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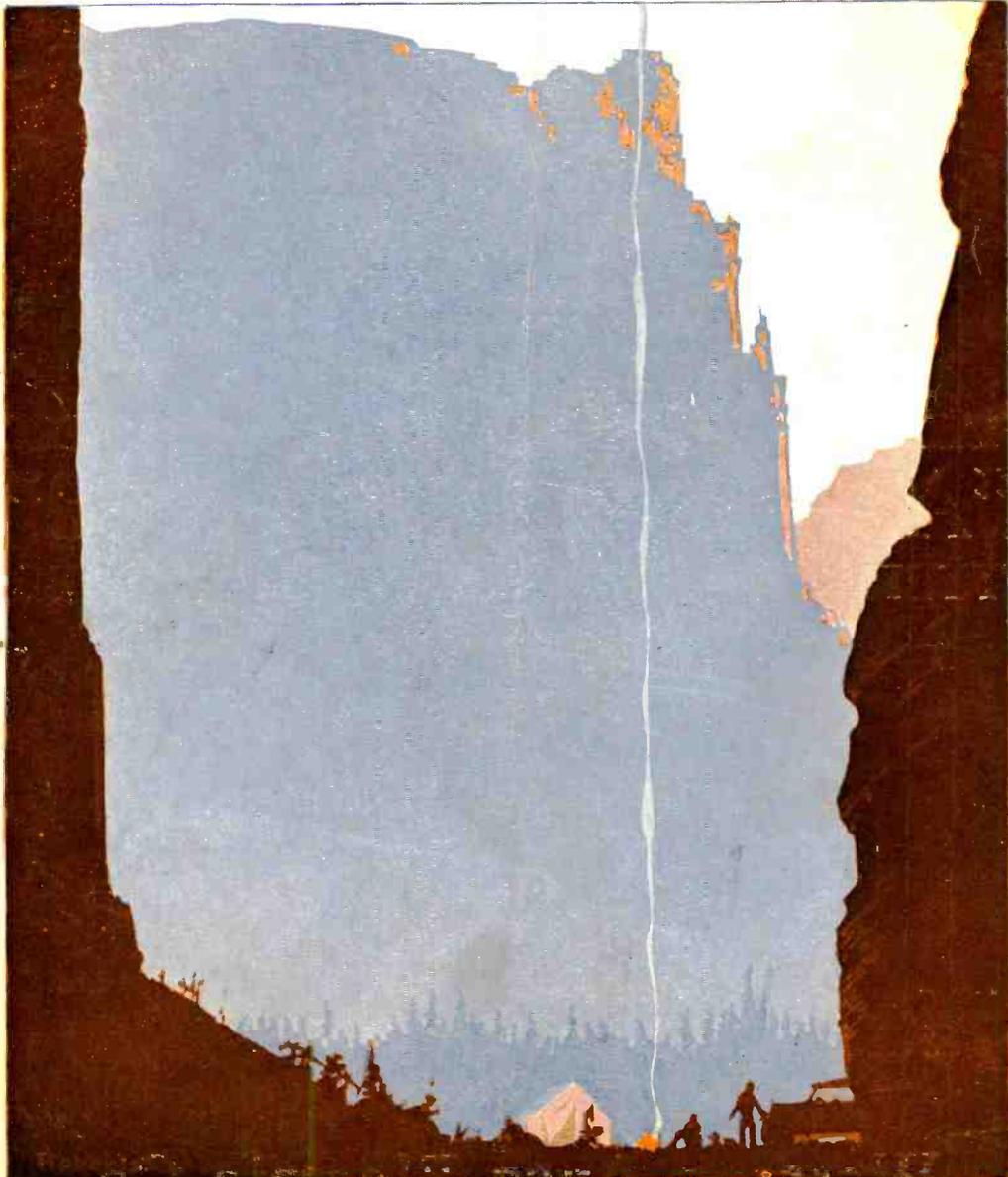
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# Radio Journal

Established in 1922

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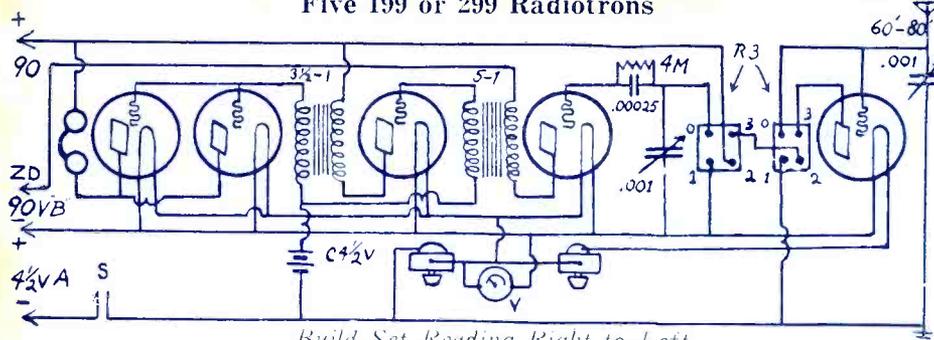


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Answering Bryan on Evolution—The Super-Het in Detail—  
Radio, Lizzie and I—Oakland's Experiment—New Hookups

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Five 199 or 299 Radiotrons



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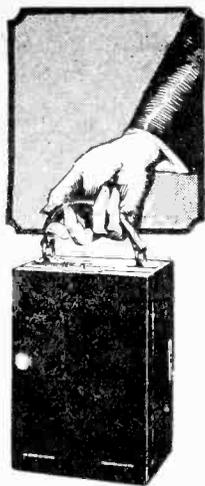
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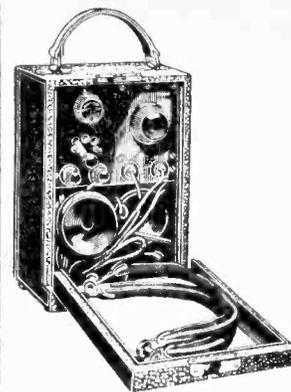
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Front view, showing phones and ground wire fitted in

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1260 West Second Street

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Los Angeles, California



Volume Four

JUNE, 1924

Number Six

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# Editorial Comment

## Education via Radio

Will radio someday supplant the schoolroom and its rows of happy faces? We hardly think so, though such an idea is tenable. But radio will become, as we said several years ago, one of the greatest aids, one of the biggest factors, to not only the education of the world as a whole, but to the concrete process of inculcating knowledge, learning, what you will, into the boys and girls of this and every other land. Oakland has given it a test, and upon ideas derived from this test may follow the development of the first genuine effort to make radio assist the teacher in the exposition of elementary and high school subjects. The experiments in Oakland are outlined at some length elsewhere in this issue. They were carefully prepared by a special committee of educators of the Oakland public schools, and were made with the cooperation of KGO as the broadcast station. It may be some time before regular classroom instruction by radio is undertaken in the public schools, but the work accomplished by Oakland in this series of tests points the way to a more general application of radio to the concrete and very real business of teaching. Don't think of the handicaps. There are many. But think of the possibilities. Think of the vast number of pupils who can be reached at the same moment by one educator of superior ability in his or her chosen field. Think of the interest stimulated in hitherto dull subjects by this method of instruction. And think of the point of contact established with the parent who, enabled to listen in and get an idea of teaching methods and instructional data, will be the more able to render intelligent aid to son or daughter at home. And think of those pupils forced to remain away from class because of illness—able to keep in touch with the class work every day if they so desire. We venture the opinion that radio will do more for education within the next decade than any factor within the past ten years. And this is not wholly a guess.

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Some gentleman connected with the army in southern Europe claims that a big munitions explosion was caused by the collision of two Hertzian waves. A gentleman of his peculiar talents should command a princely salary over here.

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Which reminds us—we wish we were sitting in the cover of this issue.

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Financially speaking, the high wave lengths are as low as the lower wave lengths and the lower are as high as the higher, the higher being no higher than the lower and the lower no lower than the higher. Make yourself a present of that.

## From Many Angles

Did a lawyer ever whole-heartedly endorse the legal tactics of another luminary? Did a medico ever agree, symptomatically or methodically, with a fellow medico? Did your last plumber's wiley tongue ring with praise of the workmanship of his predecessor? Not by a jugful of anything. Your last expert, more than likely, assumed the role of rescuer, reviling the times which permit such mistakes to be made as those perpetrated by his predecessor—and forthwith proceeded to undo everything heretofore provided for your physical, legal or mechanical welfare, and then to do it differently. Such is life in the far west, east, north and south. And of such, also, is radio. Conscientious as the Pilgrim fathers, honest as George Washington, learned as Archimedes, radio experts, inventors, researchers, all will be found to disagree a bit now and then both as to fundamental theory and practical procedure in radio. One will build a set and another will tear it to bits—all of which adds to the gayety of the nation if we can but see it that way. But it makes the editing of a radio magazine far from simple. However, Radio Journal has taken this position—that any searcher after the truth or perfecter of improvements in radio is entitled to a hearing if his work prove successful, regardless of his method of procedure. Thus it is that we publish articles by experts who decry the reflex and advocate the neutrodyne, and others who decry the neutrodyne and praise the super and others who decry all these and give their all to the straight regenerative. Our readers are entitled to all this—and the discriminating reader will profit thereby.

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## Our Neighbor Who Sells

Mental processes are affected, possibly to an untoward degree, by external forces. In similar language, what you eat for breakfast may determine your business policy for the morning, or a hot day may drive you to the uttermost recesses of innocuous desuetude. Over a considerable portion of the United States right now it is summer, beautiful, playful, blistering summer. And restful shade may look better than a prospective customer. It is the playtime of the nation. Vacation stares us in the face from every periodical. Our friends tell about their wonderful trips, past or future. And as we lazily close our eyes to the restful buzz of the household fly we conjure pictures of trout, lakes, woods, beaches—but not business. Wait a minute! Across the street or around the corner or down a few blocks is a man who pays no attention to the weather. Hot or cold, rain or shine, he is doing his darndest to sell. A customer is a customer to him whether you sleep or not. And we'll bet our five tube tomato box against your crystal harmonica that he sells. But that bet isn't exactly fair, because we see him do it every day.

# Experiment in Radio Class Room Instruction

By VIRGIL E. DICKSON

*Classroom instruction by radio has actually been accomplished by the Oakland Public Schools and KGO, the Pacific Coast Station of the General Electric Company. Just what was done in recent tests is told by Virgil E. Dickson, Director of Research of the Oakland Public Schools, in this article.*

ON April 30, the Superintendents' Council of the Oakland Public Schools authorized me to conduct an experiment to determine the feasibility of classroom instruction by radio.

What teacher would be willing to stand before the microphone for the first time in his life, risking his reputation by teaching invisible classes in fifteen specified schools (and nobody knowing how many more might be listening in) realizing that invisible critics were actually stationed in every school and that thousands of people in homes, shops, stores, and everywhere in the community, were listening in, or could listen in if they wished? After considering the matter eight teachers were asked to prepare lessons. Not one refused. The authorities in charge of KGO, the General Electric broadcasting station, offered their services free to broadcast eight lessons. The experiment was planned with such questions as these in mind: What kind of lessons could be developed to interest classes in many parts of the city? Could a teacher or supervisor give a demonstration lesson of value without the element of personality gained by presence with the class? In brief, we wished to determine whether anything approaching a common classroom lesson could be sent over the air to many classes at once.

A committee composed of Henrietta A. Johnson (chairman), Mrs. Elizabeth Madison, Mrs. Sue L. Fratis, Mr. Frank Cauch, Mr. E. W. Jacobsen, Mr. W. A. Hammond, and Virgil E. Dickson, ex-officio, arranged a program as follows:

May 9—Miss Blanche Bowers talked to the high eighth and high ninth grade graduates on "What the High Schools Have to Offer." Music by boys' glee club, directed by Irene Mackinder.

May 13—Miss Alice Bumbaugh, with pupils participating, discussing the development of English art and folk songs for the eighth, ninth, and tenth grades.

May 15—Miss Armeda Kaiser handled a subject in geography—"Petroleum as One of the Three Great Resources of Our State." Music by twelve-piece orchestra directed by Mr. Arthur Nord.

May 20—Miss Beatrice Burnett



*Fred M. Hunter, Superintendent, Oakland Public Schools, who addressed the vast KGO audience recently, on the subject "Education as a National Issue." Referring to the tests just completed, conducted by KGO and the Oakland Public Schools to determine whether or not radio can be used in school work, Mr. Hunter had this to say: "The response has been highly gratifying. Both the managers of KGO and the school authorities regard the outcome of this series as an optimistic forecast of great things to come in this field."*

gave a lesson on Shakespearean literature preparatory to the Shakespearean Festival for the junior and senior

high schools. Music by stringed trio directed by Mr. Herman Trutner.

May 22—Mr. Howard Welty presented for seventh and eighth grades a history lesson—"Indian Folk Lore." Music by trombone quartet, directed by Mr. Fred Rau.

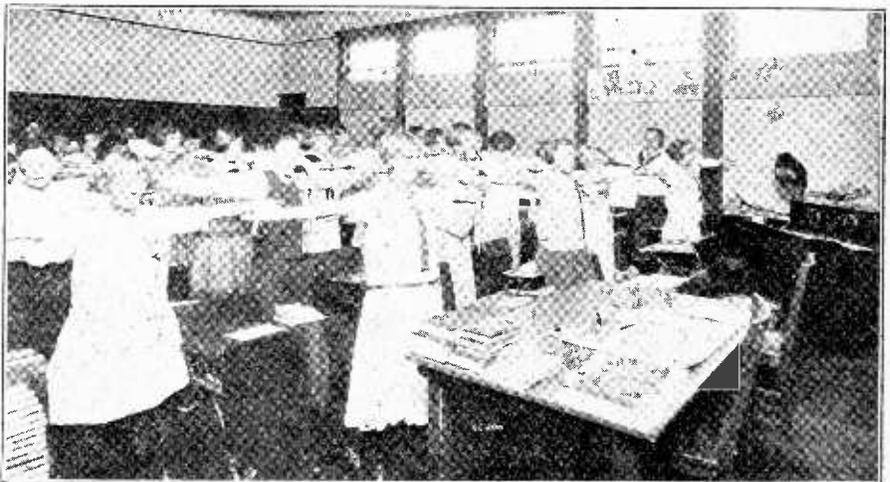
May 27—Mr. E. E. Washburn taught an arithmetic lesson to the 9th grade classes. Music by stringed quartet directed by Mr. Herman Trutner.

May 29—Miss Myrtle Palmer gave a lesson in penmanship for seventh and eighth grade classes. Flute and oboe solos directed by Mr. Franklin Carter.

June 3—Mr. Jay B. Nash conducted a lesson in physical education adapted to seventh and eighth grade classes. Quartet directed by Mr. Herman Trutner.

These schools had receiving sets and listened in on a part or all of the lessons: Allendale, Clawson, Durant, Elmhurst, Garfield, Golden Gate, Lakeview, Lowell, Hamilton, Highland, McClymonds, Melrose Heights, Part-Time, Prescott, Roosevelt, and University.

The members of the committee were distributed among the schools to observe each lesson and to make suggestions for improvement of the next. Also the principal of the school was asked to make a report for each lesson describing the results of the listening in at his school, and giving suggestions for improvement. A complete study of these reports revealed many interesting things. Space here,



*Pupils in the Melrose Heights School, Oakland, California, receiving a physical education lesson by radio during recent tests made by the Oakland Public Schools and the broadcasting station KGO.*



Jay B. Nash, director of physical education, and a studio class before the microphone at KGO broadcasting a test lesson into fifteen Oakland Public Schools.

however, permits me to make only a few general statements as to the results.

The members of the committee are unanimous in the belief that radio can be used successfully by a supervisor or demonstration teacher for certain types of lessons. Principals and teachers have grown more enthusiastic as the series of lessons progressed. It will be necessary to train the radio instructor in the art, methods, and devices for broadcasting a lesson. It will likewise be necessary to train the classroom teacher, the receiving operator, and the listening class in the art of listening in.

Wherever receiving sets were good and were well adjusted the lessons could be clearly understood by a class of fifty or more children. The interest was keen and the concentration was intense. It was surprising to find that the lessons in arithmetic and penmanship were among the best of the series. The pupils followed the instructions of the radio teacher and turned in their papers at the close of the recitation period to be graded. The results were highly pleasing.

*Radio is destined to prove one of the greatest single factors in the education of the future. Radio Journal has heard this statement reiterated again and again but when we say it we mean it in a very definite way, not as a generalization. The Oakland public schools have taken one of the first big steps. Grade schools, high schools, colleges and universities will, in less than a decade, be using radio as a conservator of time and energy, or, to put it conversely, as a producer of increased results from a given amount of time and energy. For in the land of tomorrow, as never before, results will count. And if radio can produce greater teaching results, it will be employed.*

Interest has been reported from many parents who listened in on the school lessons. "I am not a pupil of the Oakland Public School, but a mother of three of them," writes Mrs.



Oakland Public School radio committee. From left to right: Dr. Virgil Dickson, chairman; E. W. Jacobson, Hewrietta A. Johnson, F. R. Cauch, W. A. Hammond. They developed a series of eight test lessons which were broadcast into the Oakland Public Schools by KGO.

T. J. Smith, Oakland. "I have often been very much interested in my children's lessons and have tried to help them in arithmetic, writing, and reading, but am told 'Mother, we don't do it that way now'. I am tied down so that I cannot very well go to the school, and radio brings the school to my home."

Schools in neighboring towns have reported their interest in the lessons. The experiment reveals a new field of untold possibilities in broadcasting education to children in school and to all others who wish to listen in.

### Crystal Contest Letter

Editor Radio Journal:—Your note on Crystal Contest noted. Also a letter of Mr. H. W. Hamlins in May issue of Radio Journal. A proper contest, conducted and awarded after testing hookups. So that the readers of your Journal would know what to expect from each—on a 65 or 100 ft. aerial—7 miles from a broadcast station, or in other words the exact conditions under which tests are made and results of same. Many users of crystal sets prefer it for reception. The big majority can not afford a tube set. And a real contest with reliable information will be appreciated. It is very discouraging to pick out a hook up from any radio paper, build your set, and find out by removing wire or adding more to coil you get better results, or changing condensers, or throwing away part of set gives better results. We read in Journals that by using my hook up you can get 400—1000 miles. Another adds 500 miles on my crystal, etc. What we want is real information. We desire all the volume and distance we are able to get. My experience with hook ups are similar to those of Mr. Hamlins. As a subscriber to your A-1 Journal, I am in for everything that will help the radio fan—and I believe there is more to be had out of a crystal set than we are getting today. So I say let's have a real contest for the crystal owners. At present I use a crystal set for local and tube for distance.—Ira C. Jones, Los Angeles, Calif.

Ed. Note:—Fine. What do you think, readers? Give us some more straight from the shoulder stuff. Maybe we can be persuaded to pull off a real crystal contest.

The broadcasting resources of KGO, the Pacific Coast station of the General Electric Company at Oakland, Cal., have been greatly increased by the introduction of a San Francisco studio at the Hotel St. Francis. Ground wires under San Francisco Bay connect the San Francisco studio with the control room and power house of KGO, ten miles away. It will no longer be necessary for San Francisco artists to travel to Oakland to fill a radio engagement with KGO.

# Three Tubes with Tuned Radio Frequency

By C. LLEWELLYN

*Reddy-det-det, three tubes in a set. Turn on the juice, and see what you get. How's that for the new Radio Mother Goose. 'T would utterly ruin it, however, if we had to move to England and call them valves. Seriously however, this three tuber talks right out for itself and will be the real thing for many a set builder.*

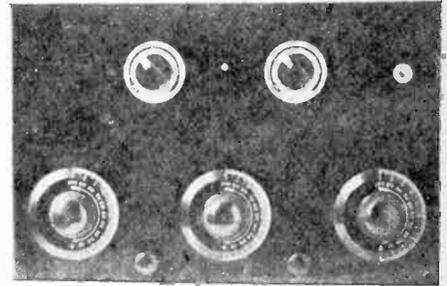
**T**RY this as an interesting and surprisingly efficient three tube set with tuned radio frequency. In Los Angeles downtown district I have managed good room speaker reception on local and KGO, with occasionally KPO, in the summertime.

The photograph demonstrates some of the differences, particularly in the coils. The coils can be wound for the stations desired, the idea being not to

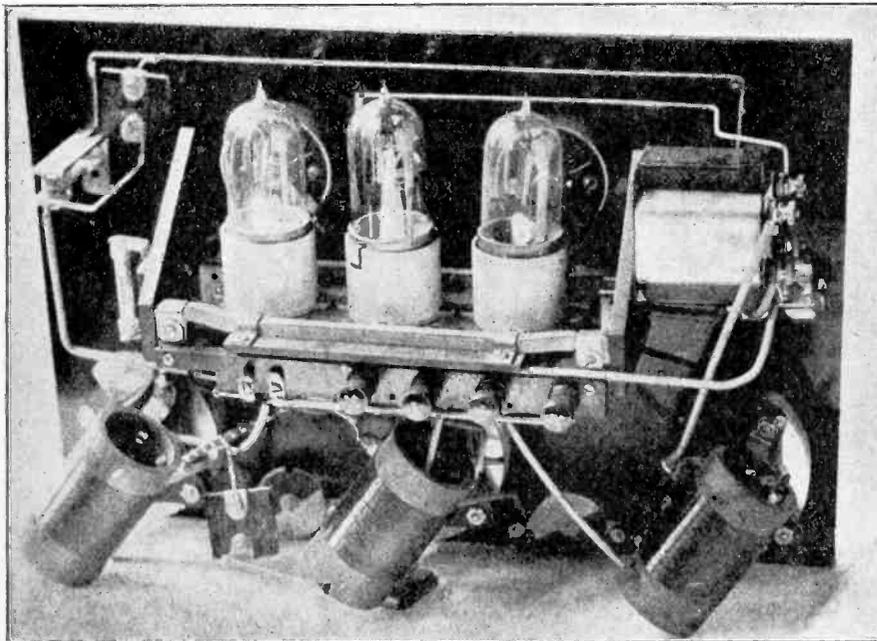
the ends several times and the right tapping will be discovered.

Use a soft tube for the detector on low voltage,  $22\frac{1}{2}$  volts. Use 90 volts for the other two, using A tubes, 200 for the detector and 201 for the other. Use a variable neutralizing condenser. I used the Marco, usual setting at about one eighth. I found the Thor-darson amplifying transformer the best for this particular hookup.

The coils are wound with No. 26 enameled wire, and set at an angle of



Panel layout for Mr. Llewellyn's set.



Innards of the three-tuber which acts up like a big brother. This panel is designed for the new A tubes without tips, which just clear the panel top.

try to cover a wide band of wave lengths but to stick to a narrower band and secure volume and selectivity. And it does.

The coils are wound with the primary coil "countersunk" and the secondary wound over it in a smooth job. It might prove interesting to try winding the coils lead pencil size. The results might prove astonishing.

In its operation the set is identically the same as the neutrodyne except that it will oscillate. This enables one to pick up his station on the carrier wave, and simplifies tuning-in the first time.

The set is regenerative, which feature combined with the reflex may prove troublesome if the secondary is not properly tapped. Try reversing

$497/10$  degrees. They are wound on inch and a half tubing, using 87 turns. I believe 96 turns for the secondary would be better for up to 509 meters, with six turns on the primary. In this case a 15-plate instead of 13-plate con-

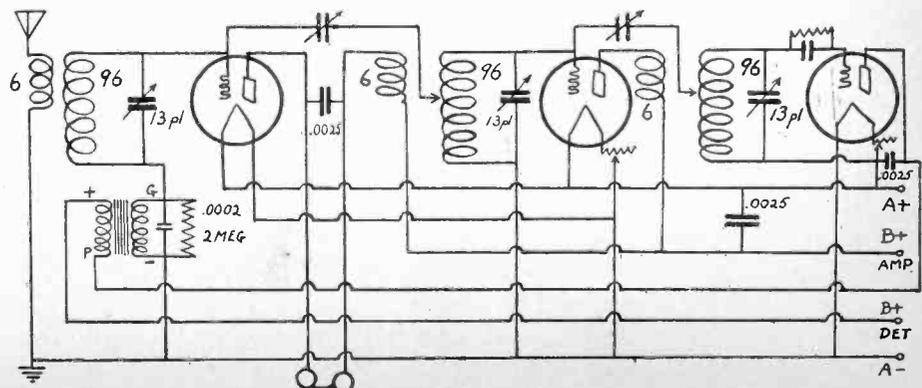
denser should be used. Any good condenser of this capacity will do.

The by-pass condenser is .006. The .0025 condenser is essential. This is one of the things that must be there. This set has a panel 8 by 14 inches, but can be cut to 7 by 14. Although not shown in the photo the tubes used should be the new A tubes without the tips, thus putting them well within the top of the panel.

I will be glad to answer any questions regarding this set, if stamped envelope for reply is mailed, together with the question, care of Radio Journal. I might add that in performance and operation the set is, to all intents and purposes, a three tube neutrodyne with surprising sharpness and volume ability.

Radio compasses, or direction finders, have been installed on the Leviathan and the President McKinley, of the Shipping Board; eight ships of the Admiral Line, nine of the Matson Navigation Company and four of the Standard Oil Company, it was recently announced by the Department of Commerce.

Plans have been made for the erection of at least fourteen new class B broadcasting stations.



# My Radio, Lizzie and I Go Rambling

By REX CARRELL

**A** FEW simple rules, our doctor used to tell us, if followed faithfully can accomplish much. And that's that. Likewise in summer radio—particularly in the camp—a few simple rules will bring in the music. Everyone is packing radio along this summer, somewhere. For a few months out of each year the American becomes a nomad, but of late he has begun packing many of the luxury-necessities along, in tabloid form so to speak.

Now the receiver for that camping trip can hardly be called tabloid radio, but it has many characteristics which would fit this description, among which are size, simplicity and light weight.

In general a two or three tube set, dry cell, using telephone receivers will be found the most satisfactory for those wishing to carry the set along in the motor car or in ones luggage for that vacation in the mountains. Because of summer static and the fact that radio frequency of the tuned variety gives better signals with less static on short range work, radio frequency is the thing. Audio frequency sets will more than likely give trouble because the amplification at low frequency brings out all the static there is to pluck. Before this appears in print however we will probably be confronted with a first class portable set of the five or six tube variety—in fact we recall some which we believe would be efficient as portables.

While the loud speaker may be suc-

cessful in a quiet camp the headphones are far superior where the camp is noisy. A group of phone sets can be connected in series with the output of the detector tube with good results. Naturally dry-cell tube sets lend themselves more readily to transportation problems. However the storage battery tubes are fine if

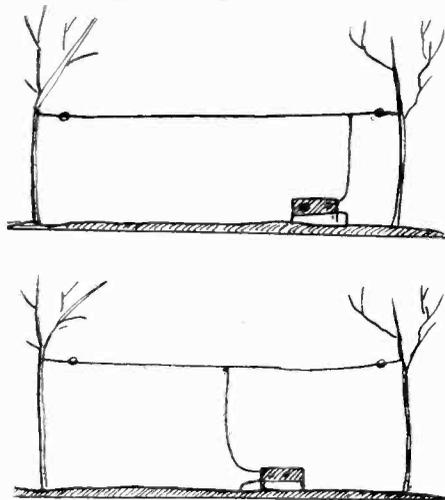


Figure No. 1—Hooking lead-in to center of aerial reduces the wave-length range of your set, while hooking it to one end enables you to reach higher wave-lengths.

the automobile battery is handy. Connections for this can be run to some part of the car, probably the dash, in advance of the trip to facilitate hooking on the set.

The aerial does not present such a big problem. Figure 1 shows the inverted L and T types. This will often depend on the locality, and whether a long or short aerial is required. Di-

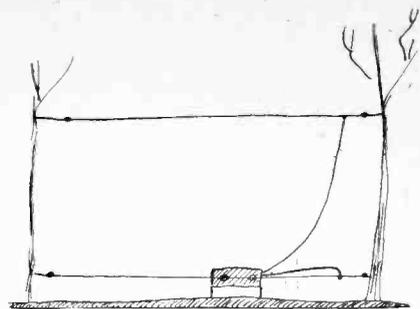


Figure No. 2—Sometimes where the ground is poor one can get results by stringing a counterpoise as shown.

rection has something to do with it, the inverted L especially receiving best with the lead-in nearest the station to be received. Oftentimes the aerial can be readily handled as shown in Figure 3. Have the aerial wound on a reel. An ordinary fishing weight attached to the end enables one to cast the aerial line over the limb of a tree without difficulty. Keep the aerial well insulated and free from all objects such as interfering branches, etc. If the camp should be in the open where no trees are available, or if it is to be more or less permanent, it may be advisable to raise aerial posts, by the method shown in Figure No. 4.

