the fact that the latter was one of the outstanding trade show triumphs of the decade.

As nine-tenths of the exhibiting space in Madison Square Garden has already been contracted for and as the remaining ten percent is oversubscribed, it is practically a certainty that the exposition will be forced to spread out and take in the 69th Regiment Armory, located just across the street, upon which the R. M. S. A. has just taken an option.

New Concern in Field

Clarence E. Ogden, founder and president of the Automatic Electrical Devices company, manufacturer of the Homcharger and incidentally the world's largest manufacturer of vibrating rectifiers, has recently organized and incorporated under the Laws of Ohio, a new concern—The Kodel Manufacturing Company — for the manufacture of a portable radio set, of which he is the inventor, together with other electrical and radio specialties.

This Company's first offering to the trade will be a small, compact and really portable long distance radio set—The Kodel—the camera of Radio. This set weighs less than 5 lbs. complete with all accessories. Contained within

a neat leather covered case 5¾ x 4½-x 8 inches in size is a standard UV-199 tube, "A" and "B" dry batteries, pair of standard head phones, ground and aerial wires. This set operates quite successfully without either ground or aerial, the two wires merely being thrown on the floor. With ground connections only, surprising distances have been received, and using aerial the Kodel has a range of from 2,000 to 3,000 miles. This set will be retailed at $18.50 without accessories. A complete line of radio parts and other specialties are being developed by the Kodel Company and will be offered to the trade the coming season.

Zenith Exhibit

In Suite 323 of the McAlpin Hotel, during the week of the Music Trades' Convention in New York City, the Zenith Radio Corporation of Chicago exhibited a full line of their products. Probably the greatest interest centered around the super portable, just being marketed, which represents the last word in radio development. It is a six tube Zenith circuit with every part, including batteries and loud speaker, built into a small size suitcase. There are no external wires or loops of any kind. It receives radio programs while in motion anywhere.

Electrad Folder

Electrad, 428-430 Broadway, N. Y., have issued a new folder announcing their line of certified grid leaks, variohms, variable resistance and condenser combined, hydrogrounds, lightning arresters, vernier dials, indorarial, lead-ins and lamp-socket antenna.

From out where tom-toms, war-clubs and wails of dancing natives is a part of the daily grind, word has come to KGO, the General Electric Pacific Coast Broadcasting Station, that radio jazz music heard by South Sea native chiefs and their people is appreciated and awakens primitive rythmic instincts.

"Concerts given by KGO are enjoyed here", writes W. R. Ragsdale, trader at Savaii, the last primitive island of Polynesia. "The jazz dance music from the Hotel St. Francis is great and is very much appreciated by the natives who listen in regularly over the loud speaker".

Radio waves travel not 186,000 miles an hour, but about 165,000 miles, said Capt. T. J. J. See, professor of mathematics and Government astronomer at Mare Island Navy Yard, Calif. He attributed this to the retardation caused by the pull of the ground, which the waves enter freely.

