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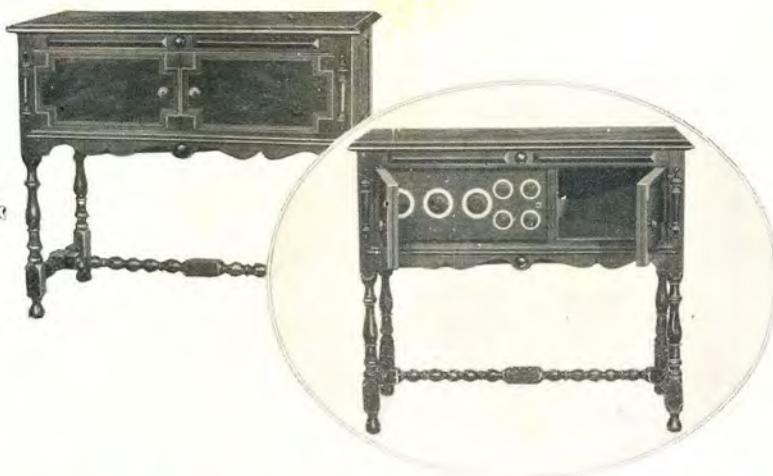
Radio Journal

Established in 1922



How to Build a Teledyne—Neutroflex—Super-reflex—Three
Tube Neutrodyne—Radio for Banana Route—Interference

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Model
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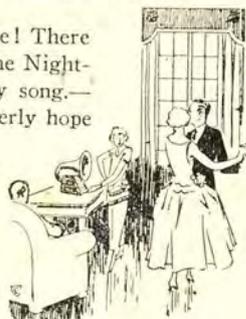
Matches the Tones of the Nightingale

By W. P. SHAW

THE Nightingale!
 What a thrill the thought!
 How it paints for us pictures
 —pictures of rapturous, balmy
 nights—wondrous nights, Mediterran-
 ean nights.

Only Italy can furnish the setting.
 The lagoons, a gliding, soft-moving
 gondola, lapping waters, wafted per-
 fume of blossoms, then the Night-
 ingale—the perfect singer—bursts into
 its song of love! 'Tis melody from
 the sky.

What a tone! There
 is none like the Night-
 ingale's lovely song.—
 What a masterly hope
 that man
 might catch
 that won-
 drous note
 —so high,
 so clear, so
 sweet that
 all Nature



turns its ear to listen. To do that
 man has striven long—almost suc-
 ceeded—but each time falling short of
 perfect reproduction. The note is so
 high and clear that it is a most diffi-
 cult thing to catch.

The Night of the Great Test

All was silent in the shop as the
 interested spectators waited for one
 more great test of man's mechanical
 skill in reproducing over the radio
 the tones of the Nightingale. The
 tone experts were listening intently.

"I almost hear it. You nearly have
 it—"

"No, not quite!"

"That's almost the tone."

"Now! Do that adjustment again! Do that
 again! Man, that's it! That's the tone.
 Exactly like the Nightingale's—clear, dis-
 tinct, unwavering, sweet! It is the tone
 of the Nightingale itself! It is a success."

And So We Christened This Triumph "The California Nightingale" Unit

It is a super-tone speaker unit that will
 reproduce even the song from the throats
 of birds—the most difficult
 of all radio accomplish-
 ments. Because of the full
 carrying quality
 of this new Califor-
 nia Nightingale Unit and
 completed cabinet
 and horn, it is
 called the Stentor
 Super-Speaker —
 Stentor for volume and Nightingale for
 melody.



melody
 from the sky
 The
 California
 Nightingale



With
 Volume
 Clarity
 Accuracy!

The Stentor Super-Speaker

The tones may be even those of the pic-
 colo with its shrill 4200 vibrations—the same
 as the Nightingale. Human voices may sing
 or instruments may play—it is the same.
 The tone is clear, sonorous and strikingly
 recreated.