After cutting the aerial poles, cut a shorter pole. Lay the long pole on the ground with its butt against a

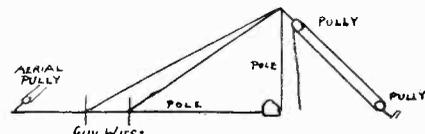


Figure No. 4—It's easy to raise an aerial pole cut in camp, by carrying two pulleys and some spare rope as shown. Lay the mast against a rock or stump, stand another short stick against the rock, and arrange the tackle as shown. Then pull.

tree, stump or rock, after having attached the aerial pulley and the guy wires. Attach two lines to the aerial pole, hitch them together and to the top of the shorter pole, braced upright against the rock, as shown in the illustration. To this pole attach block and tackle hitched to a stake. The rest is easy. Simply pull and the aerial will go up, some control of the guy wires being necessary of course to prevent side slip while it is going up. The short pole comes down and the long one goes up, and by the time the long one is nearly upright the short one will be no longer performing any service.

The ground is often a problem on camping trips because of rocky soil or any one of a number of conditions. Figure No. 2 shows one method of putting up a crude but effective counterpoise to overcome this difficulty. It will answer the purpose very well.

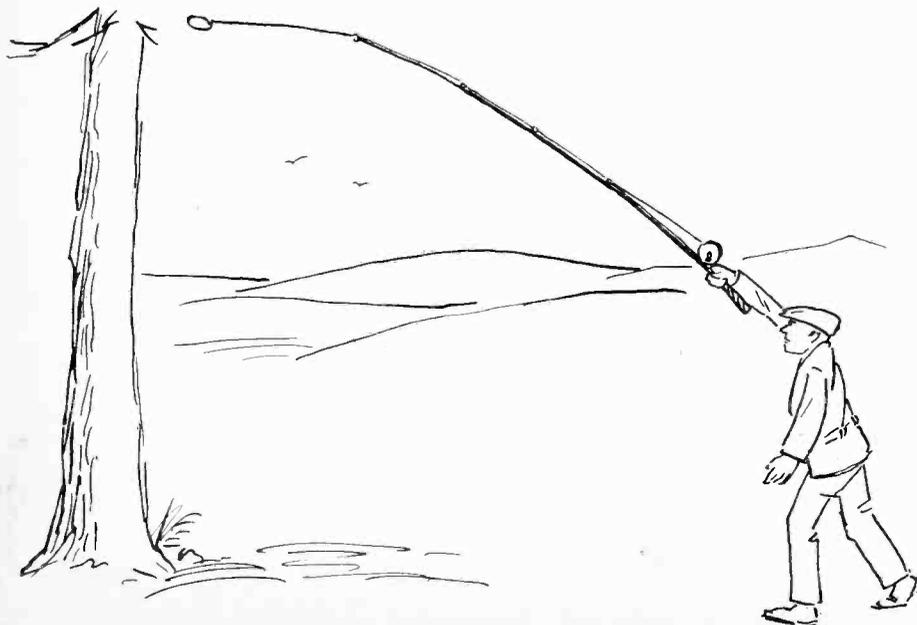


Figure No. 3—A fishing reel full of aerial wire and a casting rod, using a weight on the aerial, is handy to get the uninked line over a tree limb.

# Building Charger for A and B Batteries

By T. E. NIKIRK

*Many things have been discussed in the columns of Radio Journal but this is first effort we have made at disclosing the inner workings of the charger for A batteries. Further than that, Mr. Nikirk tells how to build the charger. Remember the stories you used to read about a soldier on a white charger. Well, this is not that.*

**T**HIS rectifier has been found to give unusual results in keeping the batteries well charged.

The main feature of this rectifier is the adapting of the rectifier to charge 6-volt to 12-volt A batteries and 50-volt B batteries. Where more than one B battery is used, they can be connected in parallel, 50 volts in each unit.

If three or four 50 volt units are used, they can be paralleled and charged at whatever rate is desired, varying from .1 to .5 ampere per unit. In case four units were to be charged at .25 ampere per unit, a total of 4 units would be one ampere, which the rectifier will handle readily. The

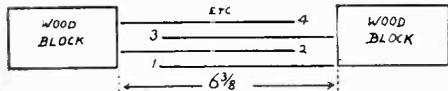


Figure No. 2

charging rate of the "A" and "B" batteries depends upon the rating the manufacturer gives for the normal charging rate of the battery. This may be obtained from the name plate of the battery.

The core is built up of laminated iron such as that used in power transformers and the like. The size of the laminations are; first,  $4\frac{7}{8}$  inches by  $1\frac{1}{2}$  inches; the second,  $3\frac{1}{16}$  by  $1\frac{1}{2}$ ". If transformer iron is not obtainable, soft black iron of about 22 to 26 gauge can be secured from almost any local tin-shop. The number of laminations needed of each size can be measured thus, when tightly pressed together they should make a stack 3 inches high. Half of the longer laminations are used for leg 1, Fig. 1, the other half for leg 2. This gives us a core of the outside diameter of  $6\frac{3}{8}$  by  $4\frac{9}{16}$ . The size of the window will be  $1\frac{9}{16}$  inches by  $3\frac{3}{8}$  inches. A sketch is shown giving the dimensions of the core as it is assembled.

### Assembling Legs.

The primary and secondary legs are assembled by taking three blocks, two being separated  $6\frac{3}{8}$ " and the third to act as a connecting block across the ends. This gives a form on which the laminations are assembled.

The first lamination will be placed

to the right; thus the distance between the left end of the lamination and the block will be  $1\frac{1}{2}$  inches. No. 2 is placed to the left, leaving a space at the right end of the same. The lamina-

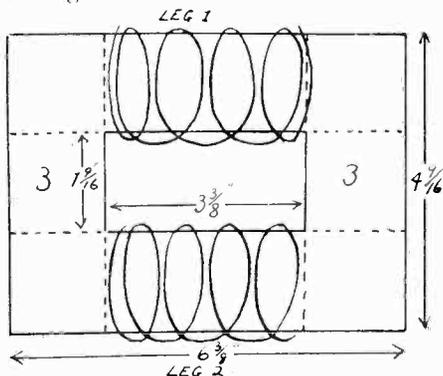


Figure No. 1

tions are then continued until a stack  $1\frac{1}{2}$  inches high is built to furnish one of the legs. (See Fig. No. 2).

Therefore the alternate laminations will protrude as per sketch, which will show how the assembling is accomplished. Odd numbered laminations to the right edge of the form and even numbered laminations to the left edge of the form. The openings which appear between the laminations are to hold the end pieces of the core.

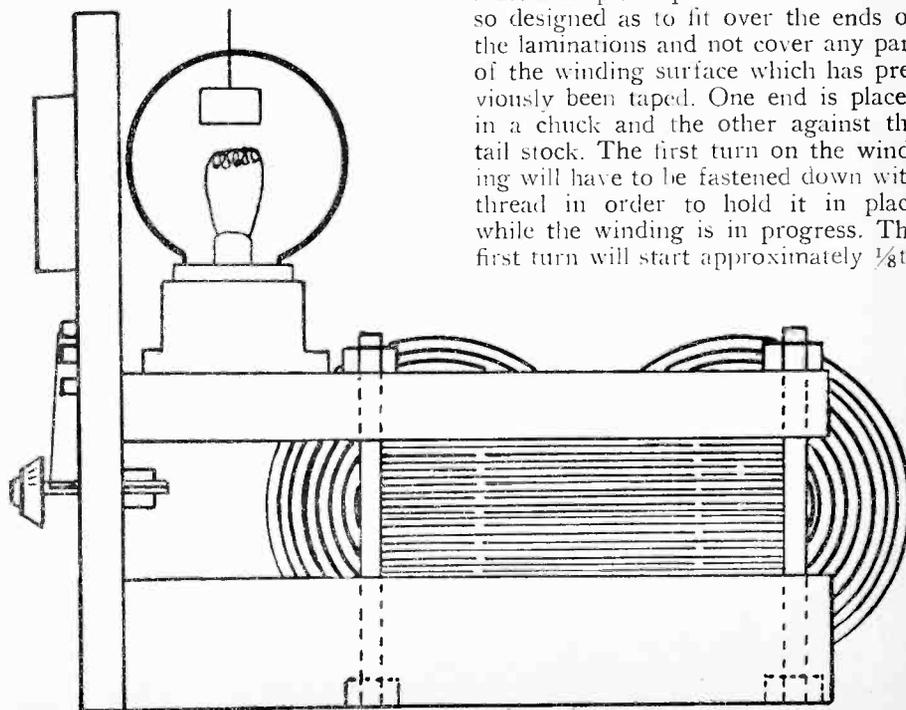


Figure No. 3

### Winding Coils

The stack of laminations, having been removed from the form are placed in a vise, exposing about 2 inches and at a point  $1\frac{5}{8}$  inches from the end heavy linen thread is wound on to bind the laminations together, this winding continuing until a point  $1\frac{5}{8}$  inches from the other end of the laminations is reached. It is necessary at various times of course to remove the core in the vise so more is exposed, so the wrapping can continue until about the last half inch of winding, which will have to be done by holding the core in the hand.

A layer of cotton tape is wound over the thread, the tape being half lapped for the job. The outer end of this tape should be glued down in place. The two legs are to be made after this fashion.

The first, which we will call the primary, will consist of No. 14 B and S Gauge DCC with 385 turns, with a tap at 360th and 345th turns. If possible the builder of the transformer should have the use of a lathe for winding it. Of course if such is not available the winding will have to be done by hand which is a long and tedious job.

In case winding is done with a lathe a couple of pieces of wood can be so designed as to fit over the ends of the laminations and not cover any part of the winding surface which has previously been taped. One end is placed in a chuck and the other against the tail stock. The first turn on the winding will have to be fastened down with thread in order to hold it in place while the winding is in progress. The first turn will start approximately  $\frac{1}{8}$ th

of an inch from the edge of the cotton tape. Winding will continue until the same point is reached at the opposite end.

A layer of heavy manila paper is then placed over the wound layer to

*Tag All Leads*

It is very essential that all leads be tagged, so that when connecting up is started no difficulty will be experienced. In the mounting of this transformer four pieces of wood are to be

This end now being completed the ends are reversed and the open end is filled in the same fashion. (See Fig. No. 2).

*Mounting On Panel*

The socket for the 5 ampere tungar tube is fastened on the upper left inch strip of wood as close to the laminations as possible. A panel is made  $6\frac{3}{8}$  inches long and 8 inches high, of half inch wood. On this panel seven binding posts are placed, four on the left and three on the right. The four on the left should be marked 110 volts. The upper three are placed one-half inch apart and the lower an inch and a half from the nearest post.

A dial switch with five points with contacts  $\frac{3}{8}$  of an inch in diameter spaced one half inch apart with a contact lever  $\frac{3}{8}$  of an inch wide of rather heavy material should be made.

There is now room enough above this dial switch for the mounting of an ammeter, which will indicate the rate of charge when A batteries are being charged.

The first tap on the left will be hooked to the 64th turn on the secondary. The second tap will be hooked to the 80th turn. The third tap will be hooked to the 98th turn. The next tap at the 25th turn on the winding over the primary, and the last tap to the 50th turn on the winding over the secondary.

The middle binding post on the right will be hooked to point "A". To point "B" will be hooked the top binding post, and to point "C" the lower binding post, as per wiring diagram.

The 6 turns of the very heavy wire are hooked directly across the filament of the tungar tube. The middle post will be the negative when charging either A or B batteries.

In charging "A" batteries the middle post and top post are used. When "B" batteries are being charged the middle and lower posts are used.

The purpose of the taps on the primary coil at the 360th and 345th turns is for the purpose of compensating for low voltage which exists in some localities. In case your line voltage is in the neighborhood of 115 volts the full winding should be used. In the case of 108 volts the 360th tap is used and for lower voltages the 345th turn is used. One setting on this will answer as long as your line voltage does not vary to any great extent. The meaning of line voltage is the voltage which is secured at the electric light socket or plug to which the rectifier may be attached.

In hooking up the various coils of the secondary circuit a 110 volt bulb should be connected across the 98 turn winding. The brilliancy is then noted. The wire which attaches to the six turns is left intact or connected, while

(Continued on Page 298)

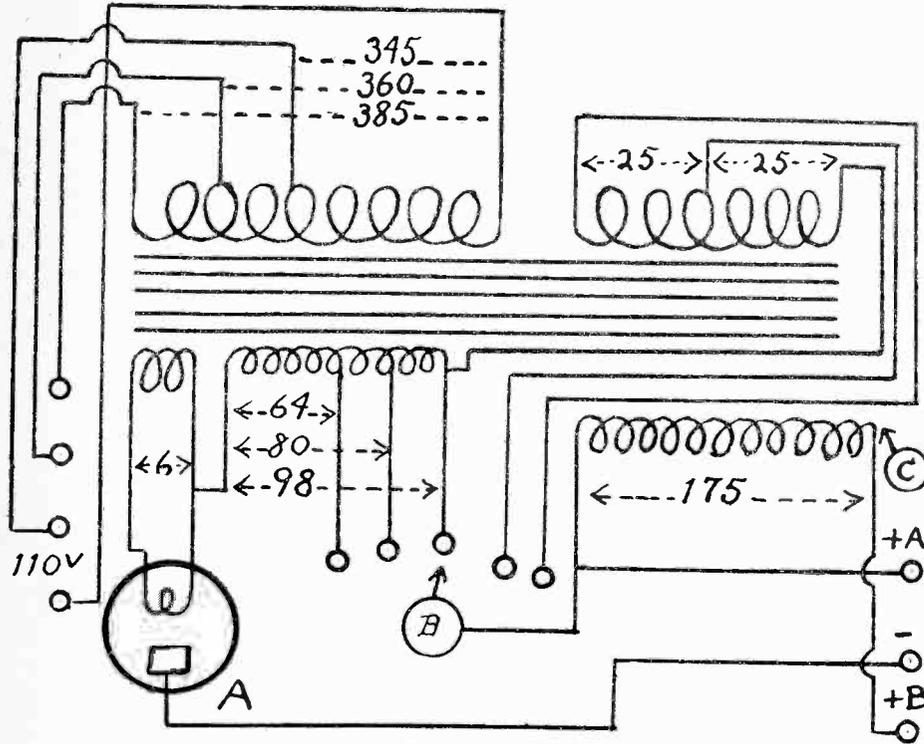


Figure No. 5

form a foundation for the winding of a second layer. The manila paper is cut the same width as the winding of the cotton tape and long enough to lap one-half an inch.

The winding is then continued in layers until the 345th turn, which will probably fall near one end of a layer, is reached. A loop is twisted, approximately 6 inches long, and then the winding is continued. The next tap is taken in the same manner, and the end of winding is tied down with cotton thread.

The primary coil is covered with one layer of cotton tape with the leads brought out at the most convenient end. These taps should then be laid flat against the coil and two layers of cotton tape wound over this. Over this 50 turns of No. 12 B and S DCC wire should be wound with a tap taken off at the 25th turn and leads being about six or eight inches long. A layer of cotton tape should be placed over this winding for final protection.

The secondary leg is started by winding 6 turns of No. 8 or 10 DCC wire, which is the filament lighting winding. Continuing the winding with No. 12 DCC, 98 turns are wound on with taps at 64, 80 and 98 turns. Taps are brought out on this in about the same manner as primary taps are brought out, covered with a couple of layers of cotton tape. Over this 175 turns of No. 22 DCC wire are wound, again covered with a layer of cotton tape as before.

used. Two pieces for the upper side are to be 1 inch by  $1\frac{1}{2}$  inches by 8 inches. The other two pieces are  $1\frac{1}{2}$  by  $1\frac{1}{2}$  by 8 inches. Holes are drilled one half inch from one end of each piece and another hole  $5\frac{1}{2}$  inches from the same end. Quarter inch drill is used.

The two bottom pieces are countersunk about a quarter of an inch so the iron bolt head will not protrude from the wood. Four inch bolts can be used for this and the surplus can



Figure No. 4

be cut off if desired. These are to be fastened upon the ends of the laminations on which there is no winding.

The primary and secondary cores are placed on one end and laminations are filled in the gap at the top. A lamination is slid into the end of the left hand winding and it protrudes to the right until it touches the edge of the core of the right hand leg.

The next one is placed on the near side of the other lamination and will be fastened to the right hand core and will extend to the left to touch the left core. The remainder of laminations are then assembled in the same manner until all the spaces in the end of the core have been filled. This makes a perfect mechanical construction job.

# Detector of 5-tube Bremer-Tully Receiver

By STANLEY WELDON

The B-T five tube receiver, called by the Chicago Tribune the "Nameless receiver" has created such interested as to justify our presenting this first of a series of articles by Stanley Weldon, radio engineer. The set is unusual in many respects.

**M**OST of us started out with a one tube radio receiver, being limited by financial restraint, lack of technical knowledge concerning radio construction, or to a belief that we were going to be satisfied with a one tube set. Later on the urge is felt to add another tube so that a loud speaker can be used. The DX bug urges the addition of numerous stages of radio frequency so that we may listen to far away concerts.

A good beginning, gradual construction, and final perfection is half the battle of radio. If you start small and build up the chances are that you will meet with much greater success than if you attempt to construct a complicated receiver of four or five tubes without having had previous experience.

The new Bremer-Tully circuit can be assembled by a novice with no previous experience with radio. The complete five tube receiver can be built a step at a time, adding an additional stage and tube only after the part al-

ready constructed is functioning satisfactorily.

This method of building a radio receiver is extremely practical and feasible. You can actually test out each stage and additional unit on the air. Any errors in wiring or defects in apparatus will be localized in one particular stage and be very easy to find. Even the most expert builders of radio sets often experience considerable difficulty in readily locating the cause of a receiver failing to operate. In a complicated five tube receiver the novice will experience a great deal of difficulty in correcting trouble for it is difficult to localize the cause of the trouble.

Even though you do not intend to go as far as a five tube set it might be a very excellent idea to follow the lines of this constructional program. If you go ahead with the intention of building only a one tube set, and later on decide to make it into a three or five tube receiver it means that you will be forced to scrap your present panel and completely rebuild your set

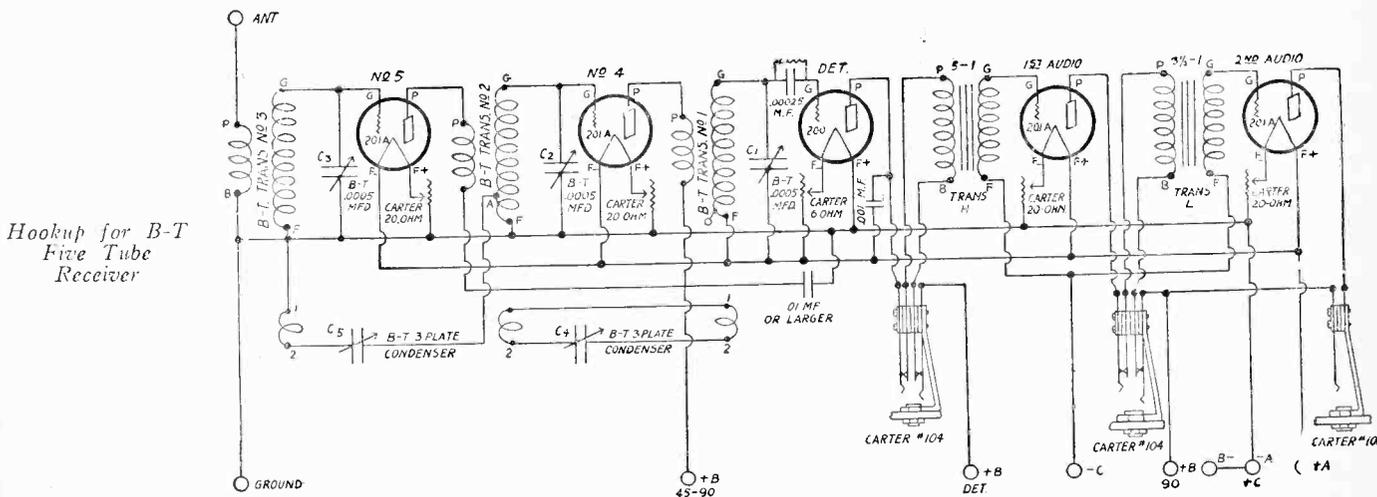
on a new panel to accommodate the entire receiver in one cabinet.

Buy a panel, baseboard, and cabinet of sufficient size to contain the five tube receiver. Then as you desire to expand and add to your receiver you need but drill a few more holes and add either radio or audio frequency amplification to your detector unit. This article is to describe the construction of the detector unit of the circuit.

### Parts Needed

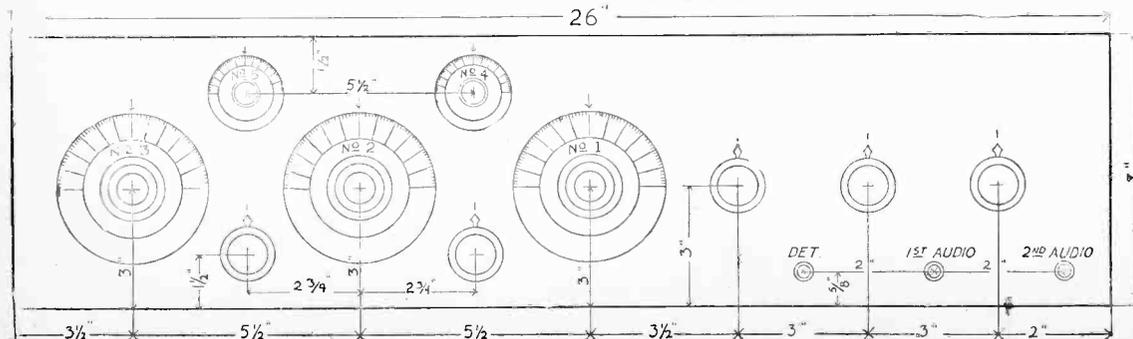
A bakelite panel 7x26x<sup>3</sup>/<sub>16</sub> will be required. The drilling plan for the complete receiver is shown and it would be well to drill all of the holes required so that the addition of apparatus at a later date will reduce itself to the simple matter of mounting the apparatus on the panel and baseboard.

Procure a baseboard of straight, well seasoned wood. It should be 24x6x<sup>3</sup>/<sub>4</sub> of 1 inch. One Bremer-Tully three circuit transformer, 1 Bremer-Tully .0005 vernier condenser, one Bremer-Tully 3-plate condenser, 1 UV 200 detector tube, 1 Carter No. 104



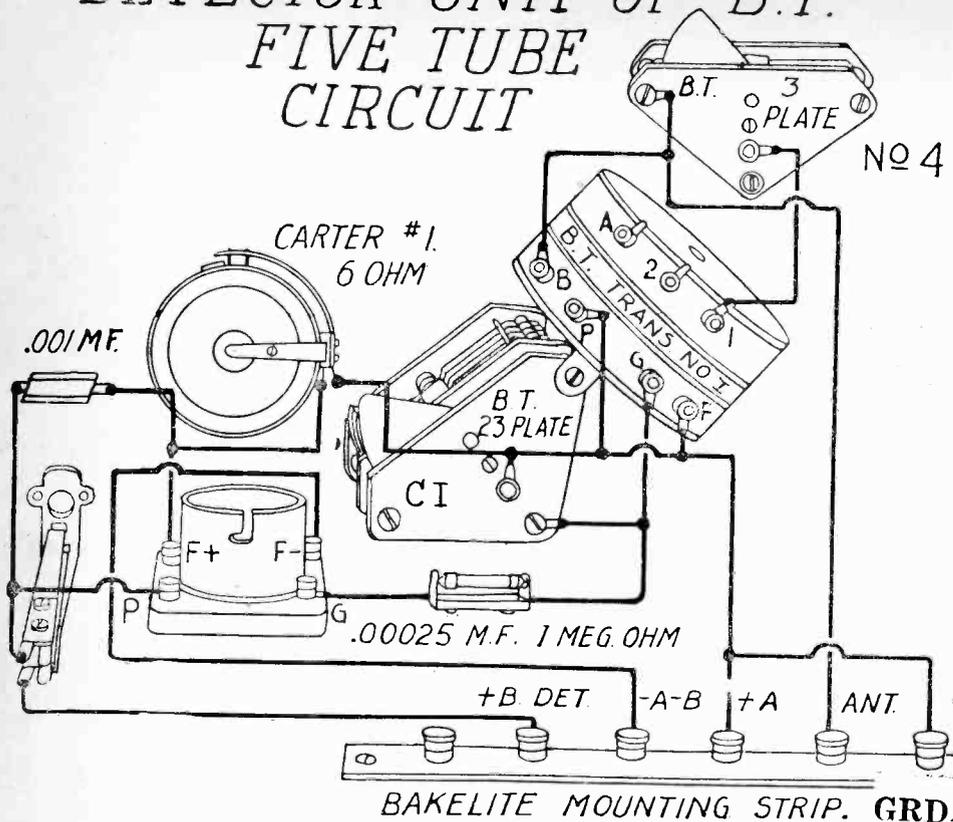
Hookup for B-T Five Tube Receiver

PANEL LAYOUT FOR "BREMER TULLY" FIVE TUBE CIRCUIT



Panel Layout for same Receiver

# DETECTOR UNIT OF "B.T." FIVE TUBE CIRCUIT



jack, 1 6-ohm Carter rheostat, one socket, six binding posts and wire will be necessary.

A one or two megohm grid leak and a .00025 Mfd. condenser, a storage "A" battery, and a 22½ volt "B" battery will complete the equipment. An aerial and ground of course will be necessary. The binding posts should be mounted on a thin bakelite strip as shown, and assembled on the rear of the baseboard.

The detector unit should be assembled in the center of the panel leaving room at both sides for the addition of amplification at a later date. The Bremer-Tully three circuit transformer is mounted somewhat as shown in the diagram by removing the screw from one of the corners of the rear plate of the 23-plate condenser, fitting the angle iron support of the transformer over the screw hole, and replacing the screw. The correct position of the transformer will be found later when the other stages of radio frequency are added.

The wiring of the various pieces of apparatus is very clearly shown in the diagram and you should have little or no trouble in assembling this part of the circuit.

### How Circuit Operates

Attach antenna and ground to the transformer (number 1). Attach all battery leads to the binding posts as shown in the diagram. Insert the tube and turn on the rheostat about three quarters of the way.

The 23-plate condenser is the wavelength control. The three plate condenser controls the regeneration or volume. Adjust the rheostat to a point just below where the tube becomes noisy. Vary the 23-plate condenser dial very slowly until a signal is heard.

The three plate condenser should always be maintained in a position below the oscillation point of the tube. Try all taps on the "B" battery from 16 to 22½ to secure the best point of operation for the tube.

Next month we will tell how to add a stage of radio.

## Broadcast Contest

What should the broadcaster broadcast and why? That is the question, folks. Send us your answer in a 500 word letter before August 15 and try to win a free course in radio, commercial, telegraphy, salesmanship or broadcast receiver—any of the courses offered by the Western Radio Institute, 625 South Hope St., Los Angeles. Radio Journal and the Western Radio Institute are co-operating in this effort to get some real opinions from our readers as to what broadcast should consist of, what it should bring into the home, and maybe what it should not bring into the home. Limit your letter to 500 words, give your opinion and back it up with reasons. The second and third prizes will be a year's subscription to Radio Journal. So send along your letters. Write plainly on one side of the paper only; address Contest Editor Radio Journal, 113 Stimson Bldg., Los Angeles, and get your letter in on or before August 15.

ful life of tubes if dry cell type are used.

To the student of circuits deficiencies are not simply accepted as facts, but the reason for the deficiency is sought with a view of modifying same. So while the above statements appear as a defamation of a rival circuit in contrast with the writer's Pet circuit the R-3, the object of this article is to point out the why and wherefor of these deficiencies so that the reader may familiarize himself with trends of errors in radio circuits.

The history of reflex circuits dates back to the long forgotten days when we used the one ampere amplifying tubes, when the ampere hour capacity of storage batteries and continuous charging prompted experimental work for the conservation of "A" battery current. The price of the multiplicity of tubes was not the reason for reflex circuits in this country. In England however, the "tax per valve" may have been an additional incentive. Taking the matter as it stands today the need for reflexing is past owing to the low current consumption of the 99 tubes. So the Harkness circuit if built today should not be reflexed and the "A" tubes that are imperative to a reflexed Harkness should be replaced with dry cell tubes. By this method an important gain in "A" and "B" battery consumption will result together with the additional achieve-

(Continued on Page 298)

## Midsummer Night's Radio

By J. T. ROFFY

THE rise and fall of circuits this mid-summer radio night is dealing hard blows to a well known moderate priced reflex circuit according to my way of thinking.