LISTENING-IN

5AW Log

Stations heard at 5 AW (Canadian) September 10 to April 26: 1YB, 1GV, 2RS, 2CP, 2BZV, 2BQH, 3CW, 3AFM, 3HG, 4KU, 4FT, 4KW, 5EB, 5KC, 5AMA, 5ADO, 5IN, 5ZA, 5MN, 5ZR, 5ZAV, 5LR, 5HG, 5PH, 5HT, 5PB, 5AIU, 5HK, 5AHR 5AHD, 5ACN, 5AKN, 5QY, 5BE, 5VX, 5AJ, 5QI, 5AK, 5XD, 5LG, 5AU, 5XT, 5MM, 5VM, 5TO, 5GA, 5BX 5BF, 5TJ, 5FT, 5RG, 5JL, 5HZ, 5AAQ, 5GN, 5BV, 5RH, 5AGK, 5NA, 5BGN, 5AMG, 5QT, 5AJJ, 6VD, 6CIZ, 6JJ, 6CJD, 6AQD, 6ADO, 6CEZ, 6CPL, 6BLS, 6CQS, 6DD, 6AFT, 6AHX, 6CNF, 6CLR, 6EI, 6EB, 6EA, 6CEI, 6ZAD, 6BUM, 6CGW, 6AFA, 6HJ, 6UR, 6CDV, 6CJB, 6MJ, 6ZBB, 6ZA, 6AJU, 6ADV, 6CPW, 6WB, 6HJ, 6JS, 6IX, 6CQ, 6BAU, 6APS, 6FT, 6CMS, 6OR, 6CGS, 6CHE, 6AHY, 6EFM, 6BMD, 6CP, 6AFG, 6CBB, 6CCB, 6ZP, 6BRI, 6BRA, 6CEE, 6NK, 6CEF, 6CHI, 6CGD, 6CET, 6BQC, 6CMR, 6BCL, 6CFI, 6OH, 6BVS, 6BGY, 6KJ, 6AOC, 6ANB, 6APH, 6CAT, 6ALV, 6PL, 6CBD, 6XAD, 6ADM, 6CBU, 6BFB, 6ZAF, 6FZ, 6AHC, 6CGG, 6ET, 6CHL, 6BVG, 6BIH, 6AAJ, 6CBC, 6ARB, 6XAH, 6ATY, 6BUG, 6AWS, 6BUO, 6CHU, 6NX, 6MN, 6CFI, 6CFM, 6ZAH, 6ZK, 6CT, 6BM, 6BIC, 6CKF, 6ZAR, 6ZH, 6ASA, 6FY, 6BNU, 6BPV, 6CID, 6AOU, 6BVK, 6BOS, 6AGE, 6ET, 6CAH, 6BIH, 6BEJ, 6ZI, 6AOS, 6CKR, 6BHB, 6BUA, 6TU, 6BKX, 6AGJ, 6VF, 6AR, 6MH, 6AUY, 6BUO, 6ASX, 6CFS, 6KA, 6BIG, 6JM, 6AO, 6BUZ, 6AFG, 6ACZ, 6BVR, 6AFQ, 6ZE, 6AAK, 6EN, 6CEJ, 6BAH, 6BFY, 6BGG, 6EI, 6AJH, 6AOL, 6CBW, 6ALU, 6CNC, 6ZAU, 6CAE, 6BTS, BSG, 6UF, 6BWE, 6AQQ, 6BIQ, 6AGK, 6AWT, 6AJF, 6XWI, 6CKZ 6AHZ, 6ALK, 6AJD, 6AOI 6CFZ, 6ACM, 6AIL, 6CAX, 6BIN, 6BS, 6CEK, 6BOU, 6ATZ, 6BUR, 6ATC, 6BCS, 6BBW, 6ABC 6AKZ, 6CAB, 6BJJ, 6GN, 6ZBA, 6ZV, 6BWA, 6CCY, 6AJA, 6CB, 6CJB, 6GT, 6QJ, 6AHU, 6RN, 6CML, 6CMM, 6AMP, 6CEK, 6PE, 6UX, 6AHP, 6CEE, 6BEZ, 6AOH, 6AJJ, 6CJK, 6TN, 6CFT, 6AMS, 6BUY, 6ATY, 6BIC, 6BVE, 6PU, 6AGW, 6BCE, 6BRC, 6BPF, 6OB, 6BMP, 6AOH, 6ADO, 6CMI, 6CMU, 6WZ, 6ARF, 6ACZ, 6HI, 6ADQ, 6PE, 6CFP, 6AVP, 6OP, 6ATW, 6BGW, 6ATP, 6ADH, 6NB, 6CDC 6CCU, 6UC, 6DJ, 6GW, 6JJ, 6CEZ, 6DD, 6ZAD, 6HP, 6HS, 6NX, 6AKN, 6CMS, 6CGS, 6AHY, 6CPJ, 6EW, 6AQM, 6CKI, 6BBQ, 6BPM, 6KJ, 6ACY, 6CQB, 6BVQ, 6CCO, 6ZCD, 6BID, 6CDG, 6CAL, 6QI, 6BQN, 7BR, 7AHG, 7AGF, 7WP, 7AGU, 7RC, 7AKT, 7AEL, 7LY, 7KU, 7ZN, 7GE, 7SF, 7SN, 7ZR, 7ADR, 7ADP, 7CF, 7ZL, 7LH, 7ACM, 7QU, 7EI, 7ACA, 7DC, 7EO, 7GI, 7ABB, 7VC, 7IY, 7IT, 7AIY, 7QD, 7JN, 7HA, 7YA, 7PF, 7CU, 7QJ, 7BY, 7ZZ, 7AHB, 7IW, 7ADQ, 7DU, 7DU, 7MN, 7ZU, 7OH, 7AKU, 7ED, 7AEA, 7AKV, 7HG, 7AGE, 7WM, 7OT, 7EM, 7ASB, 7SC, 7AFN, 7ACX, 7VE, 7KS, 7PJ, 7AF, 7NO, 7ZE, 7SH, 7QC, 7AGR, 7UU, 7IP, 7AIM, 7WD, 7ABF, 7AKJ, 7CO, 7LH, 7AFO, 7CB, 7JS, 7DN, 7ADG, 7CQ, 7OB, 7AHV, 7AIF, 7AEK, 7AEK, 7NY, 7TO, 7AHI, 7WA, 7MT, 7ADD, 7OY, 7AEE, 7EA, 7AJY, 7RN, 7HI, 7ADI, 7TQ, 7IW, 7AFQ, 7DJ, 7ER, 7EJ, 7OM, 7MP, 7QF, 7AFC, 7AKH, 7AX, 7IH, 7AKQ, 7AEK, 7NF, 7JB, 7QX, 7ABU, 7JP, 7MA, 7QT, 7IF, 7LS, 7GY, 7RK, 7AIM, 7KL, 7PZ, 7AEG, 7UT, 7CW, 7EL, (spk???) 7MI, 7NE, 7MF, 7AHC, 7KT, 7AR, 7ALI, 7FN, 7AJQ, 7JE, 7EY, 7AGI, 7DI, 7GQ, (spk??), 7ALK, 8YD, 8DAT, 8XAN, 8XAD, 8JY, 8ADA, 8CE, 8DHS, 8CGJ, 8BRC, 8CEI, 8BJV, 9ZT, 9BZI, 9ZG, 9CBO, 9AWM, 9DKY, 9GY, 9US, 9BSZ, 9ZY, 9CPA, 9DQE, 9DAN, 9UH, 9CE, 9APF, 9AXX, 9EKY, 9GD, 9NR, 9CKS, 9DPW, 9DOE, 9BLK, 9EBT, 9CNs, 9BSG, 9VM, 9OJM, 9YAJ, 9CCZ, 9AUU, 9CTI, 9MC, 9DKB, 9AIC, 9BIK, 9DLF, 9DXY, 9BEF, 9BQJ, 9BHJ, 9EIL, 9CHC, 9BED, 9BEB, 9CNS, 9AMF, 9AIM 9DJB, 9BJK, 9YU, 9DFH, 9BJI, 9DHG, 9EER, 9YU, 9BOF, (spk??), 9CLQ, 9DYZ, 9CAJ, 9BLY, 9IG, 9AWV, 9EQ, 9FH, 9VM, 9XI, 9DTE, 9DWN, 9CTR, 9AML, 9APE, 9CDJ, 9AMI 9CMK 9EEG, 9EDB, 9BAJ, 9CTG, 9CEA, 9AVZ, 9YY, 9DOU, 9BJI, (dalite), 9CUC, 9COL, 9CLJ 9DYR, 9AEP, 9AZG, 9EAK, 9BOZ, 9AM, 9EIV, 9AHZ, 9DLI, 9BRX, 9AQI, 9BGH, 9YV, 9BOF, (cw.), 9AFO, 9AYP, 9AAQ, 9BIJ, 9ASN, 9AGB, 9CFI, 9CVS, 9AQC, 9XW, 9XN, 9BQJ, 9BEU, 9BVV, 9EFE, 9BIW, 9BUN, 9LZ, 9BF, 9EAK, 9EAE, 9BHY, 9GZ, 9BEZ, 9DCP, 9CPU 9CGA, 9BNX, 9CJM, 9DEU, 9ABF, 9DKK, 9CHF, 9DAW, 9CJU, 9ELB, 9MA, 9AFE, 9BBG, 9DMS, 9DAV, 9BSO,, 9DKN, 9ELB, 9CXF, 9DAW, 9AAQ, 9EEA, 9BDC, 9SS, 9DM,—