The summer months for radio are like the race track for the automobile. All the good and bad is multiplied until it stands out glaringly; insufficient volume, lack of selectivity, instability of the crystal, high "A" and "B" battery consumption, short use-

# Why Sing the Blues in the Summertime?

By R. B. YALE

*As our complaining friend once said, "Some cuss is always finding out a way to do something that can't be done." Mr. Yale, in this straight talk from one business man to another, points the moral. The aggressive doer of "can't-be-dids" eventually hugs home the fuming shout.*

IT is a noticeable fact that a great many radio dealers, when the summer season arrives, feel that the best thing to do is to close up shop and go fishing. Why?

We all know that radio reception is a great deal better today than it was in former years—that broadcasting stations have improved, that radio sets in general are more portable and most important of all, from the dealer's standpoint, the public is thoroughly sold on the idea of radio entertainment.

The writer has noticed a growing demand for portable receiving sets that can easily be carried on vacation trips or week-ends, to the beaches or mountains.

Mr. Dealer, while it seems far fetched, I would ask you to take example from the Coal Man. In the small town, and in many large cities, the coal man sells ice in the summertime and coal in the winter. Why can't the radio dealer work on the large set prospect when the folks are home and when summertime comes, sell the idea of portable radio sets to his customers?

One must admit that it would be following the lines of least resistance to show your customer, who is contemplating an automobile trip, a compact, portable, radio receiver, that he could carry with him and operate wherever fancy might cause him to roam, in his summer wanderings.

Radio manufacturers this year have brought out a larger number of sets designed for portability and to please the vacationist. Then of course, the man who takes such a set with him must necessarily buy some sort of antenna equipment or possibly a loop aerial and in addition, a spare tube or two.

Why not come out of the easy chair? Put in a peppy window display, showing a few portable receivers, aerial wire, insulators and other items that you know will be needed by the summer enthusiasts, or possibly go a little further. Dig around the back-yard, find a few rocks, a few tree branches, go to your nearest sporting goods house and get the loan of some summer camping equipment, put in a display that will make a direct appeal to the man who is about to go on a camping trip.

Boy Scout Troops are mighty good



prospects and many times the Scout Master can be interested in buying a set for use on their outings. What about the summer camp in your neighborhood? Near almost every city there are a number of summer camps catering to vacationists or tourists. It should be a fairly easy matter to interest the proprietor and have him purchase a radio set, to furnish evening entertainment, news events, baseball returns, etc., to his guests.

One very successful dealer found

that it paid to obtain permission, which was gladly given from churches and lodges holding picnics, to take a set on these outings, and show the folks gathered there what radio would accomplish on the banks of a quiet stream or possibly a lake and through this means he obtained a great many live wire prospects.

Every magazine devoted to radio is putting real effort behind summer sales on portable sets, showing attractive photographs of radio sets in use at the seashore, on board ship, in the mountains, etc. Why not tie in with that? Practice what you preach. Take a set with you on your own outings over the week-end. You will be surprised how many interested people will ask you questions regarding the set and radio in general and through this means you will get a line on additional prospects.

In short it must be admitted that radio can be sold in the summer as well as during the wintertime and that it only needs aggressive action on your part to put it over with your customers. The bird that sits in an arm-chair and says it can't be done does not stay in business many summers.

So in closing let us all take advantage of the extensive co-operation given us through the medium of the newspaper and the radio magazine and sell the idea of radio all summer long.

## Somebody Got to Africa, but Who?

SOME amateur has played in hard luck. For his signals were picked up in South Africa but only the word "south" and part of the word "Africa" were deciphered. Here is a letter from H. L. de Gouchy, honorable secretary of the radio secretary of South Africa:

"With reference to the test between American and South African Amateurs held during last and this month, I have to inform you that only one report of reception of your signals was received by me, a copy of which is enclosed herewith with a local newspaper cutting; I may mention that no effort was spared by the South African Amateurs in order to make the tests a success, perhaps tests could be arranged again at some future date. However

I have to thank you and the American Amateurs who took part in the tests on behalf of the South African Amateurs for the trouble you all must have been put to make the tests a success. I am, yours faithfully,

"H. L. de Gouchy,  
"Hon. Secretary."

Extracts from the log of Mr. R. K. Parker Kimberley, South Africa, referring to the early morning of the 11th May.

12:49 a. m. to 2:03 a. m.—Pure C. W. morse station; X's very bad and fading very bad.

2:44 a. m. to 2:53 a. m.—Low cycle A. C. morse station difficult to follow marking; X's still bad, fading slight.

5:40 a. m. to 5:50 a. m.—Pure C. W. morse station strongest yet heard;

the word "south" and the letter "f" were read, but other signals drowned out with X's, although signals were good and fading not pronounced.

The above was heard by Messrs. Stacey, Harrison and Parker, of the Kimberley Branch of this Society.

J. S. Streeter, of Cape Town, South Africa, also writes:

"Many thanks for yours of the 19th. March with schedule enclosed. You will have gathered from the fact that you have received no cable from South Africa that we have had no luck in picking up any of your signals. A party of three in Kimberley listening in on the last night wired me the next day that they had heard some c. w. on 200 meters, the word "South" being read complete and part of the word "Africa." However that is no use without call letters or code words.

"Of course the time of day is a bad one to sit up listening in but I think

that a good number of us did their bit. I for one am going to listen in once a week on the off chance of things improving later on in the year.

"I do not think that the failure is altogether due to us being "duds," as quite a number of Cape Town amateurs for instance are able to get the B. C. transmissions from England. On several mornings that I listened I picked up music on 100 meters. There were two stations, one a few meters above the other. I heard no call letters and did not spend any time on them as I wanted to get the amateur stuff.

"I am going to make up a super-sonic receiver and see what can be done with that. We are now carrying out some tests with Australia, and should anything come of it I will let you know.

"Yours sincerely,  
"J. S. Streeter."

in our receiving and transmitting sets. Editor Free gave me a letter to the department at Washington, which is also interested in this question. Later when I went to Washington every cooperation was extended to me, and I am anticipating considerable pleasure in cooperating with the Department of the Interior in their research work, especially in its application to use in mines communication. We returned to our own laboratory with much new equipment, much refreshed and encouraged by personal contact with fellow workers here and there in America.

### *Sending From Above*

That radio messages can come from a point high up in the air as well as "through it" was shown here recently when the radio operator on the Navy's big airship Shenandoah gossiped for a while with radio amateurs below.

"To the Rochester amateurs," read one message in code. "You are the first bunch that have waked up today. Best regards."

This was not a casual greeting, attempted as a pastime for the Shenandoah's crew, but part of a systematic program for testing out the possibilities of short wave amateur communication. Some time ago the American Radio Relay League learned from the Navy Department that a short wave transmitter was being installed on the airship for the express purpose of enabling its operator to communicate with amateurs should it be needed in emergency during flights.

The radio outfit on the Shenandoah is now regarded as the most complete of any ever installed on an aircraft, having facilities that allow the use of practically all wavelengths from 100 meters to the long waves commonly used by big commercial stations. The obvious advantage of the complete equipment is to give the crew of the airship a chance to avail itself of assistance, for direction finding and other purposes, of all classes of radio stations which would be useful in time of emergency.

Even the broadcast band has not been excluded from this arrangement for the Shenandoah's operator, after sending the foregoing message to amateurs, shifted over from code to voice and gave the following message to station WHAM:

"We have been hearing your broadcast station WHAM, at Rochester, and amateurs, WHAM coming in fine. If WHAM cares to, they might report our position to the Naval Air Station at Lakehurst."

The operators at WHAM immediately forwarded the telegram to Lakehurst and then turned on the transmitter and informed the Shenandoah they had complied with the request.

## Visiting Our Contemporaries

By Dr. R. B. BUEHLER, Research Editor

**I**N the early spring we rambled east with the avowed intention of seeing what the other fellow is doing, a mighty good thing for the soul occasionally, even if it be a radio soul, and we found those engaged in the publishing end of radio everywhere intensely earnest in their endeavor to serve in the interest of better radio, earnestly combing the field for that which marks progress. A few observations on what we found may not be amiss.



Radio Digest office was a beehive of activity. There is a well organized staff covering every phase of radio and each individual appeared to be on his toes. We received a hearty greeting and were extended

every courtesy and regretted that our time was so limited that we could not further enjoy their offers of hospitality. Quarters were light and comfortable, well ventilated, with every modern business and radio improvement. It was easy to see why they had the success which they were manifestly enjoying.

Radio Broadcast at Garden City, L. I., has grown so that the department had to be given new and larger quarters, so that now Editor Lynch holds forth in an office which is the last word in radio editorial sanctums. You cannot escape his hospitality on account of the train service, so once again we enjoyed a lunch on him and a stroll through the last word in com-

munity gardens, which, after a month away from California, did seem good. Lynch has an economic mind, however, because he ropes in his visitors as committees of research as soon as they appear. Therefore we soon found ourselves lugging loud speakers and batteries down to his shack and observed his technique in testing apparatus. One gets a new sense of the value of "tested" after seeing the processes involved.

Radio and Model Engineering, edited by our old friend Milton Sleeper has become aristocratic and moved up town to the Grand Central district. Here we found him surrounded by his models of glass work and radio handcraft. He is the man who takes apart all the "new" circuits, shows where they are new and where they are just dressed up.

Popular Radio has also outgrown its original quarters. Editors Cockaday and Free were cordial and hospitable as ever, anxious to learn of our trans-continental experiences, and it was difficult to escape without leaving an article then and there for their next issue. However by promising to write up our Catalina experiences last fall we escaped with our life and a good dinner.

All our contemporaries were much interested in the tube situation and interested to know of conditions upon the western coast. They were much interested when told that there was every indication that local capital will shortly be producing a standardized article in order to prevent the repetition of the shortage existing during the early spring.

Considerable interest was also shown

# Trouble Shooting on the Neutroflex

By M. S. ADAMS

*If our old friend Kid Trouble were ironed to a stake in the center of a twenty acre lot and some folks were asked to cross the lot they would sure bump into him. Much more easy it is to stub your toe on him in building a set. Since the appearance of Mr. Adams' article on the Neutroflex we have had many letters. This article is the result.*

**L**ONG association in commercial receiver construction, especially as standardized parts are used, and the acquired knack of trouble-shooting by sound have a tendency to make the professional forgetful of the trials of the home builder. However a reference to the notes made during the development of the Neutroflex, and a tabulation of letters and factory servicing on home built jobs has enabled possible faults to be catalogued almost 100 percent.

More than half of the complete or partial failures are due either to faulty layout or to an unsatisfactory mineral detector. If the prospective builder could see the almost complete failure of layouts other than the recommended one, he would not yield to the temptation to change the back panel assembly to one which worked well on another circuit, or which more readily lends itself to the use of parts on hand. This can not be too strongly emphasized—do not change the assembly.

Crystal failures, though readily recognizable, have not been so easy to correct. A faulty crystal detector (that is, faulty in this circuit at least) will cause anything from uncontrollable oscillation in the reflexed tube to a completely dead set. The obvious remedy is a new detector, if the dealer cannot replace the faulty one. The refusal of the manufacturers of one of the most satisfactory fixer detectors obtainable to continue to make the factory percentage of replacements necessary has forced the development of a new adjustable back panel mounting detector stand for the set.

Another cause for failure and exceptionally hard for the amateur to trace is in the reflex audio transformer. For some reason as yet a mystery to the author and the sponsors of the set some certain makes of audio transformers ordinarily send this circuit into an uncontrolled orgy of oscillation. This effect is independent of turn ratio, plate voltage and even filament temperature. The defect is especially prominent in a certain extremely small, shielded transformer in wide-spread use.

The foregoing covers all errors likely to be encountered in design and

construction, and there remains only the exceptional trouble of defective apparatus or incorrect wiring. The

*"The Philosophy of Radio"—what is it? Daniel Nelson Clark scientific editor of Radio Journal, has chosen the philosophy of radio as the central theme for his series of short talks or lectures to be given, one each week, over KHJ, the Los Angeles Times. The first will be given at 9 p. m. Thursday, July 17, and one will follow each Thursday evening at the same time. Mr. Clark is a lawyer, a patent attorney, a mathematical physicist and the author of "The Universal Law of Organic Progress", "The Constant of Organic Energy" and other publications. His brief discussions will appear, as given at KHJ, in Radio Journal each month and should prove stimulating to those interested in the big philosophical side of science, and that most recent and most interesting branch, radio.*

following chart will be of use in checking.

Causes of oscillation:

- A—In radio frequency tube:
  - 1—Defective potentiometer.
  - 2—Defective wiring of potentiometer.
- B—In reflex tube:
  - 1—Faulty crystal detector.
  - 2—Faulty layout.
  - 3—Faulty make of audio-transformers.
  - 4—Open circuit, especially in crystal circuit or audio

*Multi-tube fans—can you beat this? E. F. Doig of Los Angeles brings in KFKX, Hastings, Neb. through four Los Angeles 500-watt stations, in the summertime, and audible for several blocks on a non-power loud speaker. In a forthcoming issue we hope to have Mr. Doig's explanation as to how it is done.*

transformer.

- 5—Parallel leads (exceptional).

Causes of insensitivity:

- A—Poor crystal, or detector stand.
- B—Reversed A battery leads.
- C—Too low plate voltage.
- D—Poor audio transformer.

Causes of poor volume.

- A—Poor crystal or stand.
- B—Reversed battery leads.
- C—Incorrect terminals on audio transformer.
- D—Poor audio transformer.
- E—Too low plate voltage.

Causes of completely dead set:

- A—Open B battery circuit.
- B—Open circuit in audio transformer.
- C—Shorted jack, by solder, solder paste, etc.
- D—Plug not making contact in jack.

While the foregoing may seem a formidable list of possible defects they are all avoidable by fidelity to the circuit diagram and layout, proper selection of apparatus and reasonable care in wiring. With a good job of construction and a neat cabinet you can put your set up against the commercial product and say "My set is 100 percent." The writer will be glad to help all builders of this set. Address your letters care of Radio Journal.

Few radio fans realize how essential good head phones are in long distance reception. If the phones are of poor construction, it will hardly be possible to get the DX broadcasts, because the weak current that flows thru the windings in the phone coils will not be of sufficient strength to cause the diaphragm to vibrate. To avoid disappointment make sure phones are of good workmanship.

Mistakes in making connections which often results in the burning out of tubes is a failing common to radio beginners. A good idea, and one that will prove a reminder in making connections, is to have the leads from the "A" batteries and "B" batteries tagged with little tags marked with the voltage and polarity for each lead.

# Making an Exchange Table Pay

LOUIS L. LAMPTON

**F**OR sale or exchange — what have you? Now that's a homely familiar bit of phraseology, isn't it? But it remained for D. C. Phipps to apply it to radio in a new and novel way.

Occupying a prominent position in his salesroom, a place no one can miss on entering the store, is a table on which is a step-shelf. Upon the various shelves and the table itself repose radio parts, anything and everything from obsolete variocouplers to modern transformers and tubes. Everything on that table has been taken in by

that jump ahead of the field idea. Because through the medium of this exchange department a lot of other goods is sold. A man comes in to trade a radio tube for a transformer and walks out with lots of other things he needs, purchased from Mr. Phipps' retail store shelves. He has become a friend of the place.

Mr. Phipps is here appealing to several well known human characteristics. He knows that every fan's home is becoming cluttered with otherwise good radio parts but parts for which he has no use. Someone else may. Mr. Phipps furnishes them



*This photo tells the story of the place assigned to the "Exchange" table in the establishment of D. C. Phipps in Los Angeles. Everything on the table full of shelves at the right has been traded in or purchased and is to be traded out or sold at exactly its purchase or trade in value. The table represents a real service.*

Mr. Phipps at a known cash value, or as a trade for something else of known cash value. Everything is tagged with the price paid for it and can be purchased or traded by any customer at the same figure. In other words, if someone brings in a variometer and sells it to Mr. Phipps for two dollars, it goes on this shelf at two dollars. The next customer, bringing in a transformer figured at two dollars, can take the variocoupler for it, or he can buy the variocoupler outright for two dollars. Be it understood that these prices are fictitious. In fact it would be impossible to tell you the price of anything on the table, because it will not be there tomorrow. The contents of that table and the shelves changes every few days. In fact a good share of the table changes every day.

Where is the profit, you ask? If you trade in a variometer for two dollars and someone else gets it for two dollars after Mr. Phipps has brightened it up a bit, where does he come in? Who pays the rent?

This table, involving labor and expense but no direct profit does not represent Mr. Phipps' idea of philanthropy. It is simply good business—

the medium to get together.

Then there is the bargain hunter, and the man interested in radio who is simply fascinated by that table and its ever changing array of parts. It is a bonanza for the man who likes to rummage. But it is the goo on the fly paper when it comes to producing a steady stream of other sales—and the sales are materializing right and left "in the summertime." In fact Mr. Phipps, who is also distributor for

Wing Radio Products and whose establishment is located at 726 South Spring street, says business is better than ever this summer.

## Radio Tourist

Wendell Hall, on the first radio tour in broadcasting history, which he has just completed through the courtesy of the National Carbon Company, makers of Eveready Batteries, has appeared in fifty-three of the country's class B stations. During his last trip of three months he received over 20,000 letters from fans, his record was 5,100 during his week's stay at WOC, in Davenport, Iowa. His most unusual record was 2,550 letters from every state in the Union, Canada, Mexico and Hawaii, in three night's performance at WOS, Jefferson City, Missouri. His distance record was from WON, when he was heard in New Zealand, 7,500 miles. Some of these letters were addressed. The Red Headed Music Maker, U. S. A., and Wendell Hall, "On The Air", and they found him after traveling through many states.

While in Jefferson City he sang his famous composition, "It Ain't Gonna Rain No Mo'", while the accompaniment was furnished by an orchestra thirty-five miles away in Columbia, Missouri. Mr. Hall sang into the studio microphone while he listened on headphones to his accompaniment.

Mr. Hall will continue his tour as a double instead of a single, having just been married and on the radio honeymoon tour he will appear at the leading stations in Spokane, Seattle, Portland, San Francisco, Honolulu, Los Angeles and Salt Lake City. From then on, he will finish up his fall tour in the middle West, South and West. This will give Mr. Hall the distinction of being the first artist to appear in every leading station in the United States, Hawaii and Canada. During the early part of 1925, he will appear in Cuba and possibly Mexico.

It is also interesting to note that

*(Continued on Page 306)*

## Graduating from Radio College

**C**ERTIFICATES of graduation from the first, college course ever offered by radio were awarded on June 1 to some 400 farmers and their families who successfully passed a written examination covering work broadcast from Kansas State Agricultural College during the ten weeks short course conducted by the extension division. A curriculum including agriculture, home economics and engineering was offered.

A canvas of county agents in the state indicates that the majority of

farmers plan to be equipped with receiving sets by next fall. "Practically any of the 100 lectures I heard last winter was worth the price of my set," is the common statement in the many hundreds of letters received from farmers.

Kansas State Agricultural College leads all educational institutions in the world in the application of radio extension teaching. The program of the institution in this field has been heralded by the leading magazines and large dailies throughout the United States.

# Super-het Principle, Operation and Construction

## PART I

By A. L. MUNZIG

*This is the soup course of the super-heterodyne. There will be fish, meat, vegetables and dessert and maybe some more. In other words Mr. Munzig is going down the line on the super-heterodyne in a series of articles. It is unnecessary to state that they will be received with much gusto, eclat, etc.*

THE theory of the operation of super-heterodyne circuits has been dwelt upon before in various magazines. However, a little further explanation along this line will undoubtedly be opportune.

This method of reception is credited solely to Maj. Edw. Armstrong who developed its theory and put it to practice during the world war. It was while with the Signal Corps of the A. E. F. on the battle fields of France that Maj. Armstrong conceived this revolutionary method of reception. The Signal Corp of the German Army were transmitting on an extremely low wave-length with low power. In order to receive this valuable information being transmitted between posts on the German side, it was absolutely necessary to have radio-frequency amplification that would amplify at this low wavelength. Since radio-frequency amplification was not as far developed as it is at present, this presented an unsurmountable difficulty. However, it took the ingeniousness of Maj. Armstrong to conceive the method of changing the received short wave-length to a long wavelength where it would be an easy matter to amplify before being detected in the regular manner.

The first model developed was very crude compared with highly developed apparatus of this late date. However, it served its purpose admirably. Instead of transformer coupled amplification in the intermediate frequency amplifier, resistance coupling was used. Resistance coupling will not operate with any efficiency whatever on short wavelengths. However, when on long wavelengths the amplification constant is much greater and consequently this was one of the direct reasons for developing the super-heterodyne.

There is no known radio-frequency amplification obtained whatever when used at wavelengths below 160 meters. Above this the amplification constant increases directly in proportion to the increase in wavelength. The greater the wavelength the lower the frequency, hence the amplification constant is proportionately increased. Thus the reader can see the apparent advantages of amplification at long wavelengths. Of course this amplification can be carried too far and the resonant peak

of this amplification can be seriously hindered. Hence it is very essential for certain styles of long wave RF transformers to be perfected in actual operation and under various conditions, before being suited for long wave amplification. If the experimenter has a machine shop the building of several sets of transformers will not present much difficulty and then the transformers that give the best amplification should of course be used. All this must

*Mr. Munzig is working out several good stunts for this series of articles. These include an eight tube portable super-heterodyne, in the out-performing class, with one stage of reflexed tuned RF ahead of the first detector, no long leads, very compact.*

be worked out by experimenting in actual practice. The manufacturer of reliable standing has all these facilities at his disposal and can assure the public of transformers that are perfected in their laboratories. Of course there are different opinions on the type of transformers to use and all have their good and bad points.

In this article the writer will give the advantages and disadvantages of the types now on the market, viz: *Iron Core*, *Air Core* (with small wire) and *Tuned* (with large wire), and then let the reader judge for himself the type he would use in building a super-heterodyne receiver. The facts given

here are acknowledged by all pre-eminent radio engineers of the industry.

### Iron Core

#### Advantages:

1. The introduction of iron into the core of the longwave transformer broadens the amplification peak to a comparatively broad portion, thus allowing the transformer to amplify moderately over a large waveband.

2. Permits a greater coupling between primary and secondary and at the same time allowing sufficient insulation so that no breakdown will occur between windings.

#### Disadvantages:

1. No resonant peak of amplification. Amplification takes place over average resonant points none of which is highly efficient.

2. Extreme hysteresis losses causing distortion and loss of electrical efficiency by use of iron core.

3. Untuned. Poor amplification as in the case of all iron core shortwave RF transformers.

### Air Core (small wire)

#### Advantages:

1. Has higher amplification constant due to a narrower amplification peak than that of iron core type.

2. No sharp resonant peak—but very much better than iron core type.

3. Easy to construct.

#### Disadvantages:

1. Amplification peak broad—but much better than iron core type.

2. High distributed capacity.

3. High radio-frequency resistance.

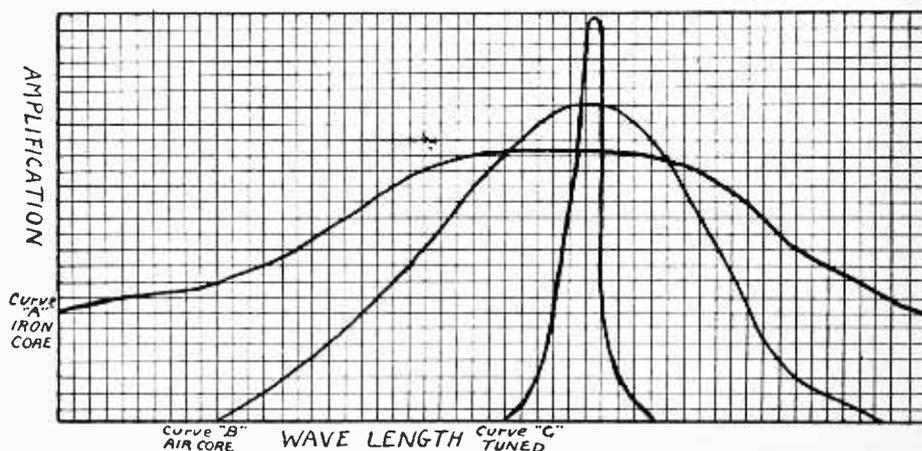


Figure No. 1—Showing curve plot of characteristics of iron core, air core (small wire), and tuned super-heterodyne transformers.

4. High DC resistance.
5. Amplification constant much better than iron core.

#### *Tuned Air Core (large wire)*

##### Advantages:

1. Extremely high resonant amplification point.
2. Passes but one frequency—very selective.
3. No hysteresis losses.
4. Radio-frequency resistance very low.
5. No distributed capacity worth mentioning—just enough to make peak a trifle broad, otherwise the tuning would be so critical that the adjustment of vernier on condenser would go past all stations.

6. Amplification greater than with any other type of transformer. Just as the neutrodyne method of tuned radio-frequency amplification is greater than untuned iron core and air core (small wire) transformers, so the use of tuned transformers in the intermediate frequency amplifier of the super-heterodyne is superior to the former.

##### Disadvantages:

1. Difficult to construct.
2. Bulky, comparatively.

In Fig 1 a curve chart of comparison is plotted showing the difference in performance of electrical efficiency and also the resonant peak and flat top portion of each type of transformer under discussion.

Curve "A" represents the amplifica-

tion and also the resonant curve. Note how low its amplification constant is and also its flat resonant top. Its amplification is only moderate over a wide band of wavelengths.

Curve "B" represents the resonant and amplification performance of the Air Core (small wire) type of transformer. Note that its amplification is slightly greater than that of the iron core type and that its flat top portion of resonant peak is much better than that of the iron core type.

Curve "C" represents the amplification and resonance that is obtained when Tuned Air Core (large wire) transformers are used. Note how much greater amplification is obtained and also the resonant point is very sharp. Tuned Air Core longwave amplifying transformers are without a doubt the best type to use if the most is wanted out of amplification.

In following articles the writer will describe the construction of various methods of the super-heterodyne using tuned radio-frequency amplification before the first detector. Also complete and full details will be given of the construction of a portable super-heterodyne receiver using C299 tubes in which one stage of tuned RF amplification is used and one stage of audio-frequency amplification is reflexed in this tube. Thus there are only 8 tubes used. Other developments in which regeneration is used with the first detector of super-heterodyne will appear at an early date.

We must be practical and attend to the things of this life. For this reason our conscious mind functions chiefly through our physical brain, which is the organ of adaptation to this material world. But while we live in a physical body and, therefore, must attend chiefly to the things of sense, we have a spiritual soul and this soul (Greek "psyche") has a psychical environment, and so our conscious mind, at least to a limited degree, can function through our subconscious mind which is the organ of adaptation to the psychical world which surrounds us and pervades us. At this point it is of the utmost importance to recognize that while our conscious mind can directly control our physical brain, it can only indirectly control our subconscious mind.

Mind energy possesses intelligent activity and moral power. It is, therefore, on a much higher plane than radiant or electric energy, but nevertheless there is a very close affinity between these two forms of energy which both come from a Common Source. The same law of vibration is operative both in electric energy and in mind energy. There are psychic waves of thought and feeling which correspond to electric waves. In the psychic world the law of vibration becomes the law of sympathetic rhythm and spiritual harmony, and it is only as the conscious mind makes use of this supreme law of mind energy that it can indirectly control the subconscious mind. Some seem to make use of this law spontaneously, others only with practice.

The unity which exists in the subconscious realm is a primitive unity. This is proved by the fact that telepathy prevails among young children, and primitive races before they have an intelligent understanding of the human mind. An infant crying in its sleep can be quickly calmed by a mother's soothing thought. Long before the days of the radiophone a traveller in the arctic regions was astonished to hear an Eskimo humming a tune which had just become popular in London. Many years ago an important event which occurred among the Indians of the upper Naas river was intuitively known by some of the Indians of Metlakatla on the coast so that when the messenger arrived he found that the news was there before him. When General Gordon died at Khartoum the fact was instantly known by some sensitive natives at Cairo. A sleeping mother three thousand miles away can easily be awakened by a rhythmic wave of thought and feeling from her suffering son. A mental epidemic can sweep across a country with amazing rapidity. A whole nation can be roused into united action in a single night provided there is an intense emotional psychic wave resembling a mighty tidal wave.

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## Indivisible Mind Energy

By BISHOP F. H. DuVERNET

RECENT scientific experiments in telepathy seem to demonstrate that there is a primitive unity between all minds in the realm of the subconscious world. There is no such thing in the universe as an absolutely independent individual mind. There is abundant evidence to prove that while our conscious minds tend to individualize us our subconscious minds tend to unite us. We have yet to discover a word which will rightly express the relationship which exists between two minds which are in sympathetic harmony. We say that these two minds interpenetrate, and so they do, but the relationship is closer even than this. Water may be mixed with sand but we know that each atom of water and each grain of sand occupy separate localities because both are material. It is different with two minds. They are not material units. They are in space it is true for where they act there they are, but at the same time they transcend space because they are spiritual. When two minds interpenetrate they are not still separate as sand and water when mix-

ed. They interact in the unity of Mind Energy.