Hawaiian—6CEU, 6BDT.

Mexican—AOB ???

Greenland—WNP.

Total No. of Stations heard=607.

From 6ARB

Calls heard and worked by 6ARB, C. E. Duncan, 3029 Acton Street. Berkeley, Calif., February 1 to March 31, 1924: 1FD, 1JV, (1SW), 1YW, 1XW, 1XZ, 1AER, (1AV-J), 1BBV, (1BOA, 1XAK, 1XAS, 2BG, 2BJ, 2GK, 2AYV, (2BRB), 2XAB, (2XN-A), (3BB), 3MB, 3ME, 3TE, 3YO, 3ZL, 3CKJ, 4BY, 4BZ, 4CN, 4HI, (4IO), 4LL, 4OA, 4YO, (4XC), 4XE, (5AC), 5DW, 5NN, 5NY, 5PH, 5QL, (5QY), 5TJ), 5XD 5AAR, 5AAW, 5AIU, 5AMB, (6CEU), (JBJ), (8PL), (8ADA), (8ALF), 8ARV, (8BOE), 8CKV), (8CRV), 8CTP, 8XBH, 8XBQ, 8XBP, 9MC, 99RC, 9VM, (9YY) (9AAU), 9AIS, (9AMB), 9APE, 9AQC, (9AZG), 9BAB, 9BED, (9CGU), 9CHC, 9CJC, 9CLZ, (9CMK) 9CXP, (9DAI), 9DDP, 9DFQ, 9DKB, 9DRO, (9EEA) (9EKY) (9ELD) (9XAX), Canadian, 3BQ, (3NI), 4CB (4CR) 4OQ, 4HH, (5AK), 9AL. All districts worked in one morning on a 50 watter. Signals have been heard in 46 states, Alaska, Australia, Canada, Canal Zone, Greenland, Hawaii, Japan, Mexico, New Zealand and by ships in the Atlantic and Pacific Oceans. Am installing a 250 watter for real DX.

Log From 6EA

Log from 6EA: (1AWE) 1BDA (1CMP) (2BCM), 3BVA, 3XAQ, 4IO, 4XC, 5HG, (5OQ), (5XT), (6FH), (6HP), (6JJ), (6TU) (6ZH) (6ACZ) (6BEZ) (6BMD) (6BQB), (6BQL), (6CEE), (6CEF), (6CIE), (6CKR), 7BJ, 7DM, (7FR), 7GR 7TO, 7VS, (7ABB), 7AFE, 8BFM, 9AMQ 9AGL, 9BMU, (9CJT), (9CSJ). This list is smaller than last month due to QRN making DX unreliable QSO. Will only be on the air before 8:00 P. M. now. Any reports hearing my five watt tube—DC—CW from distant points such as foreign countries, etc., will be greatly appreciated. Have called English 2KF, French 8AB, Australia, and Africa, during the past two months on 150 meters. Never have been heard there yet. Hope someone heard me. If so, please give date, time, etc., so same can be checked by log.

So. Calif. Association

The 100th Ham meeting of the Club was called to order by President Brown and the minutes of the previous ham meeting were read and accepted. Mr. McCreery spoke briefly on A.R.R.L. matters. After much discussion M. Hexter, 6CNL, was nominated and elected the new editor of the BULL in place of Mr. Wood, who will continue to print it.

There was a general discussion of the broadcasting station and Mr. Gray told of his efforts and success in closing the deal with the Armory. A vote of thanks was given Mr. Gray for his hard work. It was decided that the transmitter used at 6CFY be used temporarily.

The new members were introduced and President Brown spoke on the subject of the meetings committee. Mr. Gilbert was nominated and elected chairman of this committee.

Mr. McCreery, 6LJ, told of Dr. Shelton's experiments in San Diego.

Mr. Nikirk, 6KA, gave an interesting report on the work of the antenna for the broadcasting station. He also told of a petition to close down his station.

Twin City Club

The Twin City Radio Club wil hold its last meeting on Thursday, May 15. This will conclude the radio season as far as the club is concerned this year.

Next fall it will reorganize and start once more.

The Dakota Division of the ARRL will have a convention here Thanksgiving week, and the club will plan on taking charge of this convention when it starts.

"A million Casks of Pronto," the radio drama which was awarded the $500 prize in the contest conducted by WGY, the General Electric Company station at Schenectady, N. Y., was presented by the WGY Players, Friday evening, June 6. The play was written by Miss Agnes Miller of New York. This play was written expressly for "the air" and many of its important situations were constructed with the view to interpretation by sound devices.