It is not enough to speak of our individual minds as parts of a larger whole. They are more than mere parts, they are living members of the Great Mental Society, but there is something more even than this. To our conscious minds which tend to individualize us we may rightly apply this term for they are truly social members, but to our subconscious minds which tend to unite us we need to apply a more comprehensive term which will bring out the primitive unity of the indivisible Mind Energy which pervades the universe.

When a telegraph operator presses his key every open instrument in the circuit responds because of the indivisibility of electric energy. In like manner every subconscious mind is in the circuit of the universal mind. We could know all that is going on in the mental universe if we could become conscious of all that is passing through our subconscious mind, but this is impossible because of the barrier of the brain. We live in a physical body and this body has a physical environment.

# Removing the Wail of Lost Souls

By A. K. PHILLIPI

*Listening to "The Birdies" may be all right in its place, but none of us believe that place is radio. Mr. Phillippi, radio engineer for Westinghouse, here tells folks operating regenerative receivers how to tune them and eliminate trouble for the other fellow.*

**H**OW many of you listening in are sure that your listening in is not preventing some other person from enjoying some radio program? By this I do not mean that you should lend them your receiving set, but that you, by the improper manipulation of your set, are causing a disturbance in the air that interferes with your neighbors' proper reception of the program.

How many of you, never having driven an automobile, would go to a dealer and buy a car, get in, and drive away, without first being instructed in driving and handling a car? Such a person would be considered a public nuisance and would soon be arrested.

While the operating of a radio set by a person not knowing just what he is doing with it will not endanger the lives or property of others, yet it can cause so much annoyance that it greatly mars the pleasure of others. The majority of people are good sports and play the game fairly to the best of their ability, and people who do cause these disturbances are usually those who are unfamiliar with the operation of their receiving units.

It is my purpose to point out some of the things to do and what not to do when tuning in, so as to prevent disturbances which can be heard by other listeners. First of all, the radio set should be of a good design. Secondly, it should be connected up properly. We now turn on the filaments of the tubes to their proper brilliancy. This varies with the different types of tubes used. With the tickler or amplification dial or pointer turned to zero, we next move the tuning dial or dials slowly from left to right listening for signals. If no signal is heard, the tickler or amplification dial should be advanced slightly from the zero position on the dial, and again the tuner dials should be turned slowly over their range. Should a signal be heard but faintly, the tickler should be advanced as far as possible without causing a hissing sound, which indicates that the tube has passed the point of greatest regeneration and is oscillating. These oscillations are just like another transmitting station sending out signals as they are heard by other receiving sets and are known as "birdies". The tickler should be turned back until the signal is cleared up or even a little past that point, for a

too strong signal may cause the detector tube to break over and oscillate again.

The best way to make sure your detector tube is not disturbing others is to plot a tickler diagram. This is done as follows: After the tubes are lighted to the proper brilliancy, the tuner is placed at zero and the tickler is advanced until a click is heard. At this point the tube starts to oscillate. Then mark down the readings in two columns, one marked tickler and the other, tuner. Next the tuner is advanced until the click is heard, and these readings should be taken. This procedure is carried out over the entire tuner scale, and it can readily be seen that, with the use of this set of readings, one will be able to set the tickler or amplification pointer to a division just below the oscillating point.

Now it is possible that the click or breaking point of the tube may not be heard by merely turning the tickler. If so, the operator should tap the antenna post with his finger and, when the tube is not oscillating, he will hear only a signal click. As soon as the tube starts to oscillate, the operator will get a click when he touches the antenna post, and another click when

he takes his finger from the post, or in other words a double click. Now it is not advisable to do this during the program period, but during the day when the chance of disturbing others is at a minimum.

The ideal regenerative receiver and antenna will have what is termed a flat tickler curve. By this we mean that it will be possible to put the tickler at a certain point and turn the tuner any place and be at maximum regeneration without causing oscillation. If the set has this characteristic, much less trouble tuning in stations without annoying others will be experienced.

The reception of signals at zero beat causes more interference than any other method of tuning and should be discouraged. The results obtained are not at all satisfactory unless one juggles the vernier or tickler dial. Each movement of either dial causes the detector tube to transmit weird signals and those in turn are heard by all local listeners. Again the varying strength of signals may cause the detector tube to flop from one side or the other and ruins the program not only of the people but of the person tuning the set as well. The crystal

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*If this be radio given here. Lois Wilde and Stella Wooten of the Ziegfeld Follies are using their Kodak portable at Far Rockaway (we wish it weren't so darned far). Anyhow, it's a pretty set, don't you think?*

# How to Tune the Teledyne

By H. S. WILLIAMS

*This article on how to tune the Teledyne is the third we have published, and completes the series on this set. Mr. Williams, who told Radio Journal readers how to build it, here outlines how to make it perform at maximum efficiency.*

**T**HERE are two general methods of tuning the Teledyne. Both are extremely simple and therefore quite rapid. Each method has its advantages, and every user of the Teledyne probably swears by his favorite method. The important feature of the Teledyne receiver, however, is the fact that, regardless of the method of tuning employed, or of the degree of skill or lack of skill in the operator, the Teledyne will not emit the howls and squeals peculiar to other regenerative receivers, and thus cannot possibly annoy or interfere with neighboring reception.

The Teledyne receiver has thus at one stroke eliminated the only objectionable feature of regenerative receivers, and has at the same time achieved a remarkable sensitivity.

The first way of tuning is the familiar beat method. This method consists in causing the detector tube to oscillate by increasing the regeneration, and then slowly varying the secondary condenser control. As this control is moved over the scale, innumerable beat notes known variously as 'chirps,' 'squeals,' 'valleys,' etc., are heard.

The second step is to bring the primary into tune with the secondary. One of the beat-notes heard while moving the secondary control should be tuned to the "valleys" or zero-beat position as is customary in single circuit tuners. The primary control is then slowly varied over its range. One position will be found where the beat-note is made very much louder, thus indicating that this is the tune position. Leaving the primary at this adjustment, the regeneration is then decreased until the beat-note disappears and the signals are clear and distinct. Re-adjustments of primary and secondary controls will often help in bringing the signals in much louder, as in any other receiver. The chief advantage of the beat method of tuning is its rapidity, and the ease with which weak or new stations may be picked up and tuned in. Its chief disadvantage lies in the presence of the beat-note squeal while engaged in the tuning-in process. For those who object to this latter feature, the second method of tuning will probably offer greater appeal.

The second method of tuning the Teledyne may be called the Hunt method. It is characteristic of the Neutrodyne, and similar receivers, but in

the Teledyne only two controls are used, one for each hand, thus greatly simplifying the tuning process.

The regeneration control is set at a low value, well below the oscillating point. With the primary control in one hand, and the secondary control in the other, the entire range is slowly and carefully covered, maintaining the primary in tune with the secondary. The in-tune position may be readily determined by the sudden increase in atmospheric and extraneous noises as the primary is slowly varied. A little practice makes this process quite easy and rapid. Any stations operating and within range of the set will be heard as the receiver comes into tune with them. Once a station is heard, the re-

generation may be increased, and minor readjustments made until the intensity is at a maximum.

This method may be satisfactorily used on the loud stations, but for tuning in the weaker and extremely distant stations, the beat method is preferable.

The dial scale readings on the Teledyne may be recorded on a chart after they are once found, and thus a station once heard, may be immediately tuned in again at any time by setting the dials in accordance with the charted scale readings. It is only necessary to record the primary and secondary readings, as the regeneration control serves only to adjust the intensity of the signals.

## CKAC, World's Biggest Station

**S**TATION CKAC, owned and operated by La Presse, Montreal, and often called the French radio university, soon will boast of the most powerful station in the world.

A 7000-watt three-phase rectification, "all Canadian make", Marconi set will send forth a message of good will to French Canadians scattered all over Canada and the United States when the new installation and the entirely renovated studio are complete.

CKAC at the present time is operating on 2000 watts and resorts to an all remote control system of entertainment following destruction of its \$60,000 studio, April 26, which burned down as the consequence of a faulty flashlight apparatus used in photographing a new microphone. Transmitting room and apparatus were spared.

Rebuilding of the studio will revolutionize the laws governing interiors of broadcasting rooms.

Instead of resorting to the all felt padding, with overdraperies of silk and velours, La Presse broadcasting studio will be one where echoes will prevail at their height.

The finish will be in carved ivory paneling for walls and ceiling, and tiles and cork will be used for flooring. This scheme is intended for the purpose of getting the full tones out of the specially built Casavant electrical pipe organ, within the studio

walls. When a dulling effect is required, a system of wall curtains will be raised or lowered by electricity.

The object of the new plant is to inaugurate what will be known as "chats about French Canada for French Canadians", and to reach them whether in static belts or dead zones.

Throughout the provinces of Quebec, Nova Scotia, and New Brunswick there are today some 2,500,000 French Canadians and more than 2,000,000 others are scattered throughout New England states, Michigan, Louisiana, etc. There are also those of the French language in St. Pierre Miquelon island, and others in the West Indies and the Guianas. The customary bi-lingual feature of CKAC will enable European listeners-in during the winter months, under favorable conditions, to participate in the programs.

The proper connections on a crystal receiver are just as important in the reception of signals as proper connection on tube sets. It will be found that with the use of a crystal detector each one varies in the respect to which direction the current enters. Some work best and give loud signals when the current enters through the cat-whisker and others when the current enters through the crystal and leaves through the cat-whisker. Try reversing the terminal connections and note the result.

# Radio at the Thos. H. Ince Studios

By CHARLES F. FILSTEAD

*Radio is gradually establishing itself on an utilitarian basis in countless ways aside from the initial direct transmission and the entertainment via broadcast. The use Mr. Ince, movie magnate, makes of radio is but one, yet it is significant of the days to come.*

THE two Limited Commercial stations of the Thomas H. Ince Studios at Culver City, California, KZY and KDBG, have just been completed, and will soon be heard communicating on 146 meters every week-end. These two stations—KZY the Studio transmitter, and KDBG, the transmitter on the Ince yacht 'Edris'—are 100-watt combination telephone and telegraph sets, with an approximate range on voice of 500 miles or better at night, and probably 200 miles in daylight.

Special short-wave tuners are used for reception on the short wavelength these transmitters use, but for stand-by work on 600 meters, Grebe receiving sets with two-stage Grebe amplifiers are used.

The high voltage necessary to operate the transmitter on the "Edris" is furnished by several 32-volt banks of storage batteries, which are kept charged by a special charging plant installed in the engine room.

Duplex transmission—that is, transmitting and receiving at the same time—has been found impossible because the transmitter and receiver at the ship have to be so close together. By a rather clever system of relays, transmission has been simplified to the point where the person talking has but to press a button to send, and release it to receive.

Thos. H. Ince, a pioneer picture producer and one of the first of the movie magnates to take "to the air", is intensely interested in radio, as he feels that the two greatest of present day marvels—motion pictures and the radio—should go hand in hand, for they are the popular institutions of the great mass of people of the civilized world. Not that pictures will be made by radio or that the radio will supplant the visual enjoyment of the screen, but that each builds and advances the common enjoyment of all.

Mr. Ince is an all-round outdoor sportsman, but for real enjoyment he said he has found nothing that lends the "thrill" of the radio, with its possibilities for reaching out into space and making contact with across-the-continent and even across-the-ocean stations.

In an interview recently, relative to radio, Mr. Ince said: "But for all the glory of the radio expert's thrill in picking up a new station, a news flash

from some distant point of the globe, I for one anticipate no serious rivalry to the motion pictures from this fascinating new 'sport.'" Then he went on to say, "Pictures have come to stay. The millions have found in them an entertainment which I do not believe ever will be replaced or displaced. The picture industry will evolve with civilization and the screen will develop new and greater resources for entertainment and education year by year."

Mr. Ince is a firm believer in the future of radio, and even now experiments are being carried on in the Electric laboratory of his studio to improve upon its present radio equipment. Experimental work in the laboratory has developed a new type of speech-amplifier for Director's use, which will soon be put in operation to assist the Directors in the handling of mob scenes. The hook-up of this new speech-amplifier is known as the "Ince circuit" and it will probably be much used in other studios and address systems as soon as the results obtained from it are made public.

There is another use for a high resistance unit other than as a grid leak. This is an absorber of low frequency noises usually prevalent in audio frequency amplifiers. The resistance should have a value of one-quarter of a megohm, and can be used on a noisy amplifier. The unit should be connected across the secondary of the transformers.

The bulletin of the American Radio Association had scarcely been off the press before the first edition was entirely exhausted, according to an announcement made today by Alfred M. Caddell, secretary of the association, necessitating the run of another edition to take care of the demand. The bulletin is printed on good goldenrod stock, in two colors, and contains much information of value to radio fans. Anyone interested in radio may obtain a copy of the bulletin gratis by applying to Alfred M. Caddell, secretary American Radio Association, 50 Union Square, New York City.

Ev. Jones, leader of the popular WTAM dance orchestra cannot sing a note. He admits it freely. But he has a wide and growing reputation as a singer of the popular music played by his "bunch."

The effect is accomplished by Ev placing his lips so close to the microphone that they touch it as he half hums the tune and whispers the words to the piece the orchestra is playing.

The result is rather startling. The voice is plainly audible above the full strength of the orchestra and the words come ringing in out of the air loud and clear. But if Ev were in the same room with his listeners and the orchestra were silent, the ear alone could not detect a sound at distances greater than ten feet.



*"This is getting to be some world," says Viola Dana, Metro's diminutive star as she tunes in on a concert being held in New York. Her neotrodyne is installed on the stages at the Metro studios in Hollywood. By golly if our wife could tune in on that coat Miss Dana has on we should worry.*

# Charging Your Own Batteries

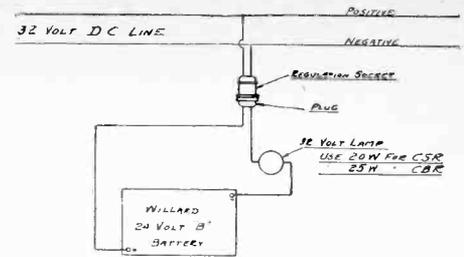
**A**LL TYPES of Willard storage "A" and "B" batteries may be readily and successfully recharged from a 32-volt farm lighting system. We are attaching a diagram showing how the "A" and "B" radio battery may be recharged by merely using the house lighting receptacles connecting with a cord and 32-volt lamp in series with the battery.

Select the socket which is most convenient for charging the battery. Screw in an attachment plug being careful that the two wires do not touch each

time, then shifting the leads to the additional 12 cells or 24 volts.

A fully charged radio "A" or "B" battery will have a specific gravity reading of 1.275 to 1.300 and may be considered discharged when it has a specific gravity reading of 1.175. For best radio results the battery should be recharged when it has a reading of 1.200.

It is possible to recharge higher voltages from a 32-volt lighting system; that is, batteries using up to 500 volts on power amplifiers and transmitters, by following the instructions on the attached diagram. Any mul-

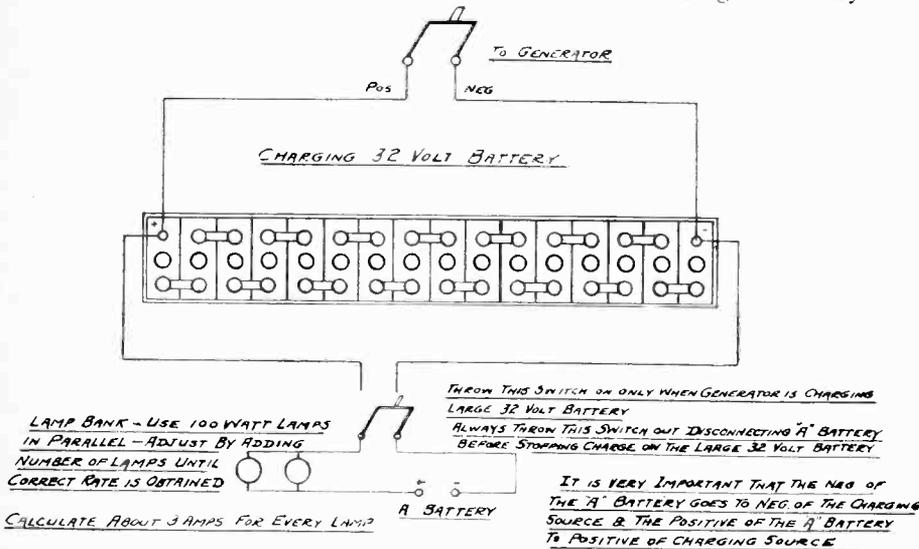


*DETERMINE POLARITY OF LINE BY PLACING CHARGING LEADS IN A GLASS OF WATER & BUBBLES WILL RISE FROM NEG LEAD. IT IS VERY IMPORTANT THAT THE POSITIVE OF THE BATTERY CONNECTS TO THE NEG. OF THE CHARGING LINE & THE POSITIVE OF THE BATTERY TO THE POS. OF THE CHARGING LINE.*

Charging 24 volt "B" battery from 32 volt D. C. current.

it from the plant storage batteries, rather than from the generator. However, a high charging current is needed for an "A" battery and it should only be charged while the generator is being operated to charge the plant battery. After obtaining the polarity make sure that the positive of the charging line is attached to the positive of the 6-volt storage battery as indicated on the attached diagram for recharging "A" batteries.

A new invention which will enable every telephone subscriber to listen to opera performances at home and hear as plainly as if sitting in a \$10 seat at the opera house, will be introduced on the German state telephone in October, according to an announcement recently. The invention is independent of the radio, and is said to be far superior, because it eliminates all disturbing noises. The inventor is Ministerial Councillor Dr. Steidle. He has found a way through the use of several microphones to collect the sound waves from all parts of the stage and orchestra and combine them into one harmonious melody which enables listeners to distinguish individual instruments and voices.



Charging Radio "A" battery from 32 volt system.

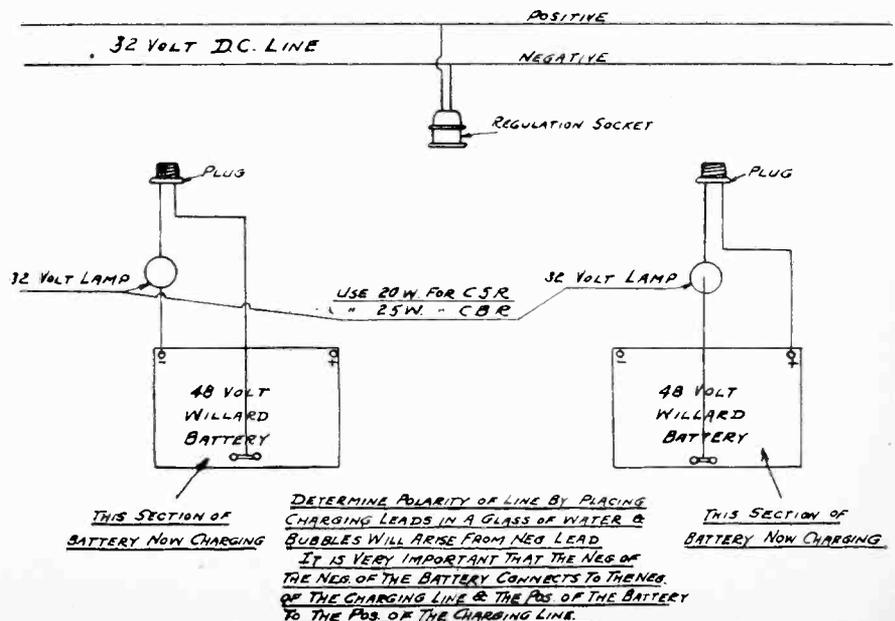
other. Determine the polarity of the charging wires by placing the ends of the attachment leads in a glass of water. Bubbles will form around the negative wire. If both leads show bubbles, the negative lead will give off a far greater number. After determining which is the positive and which is the negative lead, put some kind of a distinguishing mark on the negative and always use this particular socket when charging.

To properly recharge the batteries the positive of the charging line must go to the positive of the battery. This should be easy as you have marked your charging line, and the positive poles of the Willard "A" and "B" batteries are also plainly marked.

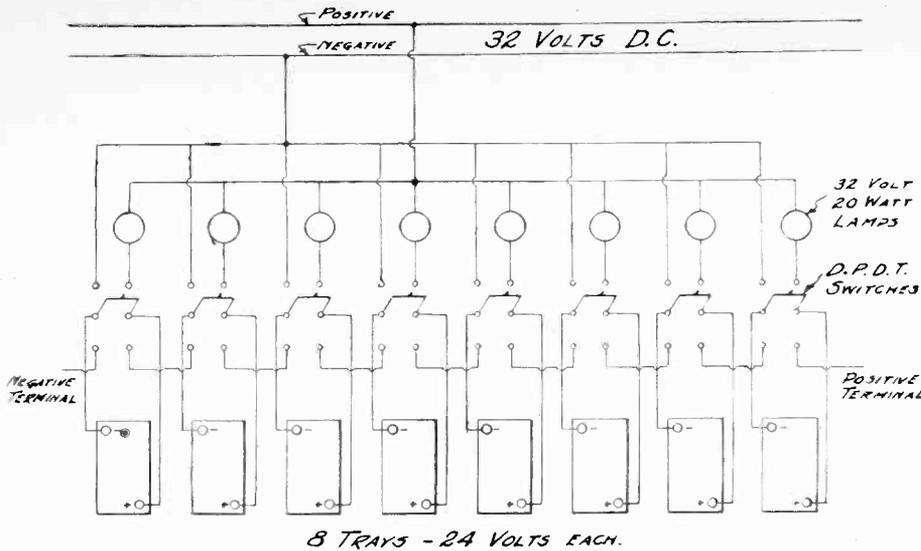
When recharging "B" batteries, use a 32-volt 25-watt lamp for the CBR type and a 32-volt 15 or 20 watt lamp for the CSR type. It is possible to recharge only 24 volts of "B" battery at one time. Therefore, we would recommend the buying of 24-volt "B" batteries where the charging device is that of a 32-volt house lighting system. The accompanying diagram shows the manner in which a 48-volt "B" battery may be recharged, that is by charging only half or 12 cells at one

multiple of this system may be used such as 48, 72, 96, and 120 volts.

Owing to the very low charging current needed for a "B" battery the efficiency of a charging plant is not lowered to any great extent by charging



Charging 48 volt "B" battery from 32 volt D. C. supply.



Charging high voltage batteries with 32 volt Direct Current.  
This Diagram for D. H. Richardson.

On July 28, 1924, 9:00 P.M. Pacific standard time, The Western Union Telegraph Employes Radio Club of San Francisco, California, will broadcast a special program through station KPO (423 meters) Hale Bros., Inc., San Francisco.

Land line telegraph employes have taken to the radio like the proverbial "duck takes to water," and this concert in addition to offering an hour of exceptional entertainment, is being conducted along experimental and development lines.

Nation-wide publicity has been circulated by the committee and all radio enthusiasts, both far and near have been invited to report to C. F. Newsom, Pacific Division commercial manager, care general manager Western Union Telegraph Co., or direct to station KPO, Hale Bros., Inc., San Francisco, either by wire or by mail, during or following the program. An excellent long-distance record is expected as a result of this experiment. However, reports from stations near-by are requested.

## KFI on 5000 Watts

**L**OS ANGELES will have one of the most powerful broadcast stations in the United States.

This comes with the announcement that KFI, the Earl C. Anthony, Inc., station is to be practically rebuilt with the installation of a new 5,000 watt set.

The purpose of the Anthony Company in replacing its present 500 watt equipment with what will be the most powerful broadcasting station in the United States, is to increase not only the range of the station, but to increase particularly the quality and reliability of reception. The secret of successful quality reproduction is to put out sufficient power to bring the modulated carrier wave into the receiving set with sufficient strength to operate the detector and the loud speaking devices from the energy actually transmitted through the air instead of using high voltage amplification, which distorts and loses quality.

The present governmental law permits but 1000 watts to be put into the antennae. Therefore KFI will be operated at 1000 watts, with a reserve of five times that amount, available for

special occasions, and in case the law is later modified.

In order to adequately take care of the new equipment, the Anthony personnel of engineers, operators and program managers, will be practically tripled. The set contains special transformers and special devices to increase the roundness of tone quality. The voice is amplified and turned into radio frequency by the same 500 watt equipment as is now in use by KFI, but instead of this 500 watts going into the antennae, as at present, it is put into two water-cooled amplifying tubes which are supplied with a potential of 10,000 volts direct current from three water-cooled rectifier tubes, and the amplified modulated carrier wave is then delivered to the antennae. The set covers about twenty times the area in square feet of the present equipment, and is the latest device used, to be a duplicate of the American Telephone and Telegraph Company's Station, WEAJ, in New York City. The added power will insure satisfactory reception during the daytime, and will mean an absence of fading during the summer months,

which is now one of the greatest drawbacks to DX receiving.

Total cost of the extra equipment, now under construction by the Western Electric Company will approximate \$75,000 more than the present towers, studio and buildings, with an operating expense of approximately \$10,000 per month. An additional studio will be constructed upon the roof of the building, permitting one group of entertainers to be preparing, while another actually broadcasts.

Anticipating the full 5000 watt equipment being available, the Anthony Company plans to remove the set to hill-tops in the outlying districts of Los Angeles in order that the city itself will be sprayed from the outside without interference due to power lines, street car lines, high tension lines, and the like. Also the number of remote control stations will be doubled in order that the supporting program may be the best in the United States.

Instigation for the new equipment came when Earle C. Anthony made a recent trip to New York and other eastern points, where he thoroughly investigated the broadcasting situation. Mr. Anthony feels that a radio station is a genuine service, and that in increasing the range and quality of KFI he is adding notably to the great possibilities of radio.

Experiments in radio reception aboard moving trains are relegated to the past and entertainment of passengers on cross continental trains by radio has become a fact following the installation of receiving sets on coast to coast trains of the Canadian National Railways. WTAM, the Willard Storage Battery Company's broadcasting station was successfully received on board of Canadian National Transcontinental Train No. 1 enroute from Montreal to Vancouver. According to Frederick P. Kent, radio operator on this train, WTAM entertained passengers all the way from Montreal to North Bay, Canada, at which point the station signed off. Other stations are picked up regularly as the trains come within their range so that scenery by day and music by night helps to enliven the trip for the traveler.

Very often after completing a two-stage amplifier it is found that it is impossible to hear anything in either the detector or first stage of amplification but very satisfactory results will be had in the second stage. When such a condition exists, the trouble will usually be located in the jacks, and an examination will probably show that the phone plug does not make proper connection to the prongs of the jack. The best way to overcome this difficulty is to use a different size washer between the jack and the panel.

# Use Light Current for Radio Sets

**A** NOTED chemical engineer, R. E. Sabin of Somerville, N. J., with the co-operation of L. G. Pacent, a well-known radio manufacturer and engineer of New York City, worked out a solution of harnessing commercial lighting current to the usual receiving set. Having fully noted the efforts of others, as well as appraised the many difficulties in the way of applying such current source more or less directly, these practical men have gone about the task in a totally different direction. They have worked out an indirect method of harnessing commercial lighting current, in which such current is merely used as a source of heat.

Briefly, these men have adapted the thermoelectric method of energy transfer to the solution of the greatest radio problem of today—the operation of vacuum tubes on a lighting current. The thermoelectric power transformer consists of a number of pairs of dissimilar metals in contact, one junction being in close thermal relationship with, but neutrally coupled electrically from a resistor element in the power or lighting circuit. The difference in temperature between the metal members causes the flow of current, and while the potential of a single thermocouple is quite low, any desired potential may be obtained by using a battery of bimetallic units connected in series.

Novel adjustments of the electrical resistances, thermal conductivities, emissivities, radiation, etc., of the various parts have been made, all contributory to the final perfected result.

The perfected thermoelectric transformer device, which has been given the name of "Thermoformer", consists of a neat pressed metal container in which are placed the several rows of bimetallic units, as well as the electrical

resistor element. The lighting current is led directly to the resistor element, which operates in much the same manner as the heating element of an electric iron. This heat is brought to bear, without any substantial electrical coupling, on special electrode castings, while the other end of each of these special castings is in contact with a strip of metal which comprises the other member of the thermo-couple. The thermo-



couple units are all joined together so that their individual electrical outputs are combined for the desired output. Furthermore, the container is provided with screened top and bottom to permit the passage of air to carry away the undesired heat.

The "Thermoformer" can be arranged to operate the filaments of a number of vacuum tubes, which is the more difficult task, as well as the high-voltage "plate" circuits which usually call for the so-called "B" batteries. Even the grid-biasing or "C" battery energy can be supplied by the Thermo-

former. Several demonstrations of this device, both with head-phones and with a loud-speaker, have shown it is claimed that the results obtained are as clear as a bell. There is no hum or buzz or other indication of the lighting current used to operate the tubes.

When it is remembered that last year dry batteries and storage batteries to the extent of some \$45,000,000.00 were sold in this country alone, one begins to realize the wide-spread scope of the present invention.

Few radio listeners know that behind the scenes in the broadcasting station there is stationed a licensed code operator whose only duty during the period the station is on the air is to listen in for distress signals.

While music and addresses are going out from an adjoining room he sits at a receiving set that is tuned to 600 meters, the wave length of ship and coast stations.

At the first signal of distress he notifies the engineer in charge and the broadcasting stops at once, the air is left free for the unobstructed transmission of S O S signals.

Except with a few sets which can be relied on always to bring in a given wave length at a given dial setting, it is well to avoid the habit of tuning by dial figures. The average set will vary slightly from night to night and from station to station in exact settings. One night we require closer tickler coupling than on other nights, due to atmospheric or static conditions. This usually produces a slight variation in dial settings for tuning. Put on the head phones and tune with the detector alone or detector and one stage, for distance, tuning to the exact peak of the wave. Then turn on the full amplification and the loud speaker.

The authorized capital stock of the Westinghouse Electric and Manufacturing Company was increased from \$125,000,000 par value to \$200,000,000 par value at a meeting of the stockholders held June 11 in the main office of the Company at East Pittsburgh, Pa.

At the conclusion of the meeting, E. M. Herr, President of the company, made the following statement: The condition of business in our industry is quite satisfactory, especially considering the tendency of business in general to slow up at the present time. While our business also is somewhat less than for the corresponding period a year ago, the decrease has not been of sufficient volume to materially affect our operations, and our commercial people believe that it will improve in the fall—to what extent of course depending somewhat upon the result of the political campaign.

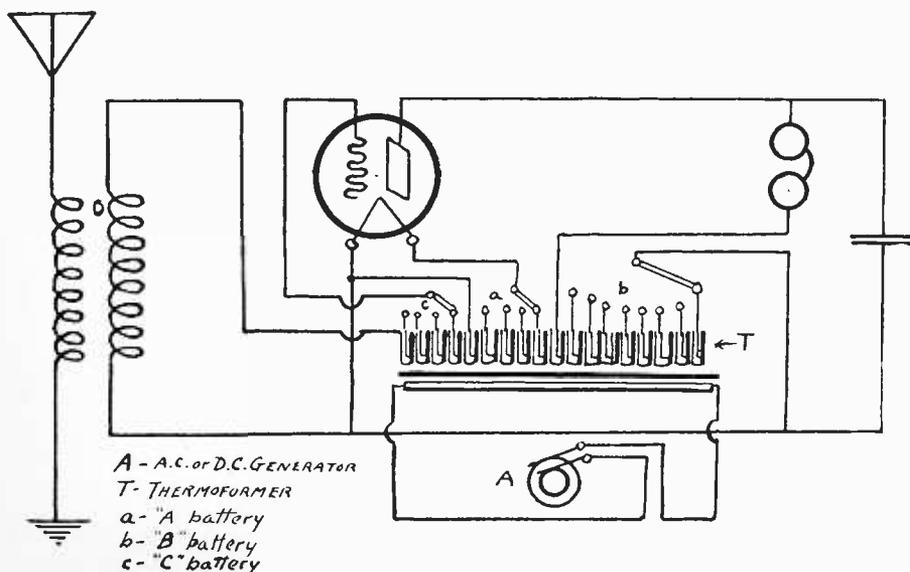


Figure No. 1—Showing Thermoformer connected in elementary circuit.

# Answering W. J. Bryan on Evolution

By DANIEL NELSON CLARK, LL.B.

*This is the first installment of a reply to Mr. William Jennings Bryan's attack on evolution which created such a furor both among scientists and the lay followers of science. Mr. Clark, a member of the Los Angeles bar, author of "The Universal Law of Organic Progress" and other scientific works, will here take up every contention made by Mr. Bryan. Mr. Clark and Radio Journal will welcome comment on this discussion which, while not directly radio in nature, is of such fundamental interest as to be important to every scientifically minded reader.*

IN addresses and articles Mr. William Jennings Bryan has given widespread announcement of his very definite disbelief in evolution, as he conceives it. The following sentences, taken from his most widely quoted address, give, in the main, Mr. Bryan's attitude on evolution:

"Religion has no quarrel with science and cannot have, because real science is 'classified knowledge'. Nothing, therefore, can be scientific that is not true. All truth is of God, whether found in the book of Nature or in the Book of Books; but guesses are not science; hypotheses, such as the hypothesis of evolution, are not truths.

"'Evolution' is the word used by scientists to describe the hypothesis which links all life together and assumes that all species are developed from one or a few germs of life by the operation of resident forces working from within. My purpose here is to show that science, as well as the Bible, condemns evolution. If science is classified knowledge, then we are justified as rejecting as unscientific anything which is not established as true. On this ground evolution should be rejected.

"The whole case in favor of evolution is based on physical resemblances. Those who believe in the evolutionary hypothesis reject the Mosaic account of man's creation by separate act of the Almighty and give him a jungle ancestry, but they offer only circumstantial evidence in support of their speculation.

"The evolutionists have attempted to prove by circumstantial evidence (resemblances) that man is descended from the brute. No one will deny that they have labored industriously. . . . If they find a skull, or even a piece of a skull, they summon the geologists, the biologists, the anthropologists, the paleontologists, the archeologists, the psychologists, and all the other experts whom they regard as authorities and hold a postmortem examination. Sitting as a coroner's jury, they solemnly declare that the Bible account of man's creation is a lie.

"All of these resemblances and all this circumstantial evidence are overthrown by one single, indisputable fact—namely, that *no species has ever*

*been traced to another species . . .* If the hypothesis were true, evidence of its truth could be found on every square foot of the earth's surface. Being untrue, evidence cannot be found anywhere. Evolution still rests upon imagination—upon a presumption—an unproven hypothesis—a mere guess.

"If the evolutionary hypothesis is true *anywhere*, it must be true *everywhere*. It cannot be isolated like a germ and confined to some particular portion of the universe. If it explains the heavenly bodies, the strata of rock, vegetable life, animal life, and man, linking each to every other by indissoluble ties, then surely it must exert a controlling influence over every atom of matter (and over the 1740 electrons which make up the atom) and over every larger unit of matter, wherever it is found and whatever it is doing.

"Chemistry has not discovered any law of evolution. It has registered the various gases and diagrammed the movements of the molecules, but it has discovered no pushing force at work in the original elements of which all things animate and inanimate are composed. Chemistry is an exact science, it mocks the atheist and brings confusion to the evolutionist.

"Let us take, for instance, the best known thing with which man deals—water. It is the daily need of every living thing. Without it there could be neither plant nor animal life. It was, therefore, on the Earth before either plant or animal life appeared. It is the largest single element in man's body. Water is composed of hydrogen and oxygen, H<sub>2</sub>O. Is it conceivable that two such gases as oxygen and hydrogen should just happen? . . . . But even if it were conceivable that chance could bring into existence oxygen and hydrogen, could chance unite them at a certain fixed ratio, so that a drop of water is always and ever the same wherever found, whether in the clouds, in the ocean, or in the veins of Earth? . . . . If the evolutionary hypothesis which assumes constant progress in everything, is true, water must have developed from something. What was water before it became water, and what will it be when it ceases to be water? Or was the law of change suspended when the two gases united in the formation of water?

Everything that man eats, wears or uses will serve as an illustration of exact and *permanent* relationship between various forms of matter. Chemistry has taught us the properties of matter and the way to use them, but they are now stationary.

"The evolutionary hypothesis robs man's conscience of its compelling force. . . . Evolution is the doctrine of the fatalist—the plea of the invertebrate. . . . Evolution excuses the sensualist and encourages the worshipper of the god of ease. The great need of the world today is to get back to God—to a real belief in a living God. Evolutionists either deny the existence of God or put Him so far away that consciousness of His presence in the life is weakened, if not destroyed. When they have eliminated all of the Bible that conflicts with evolution, the Bible is no longer an authority, but merely a "scrap of paper." The world needs the Christ of whom the Bible tells. Evolutionists rob the Saviour of the glory of a virgin birth, of the majesty of His deity, and of the triumph of His resurrection."

\* \* \*

It is true, as Mr. Bryan says, that "religion has no quarrel with science," but in order to be true there must be a true development of religion and science. Indeed, true religion and true science are tantamount to, if they are not one and the same thing, since both converge upon universal truths, whether found in the book of Nature or, as Mr. Bryan expresses it, in the "Book of Books."

Mr. Bryan observes that nothing "can be scientific that is not true," and we must add, for the sake of religion, that nothing can be religious that is not also true. Knowledge and intellectual certainty should have equal place in religion as in science, for it is scripturally said that God is a "God of knowledge". True religion either is, or ought to be, scientific, for it converges, or should converge, towards a systematization or classification of Universal Truth. Hypotheses, creeds and dogmas are as unscientific and as unreligious as theories of evolution when they are not drawn from, or are derived in contradiction to, a classification of Truth. Like theories of evolution, creeds and dogmas are

only true in proportion as they manifest intellectual verity and therefore become a part, or classification, of true knowledge. A religion without knowledge intellectually verified, therefore is and ought to be as worthless, as such, as science without knowledge. And as there must be a science of religion just as surely as there is a science of chemistry, biology or cosmology, it follows that religion should seek a corresponding verity.

While it is true, as Mr. Bryan has expressed it, "guesses are not science," it is equally true that "guesses" are not religion. There is just as much reason in, and there should be just as much intellectual force expended in the acquirement of, true religion as in true science. And while this is true—and and while it is also true, as Mr. Bryan has expressed it, that we are "justified in rejecting as unscientific anything which is not established as true,"—the converse is likewise evident that, upon parallel reasons, we are justified in rejecting, as unreligious, anything which is not correspondingly established upon an intellectual basis.

True religion, like true science, cannot be predicated upon ignorance, superstition, "guesses," "hypotheses," "presumption," dogmata or creeds, any more than something can be produced from nothing or the mathematician can produce 5 by the addition of 2 and 2; and, in any event, a religion so established would be correspondingly as worthless as science so established, for surely nothing commends itself more forcibly to the All-Powerful and All-Wise Intellectual Master of the Universe, scripturally expressed as a "God of Knowledge", than the acquirement and utilization, as well as the generation and diffusion, of intellectual power.

"Hypotheses" cannot be substituted for scientific truths any more than creeds and dogmas or mere beliefs can be substituted for religious truths. No true religionist, any more than a true scientist, can permit his conceptions to be narrowed by predilection contrariwise to established truth. Indeed, all the visible and known universe, from the movements of the stars to those of heat, light, electricity, the electro-magnetic propagations, to those of life, and even to gravitation, are actuated by universal laws of physical, radiant and dynamic forces—laws of Nature, if you will,—fixed and immutable. These laws must be, from a religious as from a scientific view, ubiquitous with all existence. The constant of motion expressed in the governing laws found in the formations of organic matter, scientifically manifested in the laws of chemistry, light, electricity, of the electro-magnetic and of gravitation, and even the laws of life, are as universal as are the mathematical laws established in the fixed relation of diameters to circumfer-

ences, areas and volumes of matter. Upon this mathematical basis it is an established law that while circumferential, or external, dimensions are varied as units of diameter, areas are varied by the square and volume by the cube of these same dimensions, and neither science nor religion can change it.

With Mr. Bryan's statement that the word "evolution is a word used by scientists to describe the *hypothesis which links all life together* and assumes that all species are developed from one or a few germs of life by the operation of resident forces working from within," I find much and serious fault, in this:

(1) "Evolution", as used by the scientists, is employed to express a conception of the orderly and univer-



Miss Grace Ann Yeager, one of the featured artistes of the San Carlos Opera Company, was the lucky winner of the \$250 radio set given by Associated Exhibitors for the best criticism on "The Chechahcos" during its engagement at the Camco Theatre. Miss Yeager resides at 23 West 64th Street, New York City. Honorary mention was given Therese Josephs Vurnham, 343 Beach 142nd St., Neponsit, L. I., and to Arthur Devlin, Plandome, L. I. There were more than 700 criticisms submitted.

sal progressions in all formations of matter, whether elemental, chemical, vegetal, biological or cosmological, even from that primordial substance generated into motion productive of the electrons, up to the atoms and then to the molecules—yes, even to human life itself, as well as to that productive of stellar systems, such as our own solar system;

(2) "Evolution" is not expressed in any "*hypothesis which links all life together*", since it applies to all formative, somatological, evolutionary and interdependent processes found in the electronic, atomic and molecular, up to and including the mineral kingdom, and then to the vegetal and animal kingdoms, even to man, in succession and in relation, with equal force; and

(3) "Evolution" does not imply "*resident forces working from within*", since terrestrial life, like all other organisms, must be, and can only be, sustained by external forces, such as heat, light and electricity, and by the spiral integration and redistribution of substance, and by the concomitant diffusion and transmutation of the contained motions, working from without, just as we find it; and, therefore, life is not and cannot be sustained by "*operation of resident forces working from within*", as Mr. Bryan would have it. In other words, the intellectual force known as life, wherever it is found, is always produced by integration of substance in kind.

The limitations, innovations and conceptions formed by Mr. Bryan around the word "evolution" as above enumerated are obviously impoverished in at least all of these particulars. Moreover, his statements are not confined to that "which links all life together," since his argument is both confused and enlarged, not only by his chemical predetermination of "a case against evolution" but also by such statements as this: "If the evolutionary hypothesis is true anywhere it is true everywhere," thereby implying that scientists would or could maintain otherwise. Then, after going on to say that "even if it were conceivable that *chance* could bring into existence oxygen and hydrogen" he asks, "Could *chance* unite them at a certain fixed ratio so that a drop of water is always and ever the same?" And then, after saying that "chemistry has not discovered any law of evolution" and that it has discovered no "pushing force" at work in "the original elements of which all things animate and inanimate are composed," he asks the infrugiferous questions, "What was water before it became water, and what will it be when it ceases to be water? Or was the *law of change* suspended when the two gases united in the formation of water?"

Possibly Mr. Bryan neglected to ask also what life was before it became life. Life is the integration of intellectual power from the eternal sources, and, therefore, if Mr. Bryan should ask from whence came life we can answer, at least scientifically, that it, like the "original elements" of which he speaks, has a common cosmological source.

Water, like life, is developed in an ordinary universal progress or evolution "everywhere" and "anywhere" throughout cosmos where the environments of, and the endowments in, matter, involve or produce that necessity just as surely as both water and life are developed from "the original elements of which all things. . . are composed", as Mr. Bryan stated it. And has not Mr. Bryan answered his own questions concerning water by his

(Continued on Page 296)

# The Five Gallon Can

By J. T. ROFFY

*Measure your ground by the gallon. Sounds like advice to bootleggers, but not so. Mr. Roffy has apparently discovered something worth while about the aerial system which will repay investigation. Anyhow, some day we may all be measuring our ground in quarts and pints.*

SOME fifty or sixty years ago there was an ambitious young man who had at that time probably the greatest foresight of the age. He conceived the necessity of an adequate carrier of liquids for the Mongolian race. In China water is carried in five gallon cans hung on yokes over the backs of coolies and in the Tibetan plateau and the rigorous climates of the Himalaya, Korea and Siberia the five gallon can is the accepted fire place. Now this genius of yore must have perceived the universal use of the five gallon can and distributed it over the entire face of the earth. He created a use for hydrocarbons and their incidental by-products such as kerosene, gasoline and lubricating oils and by this means the five gallon can became the legal tender for the lesser nations and tribes where in some cases wives, donkeys and beads may be readily purchased with five gallon cans.

The foresight of this genius is further extended into the present day. A silly writer of our time conceived the idea that a cold water pipe is a good ground connection and promptly some three million experimenters hooked long range sets that may have cost hundreds of dollars onto pipes that were sometimes hot, steam radiators, insulated gas conduits or high resistance electrical conduits. The result naturally was lack of long distance, continuous static noises and an otherwise general tendency for the set to drive its owner either broke or insane. However, all this is easily remedied by that wonderful instrument the five gallon can. The location of two or more of these highly scientific pieces of apparatus "the five gallon can" to the best advantage is as follows: Dig several holes about three feet deep and about the same number of feet apart; solder a number 14 bare copper wire to the cans and bury as many as you have available. Connect all the leads together from these cans, solder a lead that will be brought into the house onto the ground post of your set.

Now here is a curious phenomenon. We have been told that the height and length of an aerial is measured in capacity that has a natural or fundamental wave length to which it will best respond. The writer finds that

apparently the more five gallon cans used in the ground the greater aerial can be carried for the same sharpness of tuning. It is apparent that with a given sharpness and longer aerial there will be greater energy in the entire system. By this reasoning the writer propounds that this is a subject matter of invention, and if so my fellow inventor sixty years ago could not have fully anticipated the fine details of this particular use of the five gallon can. Thus while modestly not claiming to be the inventor of the five gallon can the writer claims to be a co-inventor by developing a new, useful and meritorious use for same. Thus terming the invention as the "Roffy John D. Ground." Realizing that it would be difficult to collect royalties from all users of this magnificent ground the writer asks not as a penalty for the use but simply as an aid to other experimenters that users must pass the good word along.

## Fire Prevention

With the approach of summer and its attendant electrical storms, fire prevention committees of local chambers of commerce may desire to call public attention to the fire hazards of radio receiving sets. During this season of the year the possibility of lightning striking radio antennae usually receives some consideration, but it is a known fact that many receiving sets are not safeguarded against destruction in this manner. An aerial may be safeguarded by a protective device known as a lightning arrester which is installed in the lead-in wire as near as practicable to the point where the wire enters the building. This protector should not be placed in the immediate vicinity of easily ignitable material or where exposed to flammable gases or combustible dust and flyings.

The most important precaution a radio operator should take is to keep the antenna clear of all electric light and power wires. A number of cases have been known where aerials have fallen across or come into contact with trolleys or high voltage cables resulting in loss of life. The National Electric code requires that antennae and counterpoise outside buildings shall be kept well away from all electric light and power wires of any circuit of more than six hundred volts, and from rail-

way trolley or feeder wires, so as to avoid possibility of contact under accidental conditions. Antennae should be installed in such manner that there will be no swaying during stormy or windy periods.

Aerial wires are often supported from chimneys or masts which are tied to chimneys. The application of this additional stress and leverage has resulted in many cases in the cracking of the brick work. This is a serious condition because of the fire hazard involved in cracked chimneys. Where such conditions exist they should be remedied at once. If an iron mast is used to support antenna it should be grounded as a precautionary measure against lightning. An effective ground may be obtained by running a copper wire in as straight a line as possible to water piping or metal buried several feet underground.

The current from a six volt storage battery is sufficient to cause fire if the terminals or the wires leading from them become crossed. Care should be taken to avoid this. All wiring should be installed in an improved manner. Lead-in wires and other inside wiring should not be permitted to come in contact with light and power wires.

The net income available for dividends of the Westinghouse Electric and Manufacturing Company for the year ending March 31, 1924, was \$16,125,303 as shown by the company's annual report which has just been made public. This represents earnings of \$8.98 per share, or practically 18 per cent on amount of stock outstanding during the year.

Gross earnings amounted to \$154,412,918, which exceed those of any previous year in the history of the company, except the year ending March 31, 1919. Value of unfilled orders at the close of the fiscal year was \$63,738,702, which compares with last year's figures of \$61,914,237.

Total current assets, including inventories of \$80,000,000, were \$153,209,401, equal to more than six times the total current liabilities which were \$25,730,413.

New stock to the value of \$17,955,000 was offered for subscription by the stockholders payable on April 16, and a stock dividend of 10 per cent or \$10,773,000, was declared payable to stockholders of record May 2, 1924.

## City Furnishes Giant Receiver

**A**UTOMOBILE tourists who visit the camping ground at Schenectady, N. Y., this summer will be furnished radio entertainment by the municipality. A giant, hornless loud speaker that emits signals equally from both sides has been installed near the camp ground, and listeners within 500 feet of the apparatus may enjoy music and speech of great volume and free from distortion. It is known as an induction loud speaker, and was developed in the Research Laboratory of the General Electric Company.

The induction loud speaker is quite different in every respect from the household variety of loud speaker using a horn. Dr. C. W. Hewlett, physicist, is the inventor of the device, which until its installation in the Schenectady park, has had only limited use in public.

The speech amplifier has been made in many different sizes, but the type used to entertain tourists and residents of Schenectady, measures forty-two inches in diameter. The working diameter of the diaphragm is thirty-six inches. The device consists essentially of two large flat coils of wire mounted close to one another in a frame which holds a thin aluminum diaphragm between the coils. These coils carry direct current which produces a radial field in the space occupied by the diaphragm and these same coils carry the amplified voice currents and induce in the diaphragm corresponding currents which, by their interaction with the radial magnetic field, cause the diaphragm to vibrate and give off sound waves.

Briefly the features of the new amplifier are:

It has no iron in it and does not depend on permanent magnets.

No horn is necessary as is the case with the ordinary loud speaker.

Sound is thrown out equally from both sides.

The diaphragm is acted on at all points of its surface so that it vibrates as a whole rather than being allowed to break up in partial vibrations.

The large size of the diaphragm enables it to emit efficiently the low components of the tones in speech and music. This results in much more natural reproduction than can be obtained from ordinary types of loud speakers. This is particularly noticeable in the reproduction of piano music.

The induction loud speaker is very substantial in construction. It is practically impossible to damage it or get it out of order.

When occasion calls for it, a speaker may deliver large volumes of sound, as when addressing a large audience.

The amplifier on Schenectady's camping ground is erected in a small building which may be thrown open on both sides. In a neighboring building is a motor generator set which supplies three kilowatts of direct current power to polarize the loud speaker. The amplifier for supplying the voice current is divided into two parts, a voltage amplifier and a power amplifier. The voltage amplifier consists of two stages of 201-A Pliotrons and one 210 Pliotron coupled in cascade by resistance and capacity. The power amplifier consists of a one kilowatt low impedance Pliotron. The plate current for all these tubes is supplied by a 2000 volt, full-wave kenetron rectifier which is operated from the alternating current lighting mains. Filament current for the tubes is furnished by transformers.

practice and the complex changes undergone by electrical impulses in a radio circuit.

"Radio this summer, has taken the American boy off the street-corner and placed him in his home-made laboratory. Instead of lurid novels, he now reads the radio sections of the newspapers. Incidentally, in scanning the news columns for radio news he is absorbing a large amount of cultural information on other subjects. Previously, he devoured only the comic sections and left the rest of the newspaper practically untouched.

"Radio is teaching the boy a greater appreciation of music than he could possibly have attained from painful 'music lessons' or lectures on the subject. It has given him a more graphic knowledge of current events. Radio Sunday sermons bring the teachings of religion home to him.

"Every well organized Boy Scout troop in the country has now its own radio signalling outfit, and the interests and activities of this important movement everywhere are being linked in an effective whole through the agency of the new art of communication. Through radio hundreds of thousands of potential defenders of the nation are being trained.

"From an educational standpoint it is clear that nothing could have served so to quicken the boy's interest in physical and mechanical studies as has radio. His absorbing interest in the subject has taught him the faculty of concentration in his other studies.

"But the gain is not all one-sided. The youth of the nation perhaps have done as much for radio as the art has done for them. For the fact remains that it was the boy who first 'sold' the idea of radio to the entire family. It is the boy who keeps the older folks informed of developments in the radio art; it is the boy who determines very largely the type and character of radio equipment which the family shall buy; and it is the boy, who this summer is making radio a year-round necessity rather than a seasonal luxury."

## Boy Big Radio Factor

**T**HE American boy, with his wonderful adaptation to electrical and mechanical development, continues to be a factor both in the progress of the radio art and in the summer-time demand for radio apparatus, according to reports received by the radio section of the Associated Manufacturers of Electrical Supplies. He is supplementing his winter book-studies with practical work at home, in camp or at the seashore.

Pierre Boucheron, chairman of a committee now compiling statistics on the subject, declares the outstanding fact already developed is that no other scientific achievement in recent history

has so captured the imagination of millions of American boys as radio has done. "In this case, at least," Mr. Boucheron adds, "it stands thoroughly proved that the American boy is father to the radio man."

Radio has created a new type of electrical experiment with the result, as Mr. Boucheron points out, that many of the noteworthy developments in the art have been brought about by comparatively young men.

Boys of today are astonishing their elders with glib references to such recondite subjects as electrons, ether-waves and radio frequency amplification," Mr. Boucheron continues.

"These boys understand well the fundamentals of electrical theory and

The Roller-Smith Company, at 233 Broadway, New York, have placed an extensive line of small portable and large standard radio voltmeters and ammeters on the market and are announcing extensive distribution. The instruments are sturdily built, enclosed in brown bakelite casing, and make a handsome as well as very necessary addition to radio equipment.

It is highly important that a broadcasting station announcer choose his words carefully. Letters are occasionally received from foreign-born people who explain that they are listening to radio announcements for the purpose of perfecting themselves in English.

# With the Western Amateurs

A Department Conducted by A. L. Munzig

## Bar All But CW

Southern California Radio Association, at its June 16 meeting, passed a resolution to remain off the air with everything but pure C. W. sets between the hours of 6:45 p. m. and 11 p. m. daily. The action is in line with the policy of the association to cooperate in every possible way with broadcast listeners in the effort to avoid interfering with the enjoyment of others. The action meets with the hearty sanction of Major J. F. Dillon, supervisor of radio for the Sixth District. Some opposition on the part of phone and spark sets is developing but the association, with the cooperation of Major Dillon expects to see that the resolution is generally followed.

## Maxim Honored

Hiram Percy Maxim, the inventor, upon whom a honorary degree of Doctor of Science was conferred by Colgate University at its 106th commencement, has been president of the American Radio Relay League from its beginning. In fact, it was Mr. Maxim who first conceived the idea of organizing a non-commercial association of radio amateurs and, from that time to this, he has championed the cause of the transmitting amateurs of the country.

This new honor comes at a time when Mr. Maxim's work in behalf of amateur radio is beginning to secure recognition from radio experimenters in all parts of the world. In recent years transoceanic tests of the A.R.R.L. with amateurs in Europe, Australia, New Zealand and South America have brought the amateurs of this country into world-wide prominence, which gave rise to Mr. Maxim's election as president of the temporary committee of organization of the International Amateur Radio Union.

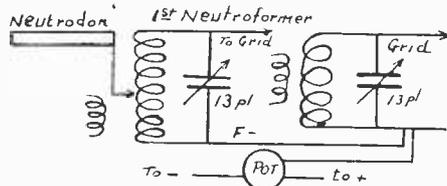
The latter committee is designed to knit together the radio societies of the world in much the same manner that the American Radio Relay League has done with those in the United States and Canada. In view of the rapidly increasing interest in amateur radio in foreign countries, the proposed international association may be destined to wield a powerful influence in world radio affairs.

It is predicted that the international union of amateurs will bring to the experimenters of foreign nations many of the privileges enjoyed by telegraph operators in North America as well as recognition of their value in times of emergency. The amateurs of the United States have frequently been of inestimable assistance in areas affected by storms and other disasters. Their merits have been recognized by the railroads and the government.

## Heterodyne Wavemeter

An intensely interesting lecture was given before the Radio Society of Highgate, London, England, by Mr. G. A. V. Sowter, B. So., his subject being "A Practical Heterodyne Wavemeter." First of all he explained the theory of heterodyne reception and showed how an ordinary single-valve receiver with reaction is, in reality, a small transmitter of oscillations. Such a circuit could be used as a wavemeter but owing to the large number of variable controls it is not very convenient for this purpose. The

anode and grid coils could be fixed in position but by so doing the range over which the set will oscillate is limited. A much more suitable circuit to use is one known as the Hastings oscillator, and Mr. Sowter explained the construction of a wavemeter using this circuit. An unusual feature of the instrument described and exhibited is that it will oscillate without any high tension voltage being used, although for practical purposes an H. T. battery of about 24 volts gives best results with normal valves. A simple method of calibrating the instrument was next described, the harmonics of the broadcasting stations being used. The range of Mr. Sowter's instrument is from 80 to 500 meters, thus covering all the



Mr. L. M. Church of Washington submits drawing of improvement in the Neutrodyne.

amateur and broadcasting transmissions. The uses of such an instrument were dealt with, and how it can be employed as a transmitter explained, as well as its use for measuring inductance and capacity values.

At the following meeting of the society the secretary announced the completion of arrangements for the annual concert. Mr. Yates of the General Electric company gave a lecture on "The Manufacture of Geco Products", with special reference to wireless apparatus. He described circuits used in standard crystal sets and the well-known two valve set. The latter will not work loud speaker and is not intended to but owing to its amplification has a long range. By using a power amplifier loud speaker results are good. He closed with advice on valve selection and a forecast of some new valves to be placed on the market.