Western Electric billings were $68,246,000 for the first three months of 1924, exceeding by $16,480,000 the total for the same period of 1923.

Radio Rings a Bell

THIRTEEN years ago, Lewis M. Clement was a radio operator on S. S. Spokane when she was wrecked in Seymour Narrows. Later, he was on S. S. Manchuria on the Trans-Pacific run. As he stood watch in the radio room and felt the 'phones bite deeper and deeper into his ears he vowed that some day he would develop a system to call operators by bell.

Since those days Mr. Clement's technical skill has contributed substantially to the development of the radio art. As an engineer of the Western Electric Company, his name appears on no less than 16 patents. Some of them may be of more importance, but no project has been dearer to his heart than the radio calling system, which he has recently brought out in collaboration with engineers of the American Telephone and Telegraph Company. The system will find use in those new applications of the radio telephone in which a continuous watch may not be necessary for the public safety, as for instance in ship-to-shore telephony.

The new system is an ingenious adaption of well known wire telephone apparatus by radio. Briefly, it consists in putting a 135 cycle alternating current into the radio system, transmitting it as other frequencies in the voice range are transmitted, and at the receiving end using it to operate a sensitive relay.

How It Works

To supply the alternating current, a buzzer operated by direct current is used, and its output is passed through a filter network which sup-

(Continued on Page 244)

Waiting for the Bell to Ring

RAY-DEE-ARTCRAFT Announces New Policy!!

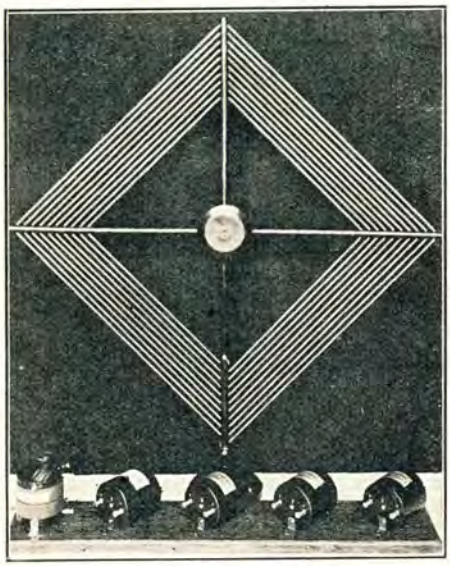
DIRECT TO PUBLIC AT REDUCED PRICES!

Hereafter RAY-DEE-ARTCRAFT PRODUCTS will be sold direct to the consumer—thus eliminating Distributor, Jobber, Dealer, etc. Intelligent advertising and increased production with no decrease in the quality of RAY-DEE-ARTCRAFT Products will be a direct benefit to the public!

AVAIL YOURSELF OF THE OPPORTUNITY NOW!

Did you know that the Ray-Dee-Artcraft Super-Heterodyne Intermediate Frequency Transformer Type 10-A is a TUNED Radio-Frequency Transformer? You are aware that Tuned Radio-Frequency Amplification is five times as sensitive as untuned transformers!

THEN IS THERE ANY WONDER THAT
OUR TYPE 10-A WORKS BETTER ! !



Showing the Ray-Dee-Artcraft Super-Heterodyne Kit: Contains—

1 Special Input Transformer.
3 Intermediate Tuned Radio-Frequency Transformers Type 10-A.
1 Oscillator Coupler.
1 Framework for Loop as illustrated in cut above.
1 Circuit and Instructions.

Price was.....$40.00

NOW ONLY

$28.50

What They Say About Ray-Dee-Artcraft Super-Heterodyne

Mr. R. W. WHISTON, 1808 Buckingham Rd., Los Angeles, Calif., says: "I can hear KYW (Chicago) louder on the detector jack (6 tubes) than I can with 2 stages of audio on a 5 tube NEUTRODYNE, and the NEUTRODYNE using aerial and ground." He also says that he hears WOR (Newark, N. J.), and many othrs, all on loud speaker.

Mr. H. P. McCORMACK, Placer Radio Mfg. Co., Auburn, Calif., writes: "Just a line to let you know what I think of your new Super-Het. It's sure a "ringer"! We have constructed three or four, but this is the first to fill the bill as to clearness, all others distort so bad. *As to distance it's actually impossible to believe that it can be done! If I were to send you a list of what I have received* NO ONE WOULD BELIEVE IT!!"

Mr. C. E. JACKSON, of the RADIO DEPT., of Hook Drug Co., Indianapolis, Ind., writes: "We had the pleasure of beating a (*name on request*) and selling a set built in our shop, *and customer is getting coast to coast on loud speaker using only a loop! On Springfield he has to turn loop to cut volume and KFI and KHJ come in like they were local.*"

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Coming Discovery

(Continued from Page 234)

which carry afar with the radiant waves which carry them. The higher spiritual is not the lower physical, and yet the two blend together in vital union. In all our experimenting we are earnestly endeavoring to discover the nature of this vital union. At times we feel that we have almost found the higher synthesis, but not quite yet. The practical value of this discovery in the way of better physical health, greater mental vigor, stronger moral character, increased social harmony, and deeper spiritual fellowship with Eternal Love will be beyond description. When our religion has a scientific basis it will be a profound reality.

The physical scientist who is trying to explode the atom may make the startling discovery that while the manifestation of radiant energy in the form of electronic activity is divisible and, therefore, physical, radiant energy itself is pervasively universal, and consequently is the harmonious vehicle of the Universal Mind and the Infinite Energy of God.