## South American Test

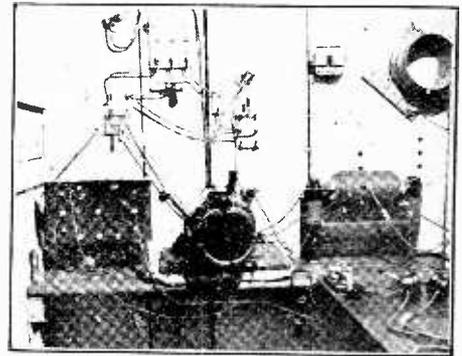
The first two-way amateur radio communication between North and South America was accomplished by Norman R. Weible, youthful amateur of Collingswood, N. J., with a low power transmitter using a Hartley circuit and two five watt tube. An examination of his equipment reveals no unusual features and indicates that equally good results could be obtained by hundreds of other code operators who have stations similar to his. The plate input of Weible's station, 3BWJ, was only 70 watts and the antenna current about 1.7 amperes. The aerial itself is a two wire inverted L type 50 feet long and only 30 feet high, while the counterpoise has been cut down to about the same dimensions. The receiving set is a standard honeycomb coil set with the low loss coils mounted on honeycomb plugs. "There may be a large loss in the mounting," says Weible, "but the set works in spite of it."

South American CB8 evidently has some station. On 121 meters he worked Australian 2AC, American 3BWJ, and was also heard in England.

## Gets WNP

6EB nearly worked WNP on April 2, 1924, and it might have added another achievement to radio history. 6EB happened to be calling 9DTE at 6:30 P. M. P. S. T. and immediately after, WNP gave 6EB a long call, according to information received from Canadian 3DF of Ontario. A report was received from Canadian 3GG of Timmins, Ont., also. He is the most northerly amateur below WNP. It was daylight at both ends when WNP heard 6EB. It was a chance of working 5000 miles in daylight, easy working, too! That is, two years from now. Anyway on April 15 was also some half way luck. It being a very excellent night right after 6EB let 6EA bring over his 5 watter and gave it a chance to look at the 250 watter, where 6EA worked several "ones", 6EB heard WNP swinging bad at 4:00 A. M., P| S. T. He was using 500 cv. and sending fast. The former opened up the muffler on the high voltage and called WNP until the tube said, "Have mercy on me," but "ND." The 5 watter must have taken all the "pep" out of the "peanut" tube.

Another night while 6EB was using the big watter, a bee was buzzing around in the shack. It is best to not argue with a bee or you will get stung. So it was left alone until it finally landed on the tube while the plate was nice and hot and then there was a cremation. Too bad it did not land on the sing rectifier and get a round



Left to right: high voltage transformer, 1000-3000 volts, synchronous rectifier and filament transformer at 6EB.

trip to "dit-dah-dit-dit" for the same price. Hi!

This is what you call efficiency when 6EB lights up the front porch lights while they are turned out, and sparks jumping all over the receiver. A new transformer is being bought with only about 6800 volts. Brute force makes things kinda light up or fade out in the golden west, for sure.

## Improve Neutrodyne

"The neutrodyne circuit is being improved here in the East," writes L. M. Church, ordinance office, War Department, Washington, D. C., "by placing a potentiometer between the 1st neutroformer and 2nd neutroformer as outlined in the drawing."

5AQW, ex-5ANC, is on again 5 watts rectified A. C. The station is operated by W. Easley, 223 South Third Street, Enid, Oklahoma, who writes "cards will be answered."

## Special Signals

The Bureau of Standards is transmitting special signals of standard frequency on announced dates. The last previously announced schedule was published in the May, 1924, issue of the Radio Service Bulletin. The next schedule is announced below. Signals can be heard and utilized in general east of the Mississippi River. These special signals of standard frequency are of use to testing laboratories, transmitting station operators, and others in standardizing wavemeters and adjusting transmitting and receiving apparatus. The transmissions on July 7 include the frequencies used by amateurs, those on August 5 ship and point-to-point communication, those on September 5 ship communication, those on September 22 broadcasting. The accuracy of these signals is better than three-tenths of one per cent. All transmissions are by unmodulated continuous-wave telegraphy. A complete frequency transmission includes a "general call", a "standard frequency signal", and "announcements". The "general call" is given at the beginning of the eight-minute period and continues for about two minutes. This includes a statement of the frequency. The "standard frequency signal" is a series of very long dashes with the call letters WWV intervening. This signal continues for about four minutes. The "announcements" are on the same frequency as the "standard frequency signal" just transmitted, and contain a statement of the measured frequency. There is then a four-minute interval while the transmitting set is adjusted for the next frequency.

## Reinartz Honored

In a short acceptance speech after receiving the Radio Cup, an annual award of the Executive Radio Council, Second District, given to the radio amateur whose experimental work during the year most befits him for the honor, John L. Reinartz, recognized radio engineer and amateur radio experimenter at a monster convention of radio amateurs from the metropolitan area of New York declared that he had turned over to the Navy Department his entire development on a radio transmitter functioning on 10 meters. He further declared that his system could be adapted to any amateur station operating today, within less than ten minutes. Previously, radio communication on 100 meters was considered epoch-marking. At this high frequency special insulation is necessary.

President W. J. Howell of the Executive Radio Council presented Reinartz with the cup before several hundred cheering amateurs gathering at the Convention Hall of Seaman's Church Institute, 25 South St., Saturday, June 7. Reinartz was selected for the award for his shortwave transmission and reception experiments.

Preceding the award, Boyd Phelps, Wm. Diehl, J. Clark, P. Willis delivered technical papers. Another similar get-together will be held in about three months.

## 6EB Layout

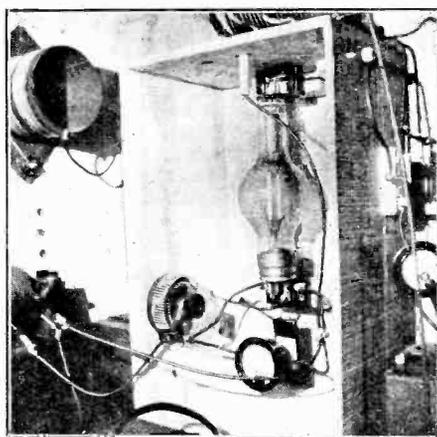
Editor Radio Journal:—

I am enclosing a couple of late photos of the "peanut" tube and cw. apparatus at 6EB. I just received a card from Z-1AX of New Zealand hearing 6EB on April 21, 1924, at 2:30 a. m. P. S. T., calling 410. This checked with in five minutes by my log and "Ingersoll Yankee" watch, so I guess he heard me O. K. Hi! Am giving the tube a rest thru the summer. Too much "qrr" to do any "dx".—L. F. SEEFRED, 6EB, Los Angeles.

9ADS, operated by Abe Benesovitz, 415 McKinley street, North Hibbing, Minn., is a new one. He will reply to cards.

## Southland Meet

The 101st meeting of the Southern California Radio Association was called to order by second vice-president, Mr. Blodgett, and as the secretary was absent the minutes of the previous meeting were not read. The new members were first introduced, seven new fellows having joined. Mr. Hardy, chairman of the meetings committee, gave



Here's 6EB's tube in a cracker box. This tube is in retirement for the summer.

his report. Mr. Hardy was given a vote of thanks because of his hard work in securing new members.

The report of the technical committee was given by Mr. Nikirk, 6KA. He reported that the aerial for the broadcasting station was complete except for a few minor details. The set for the station is now being constructed and will be completed in the course of about three weeks. In the meantime the set now owned by 6CFY, Mr. Palethorpe, will be installed at the Armory for experimental purposes.

Mr. Blodgett read several communications from Col. Dillon concerning the broadcasting station. The colonel stated that the department of commerce would in all probability grant a broadcast license to us and that the QRH of the station would probably be 224 meters.

The speaker of the evening, Mr. A. P. Hill of the telephone Co., was introduced and he gave a very interesting talk on installing broadcast stations with remote control studios. Mr. Hill explained the difficulties that had to be overcome with remote control transmission and how these difficulties could be overcome by counter capacities, inductances and shielding.

Several arguments arose as to the advantages of D. C. over A. C. for plate supply and the comparative results of loose and tight coupling. D. C. and loose coupling won.

## Twin City Club

The Twin City Radio Club of Minneapolis has shut down for the summer,—yet activities still continue in a large measure. New American Radio Relay League ORS's are being appointed every day or so, and all those who wish to secure this new type or official Relay Station certificate can secure the application from the city manager of the assistant division manager. At present the executive personnel of the Dakota Division is as follows:

Minnesota: M. G. Goldberg, ADM, 711

Dayton Ave., St. Paul, Minn., 9ZG-9APW; District No. 1: James Hayes, DS, 1014 11th Ave. E., Duluth, 9GW; Alfred L. Bergtold, CM (Duluth), 2107 E. 4th St., Duluth, 9DOE; Albin Lofback, CM (Virginia), Box 957, Virginia, 9DXT; District No. 2: Norvell A. Canfield, DS, Luverne, 9DYR; Edw. J. Caveny, CM (Luverne), 9DYR; District No. 3: L. C. Smeby, DS, 1504 W. Broadway, Minneapolis, 9AUL; Win C. Hilgedick, CM (St. Paul), 2191 Knapp St., St. Paul, 9GZ; L. K. Smith, CM (Minneapolis), 1619 16th Ave. N., Minneapolis, 9BLY.

North Dakota: Bert Wick, ADM, 1025 3rd St. E., Devile Lake, 9AEJ; District No. 1: John A. Gargrave, CM (Aneta), Aneta, 9DLF.

South Dakota: Orville Wheelon, ADM, 800 East Cañon, Pierre, 9AVZ; District No. 1: Adolph L. Sals, DS, Salem, 9BOF; William W. Eymer, CM (Yankton), 811 Douglas Ave., Yankton, 9CXV; H. B. Manning, CM (Sioux Falls), 114 S. Euclid, Sioux Falls, 9DKQ; District No. 2: Leland Thompson, DS, Winner, 9BRI; Ted F. Anderson, CM (Aberdeen), 404 S. 8th St., Aberdeen, 9DUI; Merle F. Buck, CM (Huron), 677 Lawn Ridge Ave., Huron, 9CCA.

It is interesting to note that experimental radio continues on throughout the summer in much the same fashion as it does in the winter time. Static and so-called weaker signals seem to have no terrors for the experimental amateur, and practically as good work is done from this territory even now in the months of June and July as was done in the heart of winter. It is not infrequent for Twin City stations to communicate with four or five west coast stations in a single night.

## Holland Hams

The decision that it is not a serious offense against law and order for an experimental radio amateur of Holland to communicate with amateurs in this country has done much to vindicate the standing of amateurs in the Netherlands, according to a report received by the American Radio Relay League. Soon after a prominent French telegraph amateur was decorated with a gold medal for the skill with which he communicated across the Atlantic Ocean on short wavelengths, amateurs in Holland were regarded as something equivalent to the boll weevil. The authorities were inclined to classify them as a menace to their community.

The science of private radio communication among the youths of the country had kept abreast of progress much better than the laws, with the inevitable result that H. J. Jesse, Jr., prominent radio experimenter at Leiden, was made the defendant that the courts might decide whether it was lawful for a citizen to transmit.

It was charged that Jesse's telegraph and telephone station was not intended for public communication and that messages had been exchanged "without authority having been obtained from the minister of Waterstaat." He had in fact taken part in trans-Atlantic radio tests and communicated with amateurs in the United States as far west as Nebraska.

The attorney for the defense pointed out that regular telegraphic communication in competition with commercial traffic was not intended and that the case was in the class with work concerning laboratories. The clerk of the open ministry congratulated the defendant for having communicated with a station in America. It was shown the defendant had not transgressed and the case was dismissed.

# Questions and Answers

Q.—Is the improved Cockaday four-circuit hookup reliable? Or is it difficult to operate? I have attempted to construct such a set using their blue-prints and the specified parts, but consider my efforts so far a failure. Local stations come in fine, but KFKX is the only station out of the state that I can tune in and even that is not very good. I have been unable to get in touch with anybody who has ever constructed one that would operate as claimed. Do you know of anyone? Would you advise me to continue on this circuit or change over to the Munzig circuit or the super-heterodyne described by Mr. Munzig in the March issue. I have quite a bit of apparatus in this set but could use most of it in another hookup and would be willing to invest a few more dollars if I could be sure of getting a set that would bring in the Eastern stations in good shape. What set will it be—considering volume, distance, selectivity and quality? Would not resistance coupled amplification for loud speaker be an improvement in either hookup, say about three stages?—W. J. SCHOEPFLE, Huntington Beach, Calif.

A.—The Cockaday four circuit receiver is just one way of obtaining regeneration. Personally the circuit did not appeal to me. However, it has its merits no doubt and because I do not recommend it is no reason why others should do the same. Those that I have known to give it a trial do not seem to get results even to compare with a good regenerative receiver. We recommend the Munzig circuit as superior to the one you now have. If you want distance, selectivity, volume—then watch for the coming constructional articles to be given in detail in subsequent issues of Radio Journal. Some radical changes in super-heterodyne methods will be given.

Q.—I again find it necessary to bother you for advice in regard to our radio set. I wrote you some time ago in regard to one of my problems and your advice has served me very well.

The boys of this camp were given an old Radiola IV to use. I fixed the set up but we did not get any results to speak of, due principally to our location in the mountains. Not being able to purchase parts for the set, we were compelled to ask for donations from the different firms of the state. Spiro & Company of San Francisco donated a radio frequency amplifier, the Model AA-1520, manufactured by the Radio Corporation of America. We secured tubes and loudspeaker and I set the set up.

The new amplifier decreased our wavelength belt to almost half. With the three tubes in the Radiola we were able to get in stations with wavelengths above 500; with the amplifier we can not get above 455. KFI, KLX, KGW stations that we were able to get before cannot be reached now. The amplifier increases our volume in bringing in the stations that we are able to receive, but restricts us to a small belt of wavelengths.

What I desire your assistance in is how to change the set so as to get the former range with the increased volume. I am using C-299 tubes throughout. I have made every possible change that is within my experience and have not solved the problem. I will be very grateful for your advice in

this matter and the boys of the camp will extend their appreciation for helping them enjoy their favorite programs.

Can you give me the hookup of the Radiola IV? I have asked the Radio Corporation for one but they never answered my letter. I tried to trace out the circuits but the wiring is so cramped up I cannot get to it without unsoldering some of the joints. I note that with the amplifier it is impossible to use the jack that is for wavelengths from 200 to 350, that is you can only bring in two stations with it and they do not come in as loud as they do with the 350 to 600 jack. I am not familiar with this particular set and for that reason I would appreciate any dope that you may be able to give me that would help put the set on a basis that will give the boys the maximum service possible. I am inclosing a stamped envelope and also a hookup diagram of the amplifier.

Now I will give you a little dope that may assist you. I am using a one hundred and twenty five foot antenna, located up on the side of the mountain. The plate voltage is 90, detector 45. I have a very good ground, the connection being soldered direct to a waterpipe which is connected with the river.—DAVID H. RICHARDSON, Bricenburg, Calif.

A.—You are more or less handicapped with your RF amplifier because of the inability of such type of RF amplification to cover a wide waveband efficiency. I may be able to solve your trouble.

On your amplifier marked "input" it is necessary to place a coil across this say of about 70 turns on 3 inch diameter tube with two or three taps taken at intervals. The filament end to go to ground connection and the grid end to go thru 23-plate variable condenser to antenna. If you have no coil connected as I have just outlined, it will be necessary for you to put one in.

If your waterpipe runs a considerable ways before entering the river suggest that you add on an additional ground by driving a length of pipe in moist earth and making good connection to same. Don't disconnect the waterpipe but add the extra on. This may help you some for if the pipe runs too far a length from your set it will have a preponderance of resistance and thus cut your efficiency down a very great deal. Connections of the Radiola IV are very simple. It is nothing but a single circuit arranged so that variable inductance is used to tune both regeneration and wavelength. Enclosed find a diagram of same.

Q.—Can you tell me where I can get a diagram of a three tube Harkness set, using three variable condensers, three Harkness coils and two audio transformers? Shouldn't such a set be fairly good for distance work? If you can furnish me with such a diagram, let me know cost of same, so I can get one.—DEWEY S. KROHN, Los Angeles, Calif.

A.—Such a circuit as you wish is not practical. Reflexing more than one stage cannot be done very successfully by the average layman. It takes careful shielding and proper spacing of respective transformers to make this circuit do its stuff. I do not advise its use. Watch the pages of Radio Journal and a circuit will appear

showing the use of three so-called Harkness Coils but only reflexing one tube.

Q.—I am interested in the so-called Munzig Circuit. Could this circuit be used with three tubes? And if so would it be worth while using a C-229 tubes?—WALTER HENNES, Spreckles, Calif.

A.—The addition of another tube is given in the March issue of Radio Journal. This is very simple to do. In place of the headphones the primary winding of the second amplifying transformer is substituted and connected in the regular way. Small tubes can be used and very excellent results obtained. However, you cannot expect to get out of these small tubes what you can out of the larger ones.

Q.—I have constructed several circuits, following Mr. Munzig's diagrams and descriptions and have had very satisfactory results. Recently I was transferred to this camp and have been called upon to help solve some of the troubles being encountered here in the mountains. I have used up my resources and have decided to call upon you.

The main trouble is inability to bring in any distance. The man in question who has experienced the greatest trouble has been using a Radiola IV. A three tube set using the 199 tubes. He was able to bring in local stations and Los Angeles but could not get anything from the Eastern stations. He then bought a one-sixty four tube Neutrodyne on the recommendation of a dealer and has not been able to get any greater results than with his old receiver. He was using a fifty foot antenna, about seventy feet from the floor of the canyon. I tried every means known to myself to get distance. I changed the detector tube and put a longer antenna, bringing it down from the top of the mountain and giving it an Eastern direction. The results were the same. All local stations came in fine, but with little volume. There are several receivers here in the same location and they have been experiencing the same trouble.

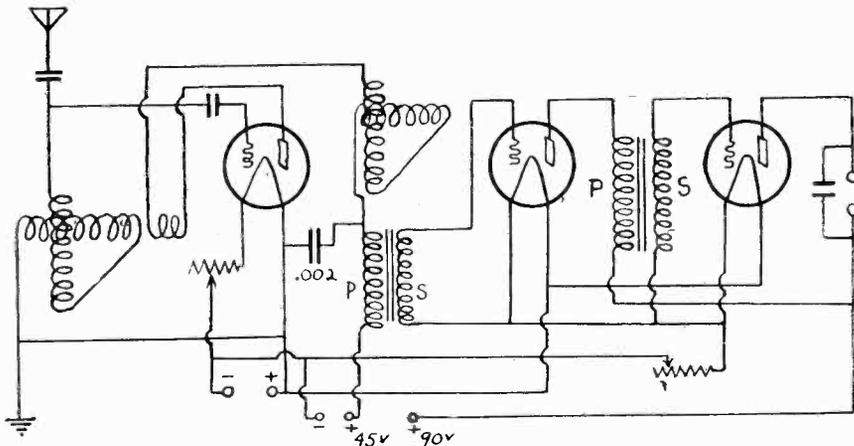
I have constructed five Super-Heterodynes in the past two months and have had exceptional gratifying results in bringing in the distance. This man is willing to go to any expense to get distance, but he wants the distance. I have recommended a super, but would like to have your views on the subject. We are located in the heart of the mountains in Merced canyon. Would a super, say an eight tube set using two detectors, oscillator, three tuned radio frequency, two audio, do the business? I have had several years experience in the radio field, but it has never reached the mountain regions. You can perhaps make a suggestion to me that may save considerable time and money in needless experimentation.

A Radio Corporation of America super heterodyne has been ordered by one of the men. It employs six 199 tubes. Will this super bring in the distance that one employing the 301 a tubes and C-300 detector? I am asking this question to satisfy the desire of one or two men here. I prefer to present your opinion to them rather than my own. I have tried to explain that the standard tubes are the best for distance, but there is a difference of opinion which we want you to settle for us.

Will your new Reflexed RF and regeneration combined circuit bring in the distance in this region? And will you please give me a rough drawing of the set using the three tubes. I have misplaced my February copy of the Radio Journal, but I believe that you only showed a diagram of the two tubes. I want to construct one of the three tube sets for one of the men if you think that it will be suitable for this section of the country.

Would an outside loop improve the reception qualities in a super here? I wish to thank you in advance for your favor and to thank you for the many splendid articles that you have presented from time to time in the Radio Journal. I would not be without the Radio Journal and consider it one of the best mediums for results in the radio field.—DAVID H. RICHARDSON, Camp E, Briceburg, Calif.

A.—Am in receipt of your very interesting letter. It is quite evident to me that your location is a very poor one. However, these obstacles nowadays can be overcome by super-sensitive receivers. A super-heterodyne receiver is your only alternative for DX reception since this method is the most sensitive method known to date.



This hookup for David H. Richardson.

A super-heterodyne receiver such as you suggest will certainly do the business. However, if you are looking for the most sensitive super-heterodyne receiver ever devised, tubes being no object, I unhesitatingly recommend the new model super that I have been working on, viz: A 10 tube affair that employs a stage of tuned RF amplification before the 1st detector, 3 stages of intermediate frequency amplification and 2 audio. If you are interested in building this model I will give you further details if you request.

A receiver using 199 tubes will not equal either in sensitivity or volume that of a set using "A" tubes.

I am confident that the Munzig Circuit will outperform any three tube set that has been used in your location. Redlands is in a poor location but we manage to bring in DX stations very consistently. Not long ago we had WOR on the loudspeaker with this set, something that hasn't been duplicated by any set around here except the super.

Because of your poor location it would be to an advantage if an outside aerial was used—even if only a small one, say 30 or 60 feet long.

Q.—I just bought a copy of Radio Journal, the May issue, last evening and read your article on page 24 reconstructing data on the neutrodyne circuit. I wish you would advise me as to idea of winding both primary and secondary on the same coils, one over the other, and what effect this will have not now obtained in the regular neutroformers furnished with the Fada Kit, these coils being wound on two separate tubes. You also provide for a tap to which to connect the grid lead from the secondary,

but do not say at which turn to provide for this tap. There being fifty five turns of wire on the secondary, presume this grid tap would be provided at about 45 turns, but kindly advise me definitely about this.

You wrote me about construction of a neutrodon on April 14, and I couldn't quite catch the idea you had in the operation of this, but from the lay-out as given in the article in the May issue I can fully understand it.

Have just finished winding a set of Spider-Web coils as outlined by Byrt Caldwell of Boston, Mass., in which article he claims the neutralizers can be dispensed with. Have not, however, had a chance to couple them up and give them a trial so I don't know whether they will work or not.

The neutralizing of the neutrodyne set is the bug-bear of the whole thing, and it seems to be the one thing that causes all the trouble. I have not been able to get my set as it should be and others here in the city are experiencing the same difficulty. If some arrangement could be devised whereby this neutralization principle could be eliminated it would sure be a boon to the home assembler of this circuit. I am quite convinced that as far as my set is concerned,

I should rewire it, which will about require its being torn down. I knew nothing about radio when this set was assembled, and don't know much about it now, but it seems that the one point that is universally recognized is that all grid and plate leads should be as short as possible, and in my set this has not been provided for, some of these leads being more than a foot long. When rearranging the parts they could be cut down to a few inches. Do you think a couple of copper plates inserted between the three neutroformers and grounded would be worth the trouble? Would this shielding prevent the interaction of the magnetic field force. I feel my set can be made to work eventually but am more or less at the mercy of those who know radio and gladly welcome any suggestions that may be made.—L. H. AMIDON, Fargo, N. D.

A.—By winding the secondary directly over the primary of the neutroformer it is possible to get greater coupling and at the same time eliminate a dielectric material from the electromagnetic field of both windings. This is desirable because a dielectric material increases the radio-frequency resistance because of its capacity effect.

By all means decrease the length of leads in your present set.

Two copper shields as you suggest would be advisable.

Here's one thing to keep in mind: A tuned RF receiver such as a neutrodyne or any other RF receiver using two stages of amplification is not any more sensitive than a good regenerative receiver. If the voltage applied to the RF amplifying tubes is increased so that regeneration takes place, such a receiver will then become a little

more sensitive than a good regenerative receiver.

Q.—Am thinking of building the three tube set described in the March issue, the Munzig circuit. Can you give me specifications on inductances, etc.—E. V. DAVIS, Long Beach, Calif.

A.—The inductances shown as L1 and L2 are constructed as follows: L1 eight turns No. 24 DCC wire wound over L2, which consists of 55 turns of same size wire wound on a bakelite tube 3 inches in diameter. In the photograph the Ray-Dee-Arterait tuned RF reflex transformer is shown which is used in place of the above inductances. If this transformer is preferred the primary winding is connected in place of L1 and the secondary winding in place of L2. This combination is harmonious both in appearance and in performance.

Q.—I recently followed your hookup in January issue of Radio Journal, page 20. One tube and two variometers with very good results. Get all the local stations with very little or no interference and under favorable conditions bring in Oakland and Frisco just as clear as the local stations. This hookup with some amplification added would greatly improve same, as many people want loud speaker. If you will kindly furnish me with hookup and additional amplification will make additions at once and report.—HENRY T. LAFRENZ, Los Angeles, Calif.

A.—Audio amplification can be added in the usual way to this circuit by connecting in place of the headphones the primary of the first stage of amplification. The audio amplifier given in the circuit shown on page 136 of March issue of Radio Journal should be followed. You will have to use your own judgment in regard to panel layout. I can't help you much that way for other details must be taken into consideration.

Q.—Have been a reader of Radio Journal since your October-November 1923 issue, that being the first copy I secured.

Have studied the many splendid articles, questions and answers appearing in each issue, but as I have not found exactly what I wished, I shall trouble you, although, from what I understand, by your later issues, the August publication, contained the information I wished, but as I stated before I did not secure this issue. I have at present a five tube neutrodyne, hooked up by the Fada hookup, using 199 tubes. What I want is a diagram that you would recommend for the UV-199 C-299 tube, having a battery switch, rheostats, so I can plug in on detector, or one step or two step of audio amplification. What is the purpose of a potentiometer. Would it help? Also show method of connecting "C" battery if in your opinion it would increase efficiency of set. Could I use a soft detector such as UV-220, as a detector, and use UV-199 tubes for the two stages of radio frequency, and two stages of audio frequency amplification, by connecting the rheostats in the negative lead of the respective batteries (6-vt. and 4½V) and connecting all the positive leads of the tubes and batteries to the ground. In the same way could a WD-12, 1½ volt tube be used instead of the 6 volt soft tube, and would it be as efficient, accordingly?

The Fada diagram I used calls for a soft tube as detector, and I do not wish to use more filament or battery consumption than necessary, is the reason I am using 199 tubes, but as it is not very efficient would like to try the above, if you so advise. Or is the "A" tube satisfactory (I mean UV-201 A) as a detector, as it is more economical to use, but would really like the UV-199 if I could get results accordingly.—J. T. HANSEN, Willis, Kansas.

A.—The Neutrodyne circuit for use with UV-199 or C-299 tubes is identical to the storage battery tubes with the exception that

(Continued on Page 297)

# Trade Talk

from  
Radio Dealers & Manufacturers

### New Roffy Plant

The Stamm-Lawson Radio Manufacturing Co., of Upland, California, have taken charge of the manufacturing and distribution of the Roffy transformer and Roffy master circuit, as well as other Roffy products to be brought out from time to time. Mr. Roffy launched the Hetro-Trans many months ago, at which time it was called a "fresh" circuit. Since then the distribution of this circuit and the special transformer has assumed national proportions. It was the first of the "special transformer" circuits which are now countless, but since its inception a score of changes have been made in the set. Mr. Roffy continues in charge of the research end of the new manufacturing and sales plan.

### Yale Crystal

The Yale reflex semi-fixed crystal detector, distributed by the Yale Radio Electric Co., of Los Angeles, is



gaining national distribution. The demand for a crystal of this type, according to Mr. Yale, is increasing with the increased popularity of sets using the crystal as rectifier. The crystal can readily be readjusted if necessary, has a gold non-oxidizing contact, is compact and can be conveniently mounted in any set. The crystal itself is replaceable. The Yale company has produced this detector and special crystals for it after con-

siderable research to determine a crystal sensitive enough to pass distance.

### New Log Book

Radio Broadcast Listeners Book of Information and Log Record, just off the E. I. Company press, the Conrad Company selling agents, is a very complete compendium of information which every broadcast listener wants, together with detailed list of broadcast stations, time, wave-lengths, etc., arranged both alphabetically and by states. A log of broadcast stations and log chart is included with full explanation as to its use.

### Llewellyn Radio

Llewellyn Radio is the name of a new establishment opened by C. Llewellyn, formerly proprietor of the Llewellyn Electric Appliance Shop of Los Angeles. The new establishment is  
*(Continued on Page 294)*



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# Late Inductance Tuned Circuit Explained

By H. M. TAYLOR

*Someone remarked in our presence the other day that the variometer and variocoupler were "dead". Anyone who opines that anything is dead may see ghosts. We didn't tell him he had the heebie-jeebies but here is a set which uses 'em (variometers not heebie-jeebies) effectively.*

**D**URING the last few months, the inductance tuned circuit has received widespread attention from radio enthusiasts. Just what is this inductance tuning? Fundamentally it means tuning by inductance, or variometers, instead of variable condensers. Inductance tuning gives best results because the voltage built up to affect the vacuum tube is a greater value.

The vacuum tube which detects the

the louder are the signals.

Accordingly, it is plain to see that in order to obtain the loudest signals, it is necessary to impress the highest possible voltage between the grid and the filament of the vacuum tube, thus causing the greatest change in the plate circuit.

### Inductance vs. Capacity

How can the highest voltage be produced? By using a predominance of inductance in the tuning circuits, rath-

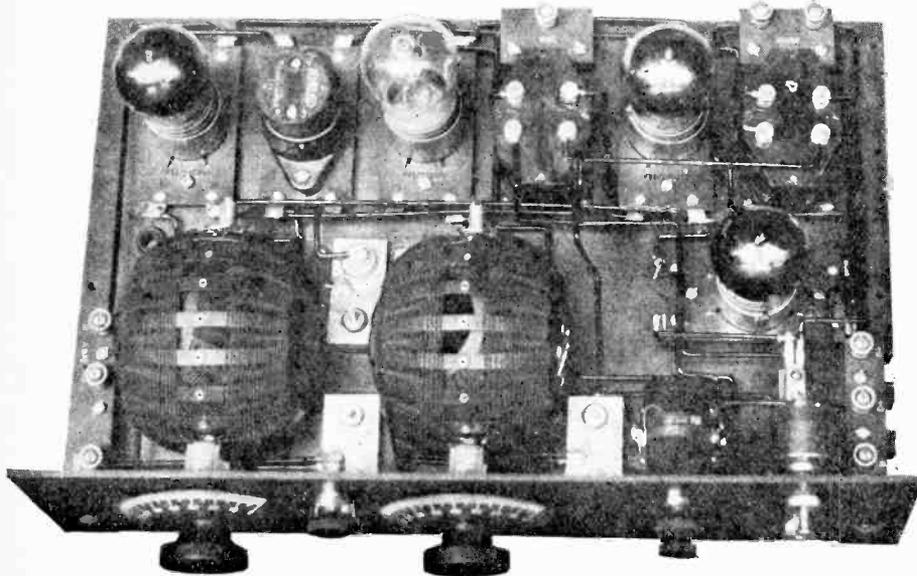
er than capacity. It is a law of electric circuits that the greater the inductance in proportion to the capacity, the greater is the voltage set up.

However, most of the popular radio frequency hookups are capacity tuned. They are easier to balance. On the other hand, building a successful inductance tuned receiver requires careful balancing of each part, but once accomplished gives a receiver inherently better because it is in keeping with the law of electric circuits. The American Radio and Research Corporation has developed an inductance tuned circuit which is entirely practical. It is known as the *Amrad* circuit.

First of all it has simplicity of operation—at most, only two dial controls. The dials can be calibrated for wavelengths, and if properly adjusted, both will read nearly alike. For instance, on a set of this kind, a given station may come in at "30" on the single dial tuning, and on two dial tuning, both dials may read, say "48". This enables you to log the stations you want—to quickly turn to them any time.

### Selective Features

In the inductance tuned circuit, there is unusual selectivity because of the extremely low capacity with respect to the inductance—the decrement is lower. This makes it possible to eliminate interference between stations, and with careful operation, good tubes and batteries, exceptional volume and clarity of tone are obtained. This com-



Backyard view of the two-variometer set which gets things.

music or broadcasting is a voltage operated device. It is only the voltage (the force which pushes the juice through the electric circuit) of the energy picked up by the antenna which affects the vacuum tube detector. It is the voltage impressed between the grid and the filament of a tube which changes the flow of current through the telephones, "B" batteries, and plate and filament circuit of the tube. It is this change in current through the telephone which vibrates the diaphragm of the receiver, and so produces the sound which is heard. It is not just the amount of current through the telephone which counts for strength of signals, but of more importance, the percentage change or fluctuation in the current flowing through the telephone receivers. The greater this variation in current the more the diaphragm is warbled up and down. Naturally the greater the vibration of the diaphragm,

er than capacity. It is a law of elec-

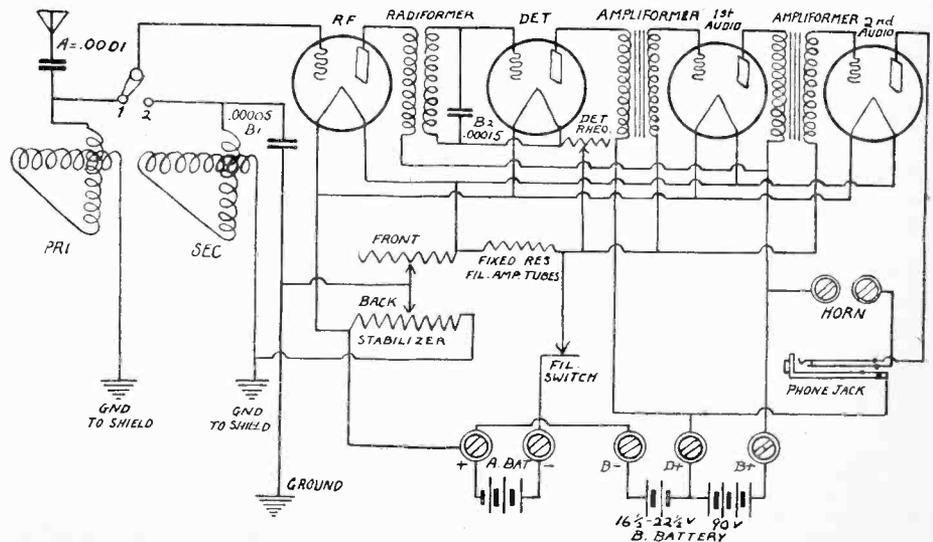


Diagram of inductance tuned radio-frequency receiver. A—adjustable mica condenser to be adjusted on installation; B—adjustable mica condenser, soldered; D voltage on phone jack; B voltage on horn. Use horn for greater volume.

bination of fundamentals is exceptional, for often to get volume you must force the tubes until the broadcasting is distorted.

A study of the wiring diagram reveals a hookup which is different in two or three essential respects from any that have been published heretofore. This will be apparent at once to the experienced experimenter, but to those building their first set, the following details are of information.

This inductance tuned circuit uses four tubes, one radio frequency amplifier, one detector and two audio frequency amplifiers. Aside from the detector tube control which is not very critical, there is only one other element which enters into the tuning control. This is the stabilizer which controls the radio frequency tube.

#### Uses Special Variometers

Standard parts may be used throughout, except the variometers must have their distributed capacity reduced to a very low minimum. This, in fact, is the heart of the set, and if you have too much capacity between turns you will lose all the value of general engineering principle of inductance tuning.

The basketball type of variometer is ideal for this circuit, as the winding is woven first up, then down, on the forms of both the stator and rotor—a construction which permits a maximum induction at a minimum of distributive capacity.

In using inductance tuned receivers employing the Amrad circuit, care must be taken to eliminate all "stray capacities" which come from poorly soldered connections or careless placing of various parts in their relation one to another. The aerial must not be too long—about 75 ft., including the lead-in, and it must hang clear of all obstructions, such as trees, tin roofs, water spouts, etc. A good ground is very essential. The radio frequency tube must be carefully selected. Silver-coated tubes such as the UV 201-A are satisfactory as audio amplifiers, but a purplish-yellow coated 201-A must be used as the radio frequency amplifier. Any C-301-A tube is satisfactory as an amplifier. The detector tube must have the right plate voltage, between  $16\frac{1}{2}$  to  $22\frac{1}{2}$ .

If you carefully follow out the hookup pictured here, you will not have any trouble with whistling and other noises common in the other average home-built sets.

Referring to the diagram, you will notice a small switch between the two variometers. When this switch is on point "1", you are using one basketball tuning element; on point "2" both basketball variometers are cut into the circuit. The former is single circuit, the latter double circuit for extreme selectivity.

The writer has been able to cut out immediately nearby local stations and

bring in distance with this tuning. The use of one dial cuts down selectivity somewhat, but increases sensitivity.

Representatives of nine dry battery manufacturers, four electric companies, two telephone companies, a railroad, the American Railway association and nine government departments met recently at the bureau of standards in a preliminary conference on dry cell standardization.

Standard performance tests for radio filament and plate batteries were adopted at the conference and the standardization of "B" battery sizes—at least a standardization of the unit cells—was proposed. A special subcommittee will shortly be appointed by Dr. G. W. Vinal of the bureau of standards to make recommendations as to the "B" battery specifications.

Regular broadcasting has been started by Shun Pao at Shanghai, the first Chinese newspaper to take up wireless. Programs are sent four times daily and comprise lectures in Chinese and music.



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## Removing The Wail

(Continued from Page 277)

type of radio receiver, as well as those having one or more stages of radio frequency amplification, causes no disturbance of this kind.

In conclusion let me say that it is possible, with the cooperation of all radio listeners, to clear the air of "birdies", or the "wail of lost souls", as they so aptly have been called, if each and every one of us will take precaution to see that our detector tubes are not oscillating. To do so demands that we all to the best of our ability observe the golden rule.

If the method of operating a set is still not clear, the local radio dealer or distributor, I feel sure, will give any information desired on this subject.

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## Trade Talks

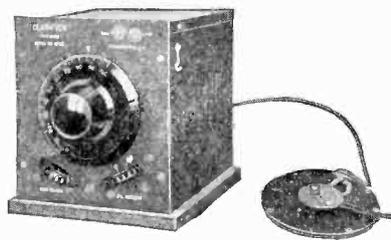
(Continued from Page 291)

located at room 300, Connell Building, 743 Santee street, with the entrance at Eighth and Santee. "I believe," said Mr. Llewellyn, "that a man should concentrate upon one thing, so I decided to quit trying to divide my time between the electrical business and radio." He has installed a complete radio laboratory and workshop, with complete files for several years back of all radio publications. Any set builder is welcome to use this laboratory and its equipment in the building of sets, without cost. Likewise Mr. Llewellyn will furnish information for set builders. He is going to specialize in the construction of specially designed sets. He recently equipped the steamships Yale and Harvard with elaborate radio receiving sets.

In addition to his manufacturing activities, Mr. Llewellyn has installed a day and night radio service station. When the broadcast listener's concert gives out suddenly and he wants help Mr. Llewellyn will be ready to get it to him in a hurry, even to the extent of loaning the listener-in a new set while the old one is being put back in shape. Batteries, tubes, etc., will be part of the day and night equipment.

### New Clarifier

The Clarifier is the name of a new bit of radio equipment just placed on the market by A. H. Grebe and Company, in an endeavor to solve the interference and static problem. It is designed to prevent radiation from any regenerative receiver, to give a

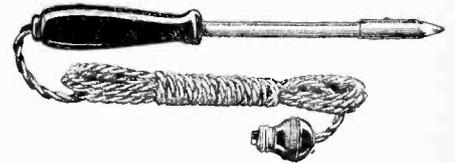


gain in signal intensity, present no additional tuning difficulties, add considerably to the selectivity of the set, to increase the quality of the received signals, and to extend the distance range. The new Clarifier works with present type tubes, is adaptable to all types of receivers without wiring changes, covers the entire range of broadcast wavelengths without taps on inductance coil, works with both long and short aeriels, and setting for any wavelength does not change from day to day. The Clarifier consists of a tuning coil, amplifier tube, stabilizing condenser, tuning condenser and output coil. The output coil is connected by a flexible cord so that it may be placed in inductive relation with the

grid coil or variometer of the receiver proper by laying it on top of the cabinet. The coupling is not critical and need not be varied while tuning. In conjunction with a single circuit set in which the antenna is part of the grid oscillatory circuit it is necessary to short circuit the antenna and ground posts on the receiver and connect the antenna to the Clarifier.

### Security Iron

The Security Electric Manufacturing Company of Chicago, Illinois, an-



nounces a new electric soldering iron under the trade name "Security". This iron is specially designed for radio work, compact in construction, a three-eighths inch rod, five inches long, with a removable copper tip two inches long. The heating element is of nichrome wire, located at the tip.

### Battery Stations

The constant voltage delivered by storage batteries is becoming more and more to be desired and utilized by broadcasting stations throughout the country. The first experimental work in this direction was done by station WCAK, Alfred P. Daniel of Houston, Texas. In this pioneering work, Willard batteries were used throughout.

One and a half years ago Station WHK, the Warren R. Cox Radiovox Company, of Cleveland, Ohio, equipped their broadcasting stations with a bank of Willard batteries. This station was soon followed by Station WDAI, the Dayton Company, of Minneapolis.

By September, 1923, the big one thousand Watt Station, WTAM, Willard Storage Battery Company, was completed and it was equipped with storage batteries to the entire exclusion of a motor generator set. This equipment proved so satisfactory that since that time twenty-three other broadcasting stations, from WNAC in Massachusetts to CFDC in British Columbia, have equipped their stations with Willard batteries. Of the twenty-five stations using batteries in the United States, twenty-four are Willard equipped. The commutator hum of the motor generator set is eliminated, and "listeners-in" from Alaska to Cuba have expressed their appreciation by letter, telephone and telegram.

The following broadcasting stations are using Willard Radio "B" batteries for plate supply: KFOP, Wilson Construction Co., Dallas, Tex.; WB-AH, Dayton Co., Minneapolis, Minn.; WBBG, Irving Vermilya, Mattapoi-

sett, Mass.; WCAK, Alfred P. Daniel, Houston, Tex.; WDAU, A. H. Smith, New Bedford, Mass.; WEAR News Pub. Co., Baltimore, Md.; WE-AU, Davidson Bros. Co., Sioux City, Ia.; WGAZ, South Bend Tribune, South Bend, Ind.; WIIK, Warren R. Cox, Radiovox Co., Cleveland, Ohio; WJAX, Union Trust Co., Cleveland, Ohio; WSAI, U. S. Playing Card Co., Cincinnati, Ohio; WSAR, Doty & Welch Electric Co., Fall River, Mass.; WRAY, Radio Sales Corp., Scranton, Pa.; WTAM, Willard Storage Battery Co., Cleveland, Ohio; WTAR, Reliance Elec. Co., Norfolk, Va.; WLW, Crossley Mfg. Co., Cincinnati, Ohio; WNAC, Shepard Stores, Boston, Mass.; WDAR, Lit Bros., Philadelphia, Pa.

### New Battery

A radio "B" battery with many new features has just been announced by The Prest-O-Lite Co., Inc., from their factory at Speedway, Indianapolis, Indiana. It will be known as the Prest-O-Lite Super-Service Radio "B" Battery and will be supplied in 24 and 48 volt sizes in 4500 and 2500 M. A. H. capacities for each. It is designed not only to produce dependable continuous service but to harmonize in appearance with the finest furniture and radio sets. It is generously proportioned and ruggedly built to insure trouble-free operation and uniform voltage without the disturbances causing reception faults frequently attributed to other sources. The cells are kept correctly spaced and are protected from breakage by spacing panels at both top and bottom.

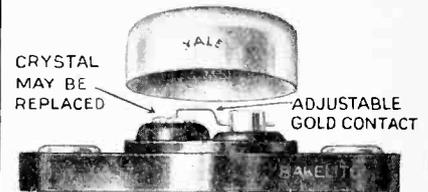
A family in Hellgate Storehouse, N. H., are admittedly indebted to WBZ for the invaluable service it is rendering them. First of all, they are grateful for the evening entertainments and solace which the station affords them through its programs, and secondly, they use the radio for a news service, relying on it for fresh topics. They are 12 miles back in the New Hampshire woods and 50 miles from a railroad. "Our papers are usually a week old when we get them," they write.

Although not actually granted, the Government has finally definitely promised a broadcasting license to the Associated Scientific and Technical Societies, Johannesburg, for a broadcasting station to be installed in that city, Consul G. K. Donald reports. The reason for the delay has been an objection lodged by the Johannesburg municipality on the ground that the city was the proper authority to exercise broadcasting rights. This objection has now been overruled. When the license is issued, it will only be a matter of a few days before broadcast-

ing is commenced. It is announced that the new station will be installed on the top of the Stuttaford Building with a broadcasting studio located on the third floor in the same premises. The wave length has not yet been definitely settled upon but it will be between 350 and 450 meters. A 500 W. transmitting set will be used. The Associated Societies' license gives them an area for the collection of fees from listeners extending 100 miles in all directions from Johannesburg and it is expected that the station will be supported by the fees paid in by persons owning receiving sets.

According to the Star, a daily newspaper of Johannesburg, Transvaal, Africa, under date of March 14, N. Grant Dalton, a radio amateur of that place, picked up radio broadcasting from Europe and America on the same evening. This linking of three continents was secured when Mr. Dalton, using a three tube set picked up 2LO of London and WGY of Schenectady, N. Y.

## Best for Reflex Yale Crystal Rectifier



Extremely Sensitive  
More Volume  
Good for Distance  
Tested and Guaranteed

At All Dealers.....\$1.25

JOBBERS AND DEALERS WRITE

Exclusive Distributors

### Yale Radio Electric Co.

4816-18 South Vermont Ave.  
Los Angeles, Calif.

## Radio Service Station

### Day and Night

Call TUCKER 4884 or after 6 P. M. 593-814 if your set fails you at any time, day or night, and help will be immediately forthcoming. If desired, a service set will be loaned you while repairs are being made. Tubes and batteries, in fact everything necessary to service your set, will be available for your requirements. Remember the numbers:

### TUCKER 4884 and 593-814

SET BUILDERS: You are welcome to the use of our work bench and equipment and any assistance you desire. Our equipment covers the expert manufacture of any set to your order.

### LLEWELLYN RADIO

(Formerly at 613 So. Spring St.)

713 Santee Street  
Entrance 8th & Santee Sts.

Room 300 Connell Bldg.  
Los Angeles, Calif.

To Be SURE—Patronize Radio Journal Advertisers.

## Need Help on Your Set?

We Can Give You a Lift in Planning and Building Your Set

We carry everything. Complete lines of Gilfillan Bros., Kilbourne & Clark, Ajax and many other standard makes of parts and accessories. We can give you the straight dope on what and how to build. Call, phone or write.

Or we will sell you a Kennedy

### PREST & DEAN RADIO ELECTRIC CO.

742 E. Fourth Street

Long Beach, California

### 378 DX STATIONS

DX fans. If you have not logged 300 stations in past six months you need a Kennedy Three Circuit Tuner. The Kennedy Tuner logged 378 stations from September 15th to March 15th, including 2LO, London; 5WA, Cardiff, Wales; CFCN, Calgary, Alberta, Canada; KGW, Portland, Oregon; KFI and KHJ, Los Angeles, California; KPO, San Francisco, California; KGO and KLX, Oakland, California.

**Kennedy Tuner Takes the Place of**  
 3 Honeycomb Coils at \$1.40..... \$ 4.20  
 1 Honeycomb Coil Mounting..... 5.00  
 1 23-Plate Vernier Condenser..... 5.00

**INCLUDING GLOBE TROTTER DIAGRAM \$5.00**

Send for Free Diagram

**T. J. KENNEDY**

Radio Globe Trotter

1360 University Ave., New York, N. Y.

**GUARANTEE:** If not satisfied after 30 days will cheerfully return your money.

### 10 INITIALED BINDING POSTS \$1

Beauties—Sent anywhere by mail on receipt of price. Fine panel design and 100 Station Log Free. Panels drilled. *Wood for beautiful cabinets* cut to size, with instructions for assembling and finishing like rosewood or mahogany. Will secure anything you want in the Radio Line and ship by parcel post, C.O.D. Send us your orders. Satisfaction guaranteed.

**MAITLAND AND SPENCER ROACH**  
 2905 Columbia Avenue. Philadelphia, Pa.

## Radio School

COMPLETE course in construction and diagram building, trouble shooting. No books. Actual building, 7 to 9 p. m. except Saturdays. Class starts Monday night. Big demand for mechanics. Big money. Open to all.

## LESTER'S RADIO SHOP

140 S. Spring Street  
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*Boys interested in  
 Earning money  
 representing Radio  
 Journal should write  
 Circulation Department,*

*Radio Journal,  
 113 Stimson Bldg.,  
 Los Angeles, Calif.*

## Reply To Bryan

(Continued from Page 284)

own statement that it is composed of the "original elements"? May we ask how came these "original elements" in the form of water if they did not integrate by some definite, formative and established law between organic matter and its motions? Does Mr. Bryan contend that as "original elements" hydrogen and oxygen have a "permanent relationship" as water? Surely not, yet his argument so implies, since he asks and wonders if "the law of aion of water. Yet Mr. Bryan neglected to tell us what he means by, it true "anywhere" and "everywhere"? or what is, this "law of change" of which he speaks. Was, or is, this "law of change" a universal one? And is it true "anywhere" and "everywhere"? If hydrogen and oxygen stand in "permanent relationship" in water, how could they be changed, and how could life be built up from it? This "law of change" must, indeed, be a remarkable one, at least to Mr. Bryan, when it can destroy, according to his conclusion, a "permanent relationship between various forms of matter", and induce this matter, in the form of water, to become an antecedent of life itself. In his opinion it must be even more remarkable when it is now "stationary", as he says.

But Mr. Bryan goes on and seems to limit life in general to some "permanent relationship" with this water, in which conclusion he is, at least from a religious, if not from a scientific aspect, wrong, since life in its highest, noblest, broadest, most enduring and most inspiring aspect is as ubiquitous with the entire universe as it is with the Master, permeating, as it must control, in the form of intellectual force, the entire range of all cosmological existence, inanimate as well as animate, 'anywhere' and 'everywhere' and even to the development of true religious sensibilities as well as to the highest scientific intelligence, just as surely as light, heat, electricity and gravitation permeate and control the universe, as we find it. Moreover, life and even water must abide with, or return to, the cosmological source force, the entire range of all cosmological existence, inanimate as well as from which it came just as surely as it can be truly said that "dust thou art and unto dust shalt thou return." Does Mr. Bryan deny this? Does Mr. Bryan deny that all is governed by a fixed and immutable law between organic matter and its motions? Yet his argument would indicate that he does deny it in order to differentiate between those intellectual processes so inherently necessary to the development of both true religion and true science.

(To Be Continued)

A new portable radio receiver is on the market under the trade name Kodol, manufactured by the Kodol Manufacturing Co., of Cleveland, Ohio. It is a one-tube highly selective set fitted in a camera case, weighing only 4¾ pounds. Its range is claimed to be many hundred miles without aerial and a thousand miles or more with aerial. Plans call for big production.

RADIO !

Onward ever onward in your flight—  
 Spreading JOY through the night,  
 Casting seeds of thought, in fertile soil,  
 Soothing troubled souls with music-oil.

RADIO !

Magic wand that you are,  
 Flinging happiness near and far,  
 With your song and verse so clear—  
 You are a messenger, of good cheer.

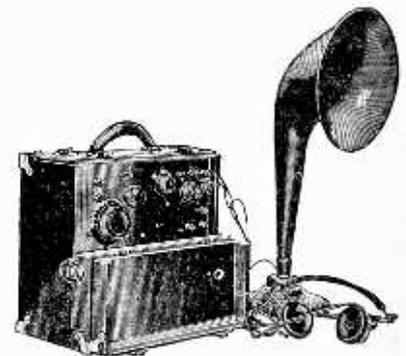
RADIO !

May your power be ever FREE!  
 From the STING of the money-bee,  
 Yea Ho! Yea Ho! Yea Ho!  
 Hail to the KING RADIO.

Leon A. Morgan.

In a letter ordering Radio Journal for the Milwaukee Radio Amateurs Club, George T. Mueller writes: "We decided to report on your magazine as we consider it one of the best of the few amateur radio magazines in the country."

Take your  
 Entertainment  
 with you



Crosley Portable Set  
 \$27.50

Complete with Loud Speaker \$60.00

Mail your orders with enclosed Money Order.

Also Full Line of Parts

Hollywood's Radio Studio

709 N. Western Ave., Hollywood, Cal.

Open Evenings

Phone HEMstead 0195

**Questions and Answers**

(Continued from Page 290)

the grid return of the detector tube is connected to the positive side of filament instead of negative.

I will not take the time to draw diagram such as you wish for it is a standard type in use all the time. However, in a few issues to come data on jacks and their proper connections will be taken up. A thirty ohm rheostat will be necessary for use with 199 tubes when a 4 volt source of filament supply is used. Use one rheostat for first two RF tubes, one for detector and one for two audio. If you wish, the detector tube can be included on the first rheostat with RF tubes. Then if you wish to use only the detector jack the audio tubes can be shut off by the rheostat in that end of circuit.

A filament switch is always connected in the negative lead of the "A" battery. A potentiometer is of no value in this circuit since the circuit has no tendency to oscillate when proper neutralization takes place.

A soft detector tube could be used as the detector but it will necessitate special rheostats for the 199 tubes to run off the 6 volt storage battery. A "C" battery will help the volume of your set if properly connected. It is connected in the last stage of audio between the negative filament return and the transformer. The negative pole of battery is connected towards grid.

Use 199's throughout your set and you will get excellent results. Otherwise use "A" tubes throughout.

Q.—I have been playing with Mr. Munzig's neutrodyne hookup since your first article on it and have had a lot of fun and some very good results with it. I say playing because I am one of those unfortunate bugs who can never let well enough alone. But at that I guess if you had not been of the same disposition we would not now have the new "super" to start playing with. Of course there is a great difference in our playing. You have produced something new and useful while I have only been able to find some more questions to ask you. So here they come.

To begin with I am using Cunningham 301 A's, with Workrite coils. The first thing I ran into was a seeming impossibility to get the circuit neutralized. I tried several different condensers with about the same results. The reproduction was good. I got a wonderful tone but not the distance I had hoped for. Not long ago I was in the mountains near Arrowhead and the set refused to perk. I got to fooling, took off the neutralizers and suffering cats how they came rolling in. Last Saturday night I had 12 different stations from Canada to Texas, including WOR on their test. Need I add that the whole family became ranting raving distance bugs? The only disadvantage of this arrangement is that a station will come in two or three places on the condensers. I guess you know the questions that go with this one. Why, and what should I do? Another, why should the set function just as well without a grid condenser as with it? Without the neutralizers the grid leak has no apparent effect while the filament control is very sensitive. I get better results with about half the current on the RF tubes and barely enough to light the detector. Before I made the change I used the current at full power at all times. This gives plenty power. On our "One Wonderful Night" KFI, KHJ, KPO, KGW, KZL and other stations within a similar distance filled the house with the magnavox on one stage of audio.

I am afraid I will be taking up too much of your time if I go into too many of my problems so now for a few questions about your new super. Will I need a new set of coils or can the Workrite coils be used? Does the set have the oscillator and primary coils built together? Can the set be used with a loop? Do you recommend reflexing

or would better results be obtained otherwise? I would appreciate it if you would give me any dope you might have in addition to your article in the Radio Journal as I want to start in on one of these sets as soon as I get a little time.—DON SHORT, Los Angeles, Calif.

A.—You are evidently having the same trouble as numerous others are having, viz: inability to neutralize capacity coupling. Complete neutralization can be had by properly spacing all transformers and having them at a proper angle. Your transformers may be crowded too close and the angle if each may be wrong. Each transformer should be set at approximately an angle of 57 degrees. The neutralizing capacities should have enough capacity to give variation over any method of mounting. That is

to say, if the transformers are spaced very far more capacity will be needed in order to reach neutralization point.

The Workrite coils or any other type of tuned RF transformer cannot be used with the super-heterodyne! It is absolutely necessary to use special transformers. These transformers do not have the oscillator coils with them. They are the tuned RF transformers only.

Single taps of the variocoupler are not necessary in a circuit using a variable condenser in series with the aerial and ground. In fact, five taps, one taken at every 10 or 15 turns, are sufficient.

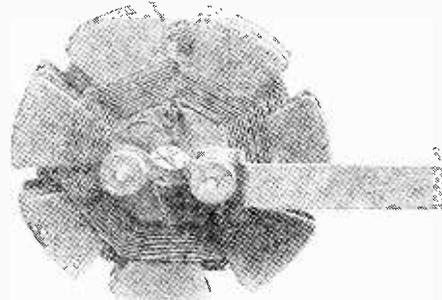
**RADIO EXCHANGE**

Bring in your parts and change for parts you now need.

Realizing the need of the Radio public when constructing a new circuit, we offer to you this service—a centrally located Radio firm with a complete stock, offered to you at wholesale prices, practical advice and a work bench ready for you at all times, with our parts exchange department always ready to assist you. Doesn't that put the pep in Radio?

A Proven Service our modern factory has done for the Radio Public.