The Western Electric Company has manufacturing schedules calling for the production of 685,000 telephone message registers in 1924 as against 384,000 last year and 225,000 loading coils as against 147,000 in 1923.

The Crystal Contest

(Continued from Page 227)

it cut down the strength of the signal to some extent.

Not long ago I knew of a fellow that got Salt Lake City very consistently on a crystal set, and a few days ago I heard of one that claimed he got Denver, well maybe, but these are the kind we want to hear about I think, and not a lot of freak hook-ups that so many of us expect to work wonders, but after we get them done are tempted to throw them in the junk.

So let's have another contest, have the sets tried out on the same aerial, and have the awards made according to the merits of the sets, and not according to some fanciful idea of the maker as to what the set might be, or if he was to build another the way he would make, not even knowing whether the new ideas would work out or not. I might add that the last "hook-up" in this contest has proven the best to me. Sincerely, H. W. HAMBLIN, 2110 W. 27th St., Los Angeles, Calif.

Announcement has been made by the Federal Telegraph Company that it had been awarded a contract to equip seven vessels of the General Petroleum Company with the Nolster Radio Compass. The radio compass is manufactured by the Federal company and has proved itself an important instrument in navigation. It is installed in the wheel-house of the vessel and through its operation bearings can be taken without interference or delay. The device is now in use on vessels of the Pacific Steamship Company, Matson Navigation Company, Standard Oil Company of California and on the Leviathan.

(Continued from Page 241)

presses harmonics of the 155 cycle fundamental. Accurate mechanical tuning is essential for both the vibrator at the sending end, and the sensitive relay at the receiving end. So closely can the relay be tuned that a difference of five cycles per second will double the current required to operate it. This ensures that static telephone signals, voice currents, etc., will have relatively little effect on it.

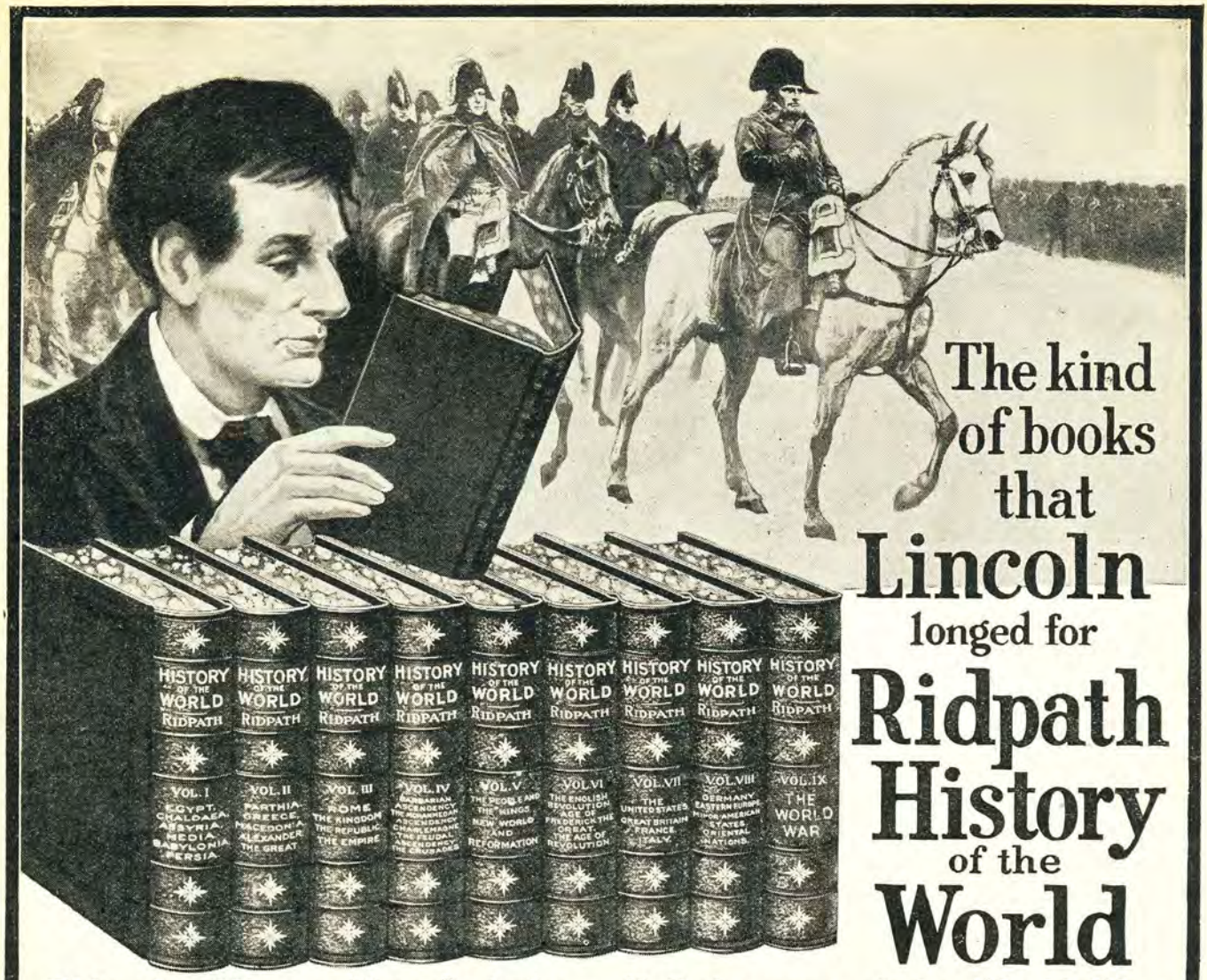
The way it operates the next relay is a further protection against false signals. The vibrating relay may close its contacts for only 1/5000 of a second at each stroke and all the electrical energy to pull up and hold another relay must be passed while the contacts are closed. Into a relay of workable size energy flows too slowly for enough of it to be stored in the form of magnetism during such a short time. But electrical energy flows rapidly into a condenser, and so the circuit is arranged to charge a 1 mf. condenser during the 1/5000 second interval. During the time that the vibrating relay contacts are open, the condenser discharges slowly through the second relay, and this current is still flowing when the contacts close again to recharge the condenser. Thus a continuous pulsating current flows through the second relay, and operates it to close its contacts. These contacts will in turn operate any electrical device, such as a bell, a signal lamp, or a selecting switch.