**DISTANCE — VOLUME — SELECTIVITY**



**Phipps  
Super  
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\$1.00  
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**PHIPPS SUPER COILS for 3 tube Harkness..... \$1.50**

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**QUALATONE RADIO RECEIVER**

**COMPLETE WITH LOUD-SPEAKER, READY TO INSTALL**

**TWO TUBE  
REFLEX**



**LIST PRICE  
\$100.00**

**WALTER W. BIDDICK, Inc.**

1316 South Grand Ave.,  
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116 East Fifth St.,  
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**MOISE REFLEX UNITS \$2.50**

*For Harkness Circuit*

**Guaranteed Improvement.**

If after a trial you are not satisfied your money will be returned.

**Glendale Radio Service**

211 E. Broadway

Mercantile Place  
Phone Glendale 3417

Glendale, California

## To Build Charger

(Continued from Page 268)

the other end is moved over to the next coil of fifty turns, which should give increased voltage, which is noted by the increased brilliancy of the electric light bulb. In case the light shows much less brilliancy than on the first coil alone the two outside ends of the second coil should be reversed, and the increased voltage can then be obtained. The same thing applies to the 175 turn coil, and the brilliancy of the light should rise the same as in testing the other two coils.

A variation of switch lever gives different voltages to the rectifier tube and likewise to the "A" battery. The same applies to "B" batteries when they are being charged from center and lower post on right. If desired an ammeter reading from 0-1 ampere may be hooked in series with the battery so the rate of charge on the "B"

may be ascertained.

I want to thank Mr. N. E. Brown, a well known electrical engineer, for his assistance with valuable data on rectifiers and this one in particular.

## Mind Energy

(Continued from Page 276)

Because this unity of mind energy is a primitive unity we must not in our pride of intellect despise it. In reality it is by an intelligent though indirect control of our subconscious mind that we can come into touch with the Infinite. There is a beyond which is within.

All men of genius, such as great musicians, artists, poets, inventors, prophets, and preachers draw largely for their inspiration upon their subconscious mind, but they do so spontaneously, and it is this spontaneity which is the mark of their genius. Their intellect functions readily thru

their spiritual intuitions.

The time is rapidly coming when through a better knowledge of the laws of radio-mind we can compensate for our lack of genius by drawing scientifically, if not spontaneously, upon our subconscious mind which is in the circuit of the Universal Mind because of the indivisibility of the mind energy which pervades the universe.

## Mid Summer Radio

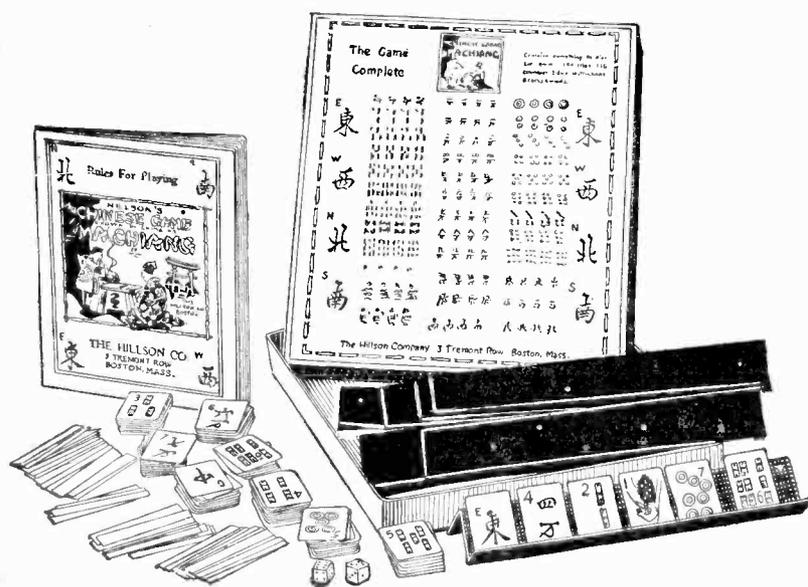
(Continued from Page 270)

ment of portability. The current drawn using a tube instead of the unstable crystal is well worth the difference. The "A" battery current drawn using a tube for last stage of audio amplification more than makes up in added volume as it is an essential part of all reflex circuits that the secondary of the audio be bridged either by an external condenser or the winding so deployed that between these terminals a ready "by path" is provided for the radio frequency current and since the difference between radio and audio currents is simply a matter of frequency a good by-pass for radio frequency is a partial by-pass for audio frequency and hence less volume. The correction of this prime mistake of reflexing brings about partial remedies and the partial remedies bring other parasitical behavior ad infinitum.

We speak of lack of volume and the alleged remedy therefor. A tube used as radio amplification having an air core transformer, the secondary of which is tuned by a condenser, can pass a portion of its plate energy thru inductance of various turn ratios. It appears that the greatest energy transference about 1 to 2 turn ratio is the least selective, and an inductance in conjunction with the least capacity is of the greatest efficiency but is also of the greatest instability.

Thus if we dissect the Harkness we find the essentials of a small neutrodyne and a neutrodyne less neutrodyne, larger condenser and lower value inductance is more stable, and if then the oscillation is introduced other than into the detector tube we have the R-3 circuit in one case with 4 tubes or the R-7 or Super-Roffy circuit with 5 tubes. The oscillator enhances the distance and volume to the extent of not less than two additional stages of radio frequency, and makes the neutrodyne less of a "Blind Man's Bluff" in finding stations. Radiation of the R-3 circuit when properly operated is inoffensive, radiation of the R-7 is "nil".

# MA JONG



The great and fascinating game that everybody is now playing. The talk of the country.

At last a complete set including 144 tiles, 4 winds, 116 counters, 2 dice, 8 paper racks and instruction book, all in a pretty colored box.

Contains everything necessary to play the game. All of the above

**FREE with your new or renewal subscription to Radio Journal**

or send 50 cents for the Ma Jong set alone.

Send stamps, coin or checks to Radio Journal, 113 Stimson Building, Los Angeles, California.

In the accumulation of letters and post cards received at KGO from radio listeners, responding to a request by Howard I. Millholland, studio manager and announcer "HM," it has been found that an average of seven persons are depending upon each receiving set for reception of the KGO Sunday programs. Millholland said today that several letters report as many as twenty and more around a single receiving set, and a whole congregation assembled in a church received a sermon by radio. "I have just returned from church," writes Rev. Frank J. Bradley, pastor of the M. E. Church at El Cerrito, California. "We heard the services from the Oakland First M. E. Church through KGO. My congregation enjoyed the service very much. We used a receiving set built by a local electrician. On behalf of our people I desire to thank KGO for the service."

There is no question but the writer of the comment which will follow found real enjoyment in a recent WBZ program. The writer hails from Kanahoma Cabin, on the bank of Canan-diagua lake, at the foot of the Bristol hills, Oklahoma City, Oklahoma. Some place to hail from. He writes: "We were so pleased with the playing of one of your artists that were she here we would poke up the fire in the big old fireplace and 'have a little something'." When anyone in these arid days becomes so generous as a result of an entertainment, it must have been especially enjoyed.

H. C. Barnes Electric Shop, manufacturers of radio supplies, has moved from South Olive Street to its new home, 860 South Flower Street, Los Angeles. The new location marks the beginning of a real expansion program for this concern.

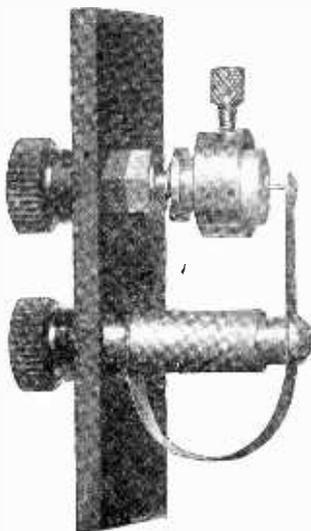
A listen-in on the air nowadays convinces one that the great radio public has learned how to tune their sets properly. There is a decided lessening of radiation compared to six months ago.

Fiddlers of years ago will be heard every Saturday evening from WLS, Sears-Roebuck Agricultural Broadcasting Station, Chicago, for three months, to determine which one is the best.

The "Thermoformer" is claimed to enable the radio enthusiast to operate his vacuum tubes on current derived from the nearest electric-light socket. Both the filament and the plate circuits are supplied with the proper current. The commercial lighting current is transformed into steady silent current, completely devoid of the so called A. C.—hum or of the D. C. commutator ripple, it is claimed.

# TANNER PRODUCTS

## The Tanner Crystal Detector



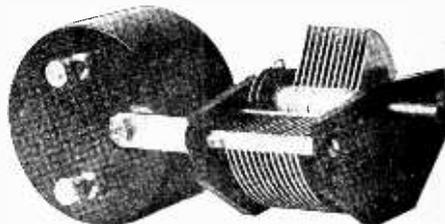
The detector without a fault. Back-panel mounting, with two small projecting knobs which give every possible adjustment. One knob presents the entire surface of the crystal for contact; the other gives a micrometer two-way control on contact pressure. Solid gold cats-whisker, phosphor-bronze spring arm. All metal parts brass, heavily nickel-plated. Shipped with full instructions for panel mounting.

Price.....\$1.50

## C. D. TANNER CO.

Phone Atlantic 4548  
528 W. Washington St.  
Los Angeles, Calif.

## Neutroflex Transformer



Neutroflex Transformer mounted on Kilbourne & Clark Condenser

The *Neutroflex Transformer*, the heart of the Neutroflex circuit, is specially engineered for short wave reflexed radio-frequency amplification. Turn-ratios, couplings, even transformer capacity coupling have been carefully engineered for successful multistage reflexing. The general efficiency of design renders them especially effective also as coupled wave traps or as a super selective antenna coupler.

### PRICE

- Set of three for Neutroflex.....\$12.50
- Single unit ..... 4.50
- Set of three, complete, with Kilbourne & Clark Condensers..... 23.00

C. D. TANNER CO.  
528 W. Washington St.  
Los Angeles, Calif.

- Please ship me C. O. D.
- 1 set Neutroflex Transformers \$12.50
  - 1 Complete Knockdown kit..... 50.00
  - 1 Crystal Detector ..... 1.50
- (Cross out order not wanted)

Name.....  
Address.....  
City.....

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# Pacific Electric Resort Bureau

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FOR ALL MOUNTAIN RESORTS ON THE  
"RIM OF THE WORLD"

IN THE SAN BERNARDINO MOUNTAINS  
AS WELL AS FOR RESORTS IN THE SIERRA  
MADRE AND SAN JACINTO RANGES.

ASK FOR FOLDERS  
NO CHARGE OR FEE OF ANY KIND.

Let us help you plan your vacation

PACIFIC ELECTRIC RAILWAY

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Classified Advertising Rates, 5c per word. Time discounts for consecutive insertions: 3 times, 5%; 6 times 10%; 9 times, 15%; 12 times, 20%. Minimum charge, \$1.00.

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**INVENTORS: PROTECT YOUR INVENTION** through A. M. Wilson, Inc., Washington, D. C. Over 25 years of efficient, expert, confidential service. Skilled in Radio-Electrical, Chemical and Mechanical fields. Our new illustrated Patent Book, giving much necessary and very useful information which every inventor should know, will be sent free upon request. Prompt and careful attention. Highest references. Moderate fees. Send sketch or model for our careful opinion and preliminary advice. Write today to A. M. Wilson, Inc., (Radio 3ARH), 325 Victor Bldg., Washington, D. C.

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**RUBBER STAMP** with large call letters 50c; Radiogram and Relay Radiogram blanks 25c per hundred, Post Card 60c hundred. Send us your orders. Carolina Printing & Stamp Co., Wilmington, North Carolina.

**CALLS HEARD POSTAL CARDS** for DX reports. Station call letters in color. Printed on government or plain postals. 80c hundred up. "Used Everywhere—Go Everywhere." Write for samples. Radio Print Shop, Box 582, Kokomo, Indiana.

**RADIO EQUIPMENT**

**IS YOUR Neut Right?** To revitalize unneutralizable Neutrodyne ye devised this Gladag Coast To Coast Circuit. Uses same panel, etc., as Neut, except three less parts. Merely rewire. Success certain. Necessary stabilizer, 22 feet gold sheathed wire, circuit and complete, simple instruction—\$5.00 prepaid. Many have already rebuilt their Neuts—and written wonderful testimonials. Thousands will do it. Be FIRST—have the finest five tube set in your neighborhood, revitalize others' Neuts. Description, etc., 10c. Radio Lists, 2c. Stamps accepted. KLADAG LABORATORIES, Kent, Ohio.

**COUPLERS**, 80 turn \$2.00, 90 turn \$2.25, 110 turn \$2.75; variometers \$1.50; complete tuners \$10.00. We make all kinds of coils to order. Special prices on sets. Stiles-Perry, Deposit, N. Y.

**WIRE TERMINALS**—150 assorted \$1.00, 20 two foot lengths No. 14 square tinned busbar \$1.00, 10 two foot lengths No. 10 special round bus bar \$1.00. Send for samples. Immediate shipment postpaid on receipt of remittance. Radio Engineering Co., 55 Halsey St., Newark, N. J.

**RADIO BARGAINS**—Any \$6.50 Tube \$5.75; Era Reflex Transformers, any type \$4.50. Burgess 2156 Batteries \$2.50; Brandies Superiors 5.25; Signal 23 Plate Condenser \$1.75. Everything Guaranteed Perfect. Write for list. Edward Bromley, Jr., Whitewater, Wis.

**IVORY RADIO PANEL:** White pyralin ivory makes the most beautiful set of all. Guaranteed satisfactory. Any size 3-16 inch thick. Three cents per square inch. Sample sent. E. P. Halton, 614 Main, Dept. J., Fort Worth, Texas.

**FOR SALE**—Omnigraph, 15 dial, new \$20. Transformers, Audio UV712, Radio UV1714, \$3.50 each. Paragon sockets and type UR542, 50 cents each. Paragon rheostats, 75 cents each. Ellison Thompson, 1301 Findlay Ave., New York.

**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.

**SET OF THREE LATEST TYPE** Ancore R F Transformers for experimenters' information service Super-Heterodyne. Price \$25 for set of three. Address: Box 4, Radio Journal.

**PACIFIC COAST STATIONS** are heard in Pittsburgh with vario-coupler and two Rogers Receiving Radiometers (Condensite molded variometers). Radiometers \$4.00 each. Postage prepaid. Rogers Radio Company, No. 5133 Woodworth St., Pittsburgh, Pa.

**A WONDERFUL CRYSTAL SET**—Can hear all over Philadelphia, and sometimes outside Philadelphia. Price with phones \$10.00, without phones \$4.00. Receiving sets \$25.00 to \$200.00. Guaranteed or money back. Send money order, Williams Radio, 2339 W. 8th St., Philadelphia, Pa.

**EDISON ELEMENTS** for storage "B" batteries, six to ten cents per pair postpaid, depending entirely upon quantity ordered. I handle only strict! first grade full capacity elements. A. J. Hanks, 107 Highland Ave., Jersey City, N. J.

**FOR SALE**—Crocker Wheeler motor generator rewound 150 watts, 1000 volts speed 3600 \$75.00. Esco 500 watt, 1000 volts speed 1750 new 150.00. Travis Radio Laboratory, 102 Diaz St., Antonio, Texas.

**GUARANTEED UP-TO-DATE**, Radio Repairing, Rewiring and Rebuilding. Send us that set which is out of order or will not work. Prices reasonable.—RADIO SERVICE SHOP, Atwood, Kans.

**FOUR CIRCUIT COCKADAY, COMPLETE**, for sale, \$105. Tubes, speaker, all batteries. Address, DX 1200, care of Radio Journal.

**FOR SALE**—1500 mile guaranteed Tube set, \$10. L. Young, 910 Strand, Hermosa Beach, Calif.

**FOR SALE**

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# Approaching the Ultimate

By E. E. BUCHER

**A**LL super-heterodyne receivers are members of the well-known heterodyne receiver group, and these have long been used to receive so-called continuous wave radio telegraph and radio telephone signals. It is a complicated class of receivers which require expert radio knowledge for their construction, but they may be used by anyone when properly built. The new RCA Super-Heterodyne receiver is known in full by the technical designation of a "second harmonic regenoflex super-heterodyne receiver."

The term "super-heterodyne" means that this new set does not depend alone on radio frequency amplification, nor yet on audio frequency amplification alone, nor on regeneration, nor even on a combination of these powerful methods of increasing the signal strength. More was required in the way of stable and selective amplification than these two previously used methods of amplification could alone yield. It became necessary to have a third and new frequency at which to amplify, namely: the so-called "intermediate frequency", which is considerably higher than the audio frequency and much lower than the radio frequency. The combined use of these three frequencies gives an over-all amplification of an amazing magnitude which makes the set so sensitive that it reaches further on a small loop than the existing sets do on a large antenna.

The receiver which is so sensitive that it can hear across the continent on its own self-contained loop under good conditions needs no antenna or ground.

Since there is no variable antenna to take account of, but only a permanent and constant self-contained loop, it is possible to mark on dials provided for this purpose the setting corresponding to the stations desired for every listener no matter where he is located; and after this is done, getting a station means merely setting the two "Station Selector" pointers to the desired station, pulling out a button, and listening. If desired, the music can be made louder or softer by an additional control which influences nothing else (neither the tuning settings nor the quality).

The loop circuit of these receivers, is a tuned circuit at radio frequency. It is adjusted by the listener. At three different points in the receiver are circuits sharply tuned to the intermediate frequency but not adjusted by the listener. They are set once and for

all at the factory, and to make full use of them, all that the listener needs do is to tune the oscillating detector Tube 2 so that it will produce the proper intermediate frequency from the incoming waves. This means, in plain language, that he simply turns a second knob until the signals are loudest. The listener therefore has only two tuning adjustments, and these are stable and definite. So that the intermediate frequency employed

by this receiver enables the receiver to have no less than four sharply tuned selecting circuits in it, one after the other, and yet only two of which are adjusted. And the nature of these selective circuits is such that the selectivity had to be carefully controlled and limited in the design in order to avoid making the set truly unusable because of excessive selectivity. The new super-heterodyne responds fully to all frequencies in a band 10 kilocycles (10,000 cycles) wide, and does not respond at all to anything outside of this band. The super-heterodyne Radiolas have six tubes, which actually

(Continued on Page 303)

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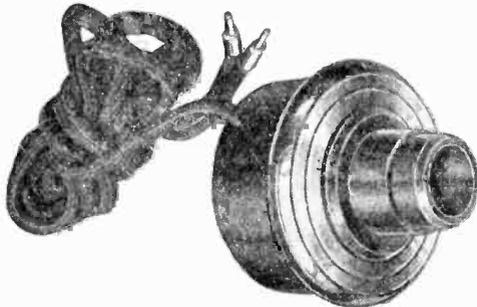
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Bring in the wonderful things of radio land as you have never brought them in before. We are giving away this wonderful *Stentor Super-Speaker* unit, which for tone quality, audibility and sensitivity is unexcelled, and we want to give one to you. It is making a big hit with broadcast listeners everywhere.

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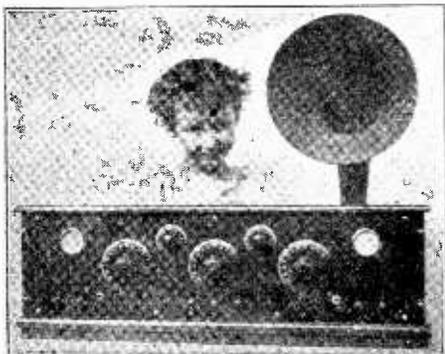
do the work of eight or nine tubes in the older experimental super-heterodyne sets.

The regenflex feature of these receivers, by its use of a special muffler tube circuit, eliminates any radiation from the set. To illustrate what can be done, the antenna lead of a sensitive four-tube receiver was laid within a few feet of the super-heterodyne set. A station several hundred miles away was picked up on the four-tube set with loud signals heard throughout two adjoining rooms. Then the super-heterodyne was tuned all over its wave length range at full sensitiveness, and

*The new Radio Corporation super-heterodyne has elicited a lot of inquiry from our readers, so Radio Journal here publishes a brief resume of this set prepared for it by E. E. Bucher of the Radio Corporation. It makes clear some of the operative and theory angles of this modification of the super set.*

naturally getting the distant station in question as well as many others. In no case was there any interference noticeable with the four-tube receiver signals!

A real novelty in receiver construction has been adopted in the super-heterodyne Radiolas. The entire circuit parts, with the exception of two or three husky and larger elements, are enclosed in a heavy metal box where they are carefully wired and definitely adjusted. The entire box is then closed by a firmly fastened metal cover, admitting only the tubes, and the box filled with a special wax. Thus the entire receiver unit is a block or solid mass, which is mounted on shock-absorbing springs thereby making transportation easy, and making sure of a quiet operation (free from "ringing"). This receiver unit, or "catacomb" as it is called, is permanent and readily replaced in the most unlikely event that it is damaged.



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**Contest Editor RADIO JOURNAL**

113 Stimson Building

Los Angeles, California

For the first time since broadcasting was inaugurated, radio this summer has come within the range of the great masses of the people, according to M. C. Rypinski, one of the leading figures in the radio industry and Chairman of the Broadcasting Committee of the Associated Manufacturers of Electrical Supplies. "This summer," Mr. Rypinski said, "there are many excellent sets for sale as low as \$25 or \$35. With a receiving set on the family porch, Mr. Rypinski predicted, radio will prove to be the coolest form of hot weather entertainment. "For the enjoyment of broadcasting," he explained, "requires only listening—listening at your ease and in your shirt-

sleeves, where you want to listen and how you want to listen, without the trouble or effort of going after your entertainment."

Most of the thirteen and one half million automobile owners are interested in the International 500 Mile Race at Indianapolis yet only about one hundred and fifty thousand of them get an opportunity to see this speed classic. But this year The Prest-O-Lite Co., Inc., of Indianapolis, Ind., whose enormous factory is directly across the road from the Speedway, broadcasted the race thru Chicago Tribune Station, WGN, and the speed fans got a realistic impression of the

race on their radio. A special wire was run from a soundproof booth in front of the judges stand at the Speedway direct to the broadcasting station at Chicago and over this wire one of the most absorbing pictures of a sporting event ever given went on the air.

Having penetrated the polar regions with MacMillan, amateur radio is now about to take the opposite extreme and set forth on an adventure in the South Seas. The auxiliary ketch "Big Bill," which is preparing to sail from Chicago in the interests of the Deep Waterways Commission on a two year trip that will ultimately take it around the world, will have as its radio operator, E. C. Page of Evanston, Ill., a young amateur and member of the American Radio Relay League.

The selection of Page has been approved by Captain A. J. Dukan, who will be in command of the vessel, following his recommendation by local representatives of the A. R. R. L. He will have for his equipment Zenith radio apparatus capable of working on both commercial and amateur wavelengths, including the shorter waves. Page expects to communicate regularly with amateurs. The official radio call assigned to the vessel is WHU.

From a radio standpoint much interest is being taken in the expedition which is being organized and outfitted under the supervision of William Hale Thompson, former mayor of Chicago. It will offer an opportunity to study the efficiency of the shorter wavelengths in the climate peculiar to southern waters.

The vessel, which has a crew of seven men, will proceed down the Mississippi, through the Panama Canal, and from thence around the world. It is expected that in addition to operators in the United States consistent radio communication will be maintained with amateurs in South America, Europe and Australia.

A good way of making antenna and ground connections when in the country or woods with a portable set is to drop a few feet of bare wire into the river or lake for the aerial. A sort of counterpoise for this is a large spike or piece of iron pipe connected to another piece of wire driven into the soil five or ten yards from the bank. With sets that use a loop this method brings fairly good results. The set should be set on a dry box so as to be well insulated from the ground.

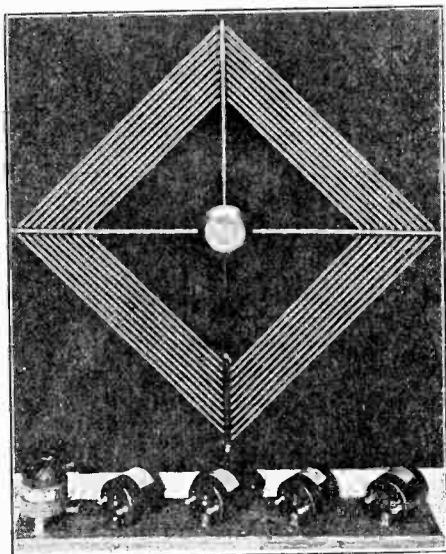
Hostess—"Must you be going, Mr. Dugan?"

Absent-minded Radio Announcer—"Er, yes, good-night. WZOK signing off at 11:15 P. M."—Brown Jug.

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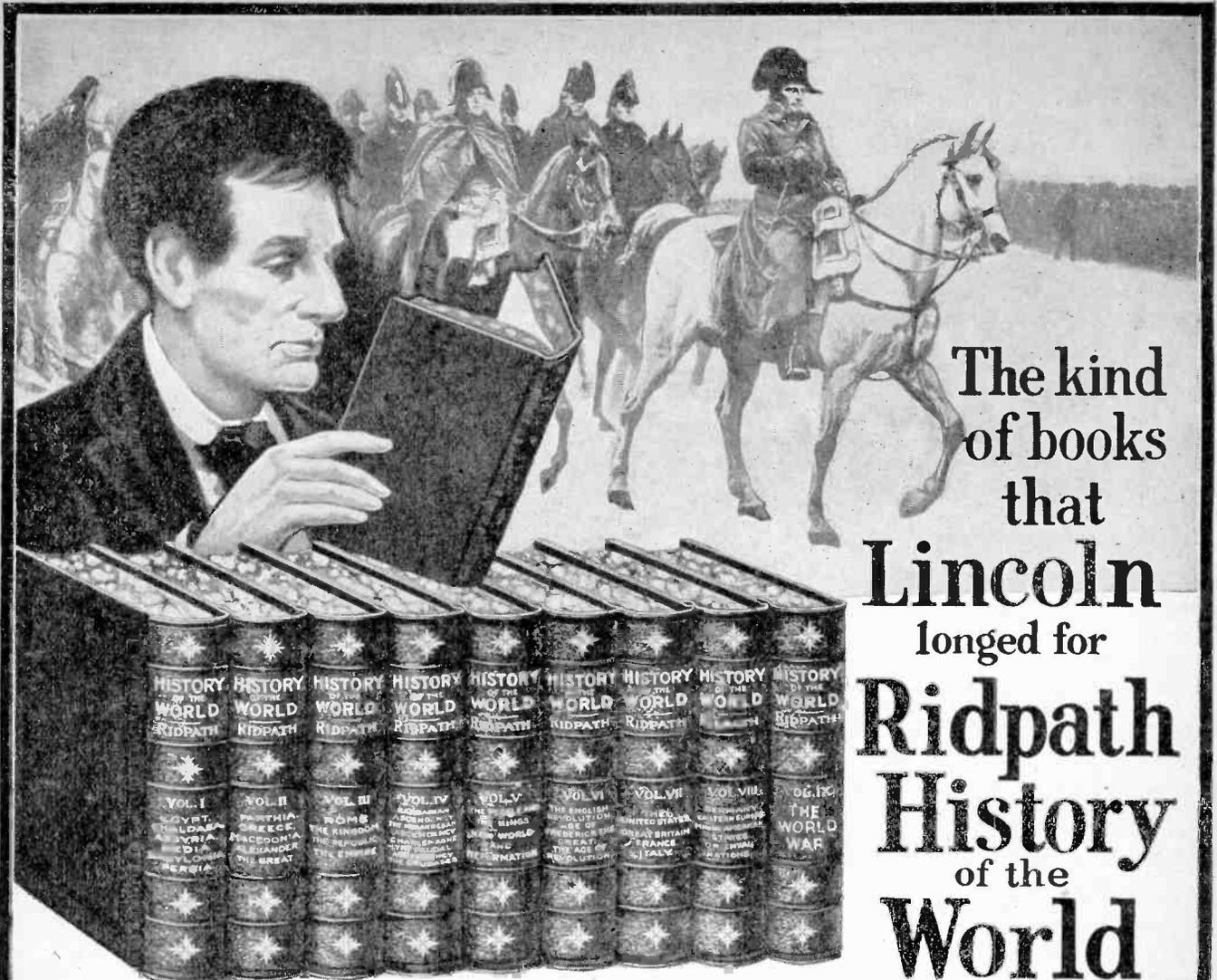
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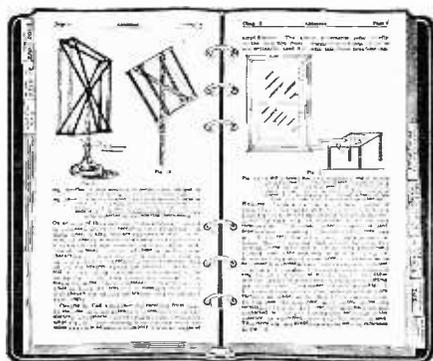
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