Can Call One or All

The use of standard train dispatching equipment enables the system to be used to call any one or all of a number of stations from a central point. For instance, the control operator, by turning a key marked with the name of a particular station, can send out electrical impulses which will operate selector switches at the receiving stations. Each of these switches is arranged like the combination on a safe, to close its contacts and ring its bell only when a certain combination of impulses are sent out. This apparatus allows as many as 78 stations on one wave length to be signalled separately.

The same apparatus can also be ar-

(Continued on Page 246)



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NAME .....

ADDRESS .....

The Portable Set

(Continued from Page 215)

lication. You can then use all the parts of the R-3 Circuit and one tube and its units and have the R-7 Circuit, or what will probably be known as the Super Roffy Circuit. The essence of all Roffy Circuits, or the subject matter of invention embodied in the circuits published by the writer is the separation of regeneration, as commonly known, into its major components, that is: oscillation and detector, and working an oscillator and detector circuit separately at the most efficient parts of the tubes' respective characteristic curves, as applied to their different requirements and processes of operation.

(Continued from Page 244)

ranged so that one of the 78 stations, or four supplementary stations can be signalled individually. For example if a marine radio telephone system is involved, the pilot house, the captain's quarters, the purser, and the engine room on each of 78 boats could be signalled separately. In addition, it is possible to signal all the pilot houses, etc., at the same time, with a further slight modification in apparatus. It is possible to extend the system to signal all or any one out of more than 200 stations.

Value of System

The 135 cycle input is fed into the audio frequency input amplifier at a point appropriate to its energy level. In small transmitters it may be applied directly to the modulator tubes. At the receiving end the output of the detector tube of the regular radio receiver is connected through a special 1 stage amplifier to the vibrating relay. Five vacuum tubes must be kept lighted continuously while the station is to be ready for incoming calls, but the current consumption is so small that it is a negligible part of operating costs. Considering the valve of an attendant's time, the use of tubes and power in this way makes possible a substantial saving.

As to the effect of interference, tests show that the electrical and mechanical tuning of the receiving circuits, and apparatus is so effective that radio telegraph signals similar to those from an I. C. W. or spark transmitter would render speech unintelligible long before they would make the signalling system fail

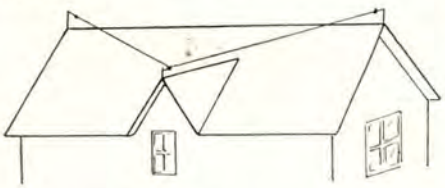
Thousands of wounded and disabled American veterans of the great war, patients in hospitals and institutions will "listen in" on the deliberations of their comrades of the Disabled American Veterans of the World War, at the organization's fourth annual national convention, to be held in Salt Lake City, June 23 to 28. Arrangements have been completed whereby the elaborate musical programme and addresses of the initial convention session on June 23, in the world-famous Mormon Tabernacle, will be broadcasted to all parts of the North American continent, over "KDYL" radio station in Salt Lake City. Madame Schumann-Heink, probably the world's best known prima donna, will sing "The Star Spangled Banner", and also give a repertoire of arias, as part of the opening day's programme.

During a recent broadcast from WBZ the announcer, though used to tongue-twisters, got all mixed up trying to get an artist's name across. In desperation he approached the artist and said: "Of all names, why should you have such a tongue-twister—why don't you change it to something easy—my name for instance?" The announcer was already married, so doubtless he did not mean that literally.

Questions and Answers

Q.—After reading your article on the super-heterodyne I have decided that the circuit shown in Figure No. 2 is the one I want to build. Will there be ample volume on loud speaker without the use of audio frequency? What results can I expect from a loop and what is the best type of loop? Give complete list of parts. Am I right in presuming that a single circuit jack will do? Can another jack be used for head phones and where would it be placed? Can I use Erla connections and Radio Tip jacks for convenience sake? How is this set tuned? I imagine C1 and C2 are used for bringing in a station and the rest for clearing it up and giving volume. Am I right? Can the stations be logged so as to be brought in again or must they be found every time? May I have the size of your RFT's so I can procure the condensers and start laying out the panel.—JAS. T. J. HOVER, Denver, Colorado.

A.—It will be necessary to use audio-frequency amplification to operate a loud-speaker when reception other than local broadcasting is received. Results with a loop will include reception from entire U.S. and Canada—equal about one-third that of outside antenna. Loop can consist of 10 turns No. 18 wire on frame 2 ft. square, tapped at 4th, 5th, 6th, 7th, 8th, 9th and end. A single circuit jack will do. Double circuit if audio is added. Jacks are placed just as any other type of audio amplification. Head-phones plugged in as usual. Erla connection, etc., can of course be used. The intermediate frequency condensers are all set at approximately the same setting. Then C1 and C2 are rotated until signals are received. The I. F. is then adjusted for best response. Dial settings can be logged and exact settings again will find same stations. The Type 10-A Super-Heterodyne Tuned RF Transformer are encased in a bakelite housing size overall: 3¾x4 inches. They mount directly behind variable condensers on baseboard.



Q.—I have recently purchased a Fada Neutrodyne receiver, 5-tube set, which I would like to make more selective or sensitive. Is there any other method by which I can secure distance and also receive lower power stations than KDKA, KYW and WGY without the decided scratching in the Magnavox. My aerial is approximately 30 feet long from the ridge of the roof to the ridge of a dormer somewhat lower and back to the main roof, facing the south. Would this dip have any effect on reception? The three stations mentioned I can get fine at almost any time. With the addition of instruments would it be possible to place the detector and amplifier tubes on a panel above the neutroformers? I am using UV200 and UV201A tubes.—E. ALBRECHT, Kohler, Wisconsin.

A.—You should get excellent results with your Neutrodyne. A good regenerative receiver will, however, almost duplicate it. For a better method than the Neutrodyne we refer you to the February issue. The circuit is known as the Munzig Circuit. It uses only two tubes. A third can be added for more volume. The dip in your antenna that you speak of will make no appreciable decrease of signal strength. It is not advisable to use the Neutrodyne in conjunction with other types of apparatus for in the close position you speak of the set will have a tendency to interact its magnetic field with the other apparatus, thus causing instability.

Q.—I read with great interest Mr. Munzig's article in Radio Journal on the Super-Heterodyne Neutrodyne. Is it ever neces-

sary to change the settings of the intermediate neutroformer condensers? If not, could not the secondary be shunted by a fixed Micodon and final fine adjustment done with a small variable fixed condenser such as is used for neutralizing? Could not the oscillation coupler be tried out and given one permanent setting, likewise. Then one could clean the 5 small dials off the panel, conveying the idea of simplicity rather than one of complication. Is it possible to cut down the number of rheostats by combining other tubes than the three intermediate amplifiers?—GEORGE E. EVANS, Akron, Ohio.

A.—It is not necessary to ever change the condensers tuning the Tuned RF Transformers when once set. Of course changes will be wanted if experiments are carried on.

A fixed condenser could not be used because each transformer must be individually tuned to resonance. This adjustment is very critical and must be right on the resonant point or the efficiency will be greatly reduced. The leads to each transformers vary thus making it necessary to adjust each Tuned RF Transformer separately. When once the Osc. coupling is found it need not be touched again. Controls will be necessary but they need not necessarily be on the front of panel. It is possible and quite possible to have a master rheostat controlling several of the tubes at a time.

Q.—I wish to ask you where I could obtain imformation pertaining to securing a license to operate a local broadcasting station? When do you think that radio sets will become unified the same as phonographs are today? Or will they ever become so? Which of the latest up-to-date circuits do you think will last the longest in the radio field? And which is the most economical to construct? I mean as to results and durability.—FERREL REMAKLUS, Drumright, Okla.

A.—Information pertaining to a license for operating a commercial broadcasting station can be had from your district's radio inspector. Suggest you write the radio inspector. Customs House, San Francisco, California. Radio, as we see it, is still in its infancy and developments of today will probably be obsolete five years hence. However, I do not believe that radio will become a thing of the past, when the present trend of public interest is exhausted—but contrary believe that radio in its present entertaining, educational and interesting development will be for all time a recognized and fixed furnishing of the home. The phonograph will no doubt have its place—but choice of the two will be overwhelming for the radio entertainment. If a circuit has recognized merits it is sure to "stick" with the public—that is the experimenting radio public. An example of such is the justly famous Armstrong Feed-back Regenerative circuits. Modifications of this are all in a sense the original regenerative circuit. However, I am sure that some methods are better than others, as you will see as you read the various periodicals. A single tube regenerative circuit will give you the utmost out of one tube.

Q.—I have several Amrad Radio-Frequency Transformers 600-4000 meters on hand and would be very much obliged to you if you let me know by return mail if I could use these transformers in a I. M. radio-frequency amplifier for a Super-Heterodyne, using the standard hookup.—RADIO MUSIC SHOP, Hermosa Beach, California.

A.—The Amrad 4000 meter RF Transformer will function as well as any other untuned RF transformer in the intermediate frequency of the Super-Heterodyne. Give it a try.

Q.—Although not a subscriber to your worthy magazine, I am a consistent reader of it and have't missed a copy for quite a

(Continued on Page 250)

The Laboratory

(Continued from Page 218)

cated. Then the wavelength registered by the wavemeter is the natural period of the antenna system.

To calibrate an unknown capacity, put the unknown capacity in the place of the condenser in the wavemeter. Put in inductive relation to the oscillator and adjust the unknown condenser until the oscillator indicates resonance. Then replace the unknown condenser with the wavemeter condenser, leaving the oscillator in the same position, adjust the wavemeter till the resonance point is found. Then the condenser of the wavemeter is the same capacity as the unknown. The condenser of your wavemeter will be calibrated as a standard when your wavemeter is calibrated if you so desire.

To measure the inductance of a coil, proceed the same as when using a condenser except the wavemeter coil is replaced instead of the condenser. Aftr finding resonance, take readings of wavelength and capacity and solve for the inductance by using the formula. Wavelength equals 59.6 times the square root of inductance times capacity or $WL = 59.6 \sqrt{LC}$.

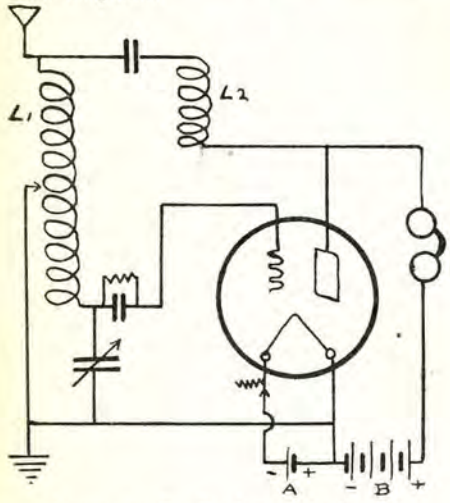
After these instruments have graced the amateur's shack till he is personally acquainted with them, he will realize more and more the many uses to which they may be put.

(Continued from Page 248)

while and while on the subject think it is just about right. So I am giving you a crack at my troubles as I am an amateur in all senses of the radio word. So I will explain the actions of my sets and I believe you will help me out. It is a Reinartz set using the WD-11 tube, with the spiderweb coil for inductance, and use single dry cell on the filament and 22-½ v. on the plate, also 2 23 plate vernier variable condensers, with the three switches, primary, secondary and tickler. The set seems to have a remarkable distance capacity for I have often heard Cleveland, Ohio, Chicago, Ill., Kansas City, Jefferson City and stations in Texas. As to the coast stations, I get Hale Brothers and the Oakland Station KLX (think it is) also all of the Los Angeles stations. So you can see that its capacity for distance is perfectly satisfactory as this town is located in Southern Arizona about five miles from the international line. Now I will try and explain its symptoms. For instance: KFI of Los Angeles comes in absolutely perfect, no distortion, and the oscillation of the tube can be stopped and the tone or music is reproduced perfectly in volume and clarity. But the Times of Los Angeles comes in plenty loud enuf (in fact louder than KFI) but is distorted so much that it is only by the greatest straining that I can understand and it is very muffled. As to the Eastern stations, I seem to have difficulty in tuning out the whistles in the tube and retaining the sound although the volume seems perfectly O.K. and were I able to get rid of the oscillation and keep the volume in sound, I would be getting a lot more sleep at night. So you see this is quite a lengthy letter, but as you have helped several of my friends out in trouble just as bad, I am coming to you with mine. Tell me your personal opinion as to the distance of the set and if I am getting as far as I should, although to me the distance is a secondary consideration and I would greatly prefer to be able to tune the stations which are in the set perfectly than listen in agony to Cleveland and just

be able to catch the call letters.—DAVID C. TAYLOR, Warren, Arizona.

A.—Your trouble lies not in the parts used but in the system of reception using regeneration. I have never found the Reinartz Method stable when used for the reception of modulated voice and music. In the first place the Reinartz Method was not designed for reception of broadcast programs but was designed for the reception of Continuous Wave Telegraphy. In this capacity the Reinartz Method is hard to beat. I have found this to be invariably true not only in my own experience with the method but others as well. You are getting excellent results, I am certain. It's all in the operator, you know. This may be a little disappointing but is my unbiased opinion of the Reinartz, when used for the reception of radio telephone.



Lawrence D. Gardner submits this hookup.

Q.—I would greatly appreciate it if you would tell me what the enclosed circuit is named, if any, and whether it is a single circuit or otherwise. — LAWRENCE D. GARDNER, Santa Paula, Calif.

A.—The circuit you send us very much resembles a transmitting circuit known as the Hartley. It is very similar to the Reinartz, which belongs to the single tube variety.

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GREATEST RADIO VALUE.—Fully Guaranteed Crystal Sets complete, 50c. Free with "Little Tattler" head phones at $4.00 postpaid. Mail Order Department, Electric Novelty Co., Lincoln, Nebr.

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IF YOUR NEUTRODYNE won't "Neut"o.k., send 10c for details of Kladag Coast To Coast Circuit, bill of materials, etc., to change over your Neut into a set that will bring them all in from Mexico City to Tunucu, Cuba, on a loud speaker. Or send $5.00 for all extra parts, blue print, etc., you need to do this. Uses same panel layout. Stamps accepted. Radio List for stamp. Kladag Radio Laboratories, Kent, Ohio.

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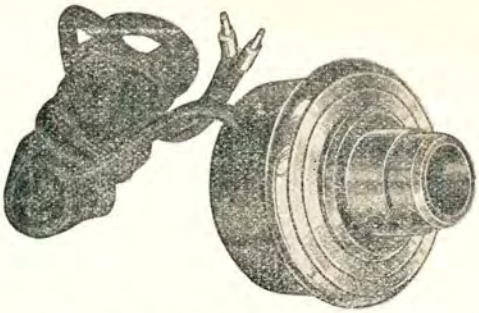

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113 Stimson Building **Los Angeles, California**

With The Editor

Commendation, now and then, is relished by the best of men,—and us. Witness: Editor, Radio Journal: Your magazine, Radio Journal, certainly beats them all!! Until the present time I was always under the impression that it was the quantity and the circulation of a magazine that determined the results that one would obtain from ads in it. However I am glad to tell you that I have evidently been mistaken. It must be the quality of the magazine and the kind of people that it reaches that count, as the ads that I have had published in your magazine have brot forth much better results than those printed in many of the older and larger publications. I am not the only one who is enthusiastic about the service that is being rendered to its advertisers by this publication. I have heard many others comment upon the same thing. Sincerely yours, A. WADE, JR.

"Keeping your A and B batteries full of Pep" is the title of an article to appear in the next issue, written by T. E. Nikirk. This article not only tells you how to do it, but tells you how to make the charger that will charge them both.

"Your article on the Harkness reflex, modified, in a recent issue was a dandy" says E. R. Breckenridge of 3321 Manitou Street, Los Angeles, Calif. "I built two of them and both worked fine." The article in question was by A. L. Munzig.

I enjoy your Journal very much and look forward to its arrival each month. Respectfully, J. E. WALTER, M. D., Waukegan, Ill.

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