Simplified for You Mechanically Points to Be Considered in the Purchase of a Loud Speaker

This speaker is simplified for you. There
 is no adjustment screw. This is done at the
 factory and sealed, and as long as it remains
 sealed, carries our guarantee.

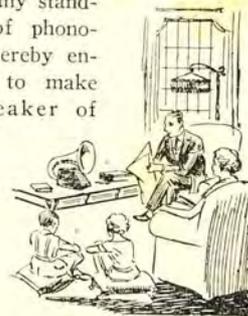
In purchasing a loud speaker you expect
 the three following points which are suc-
 cessfully co-ordinated in the Stentor with
 California Nightingale Unit:

1. **SUBSTANTIAL QUALITY**—A real
 addition to the musical instruments of
 the home, with beautiful polished base,
 and gracefully low built trombone horn.
2. **AUDIBILITY**—When you think of
 the California Nightingale Unit you
 think of round, full tones made possible
 by the elimination of many factors that
 have made radio objectionable.

3. **SENSITIVITY**—Operating on
 average voltage the California
 NIGHTINGALE UNIT will carry the
 delicate notes of birds or the
 thunderous, massive pipe organ, It
 will withstand amplification with-
 out distortion. It will reproduce
 perfectly the harmonics of the
 saxophone—conceded by experts to
 be the hardest of all musical in-
 struments to reproduce. By revers-
 ing the polarity of the cords, the
 tone pitch can be raise or lowered.

Can Be Attached to Your Phonograph

A rubber adaptor may be supplied
 for the Stentor California Nightingale
 Unit, which will
 make it fit any stand-
 ard make of phono-
 graph — thereby en-
 abling you to make
 a loud speaker of
 your pho-
 nograph—
 if you so
 desire.



The ex-
 perience
 of phono-
 graph ma-
 facturers has shown that a rubber
 insulator should be used between the
 sound box and tone-arm. This prin-
 ciple is used in our rubber adaptor,
 which increases the volume and guar-
 antees a perfect, airtight joint.

A Final Type Loud Speaker

For use in the home—where a
 moderate amount of volume is de-
 sired, and for dancing and outdoor
 speaking—where a big volume is ne-
 cessary. That is why a critical comparison
 of all loud speakers invariably results in
 favor of the Stentor California Nightingale
 Super-Speaker.

California Nightingale Super Stentor, complete	\$22.50
California Nightingale Unitype, which is a Unit only	\$10.00
Rubber Adaptor for Phonograph Attachment50



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Its fifteen large cells give 22½ volts of strong, steady energy day after day. Cells that pour out power the moment you turn on your tubes. Cells that rest well when idle, renewing their vigor for your next demands.

No cells have a bluer-blooded ancestry than these. They are the product of thirty years of dry battery research and development of the

world's foremost electro-chemical laboratories. We think that No. 766 is the handsomest battery ever made. But that is a matter of opinion. It is a matter of engineering record, however, that this great standard "B" Battery has proved itself as perfect in performance as we are convinced it is superfine in appearance.

The 45-volt Eveready No. 767 contains the same large powerful cells as the No. 766. For maximum "B" Battery economy, therefore, buy the 22½-volt Eveready No. 766 or the 45-volt Eveready No. 767, as you prefer. Here is the "B" Battery at its best.



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22½ volts. Six Fahnestock Spring Clip Terminals, giving variable voltage from 16½ to 22½ volts, in 1½-volt steps. Length, 6¾ in.; width, 4¼ in.; height, 3 3/16 in. Weight, 5 lbs.

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No. 764 The Space Saver Vertical 22½-volt "B" Battery

Eveready Radio "A" Dry Cell Specially manufactured for use with dry cell tubes

No. 767 "B" Battery, 45 volts Variable taps Fahnestock Clips

No. 771 "C" Battery Clarifies tone and increases "B" Battery life

EVEREADY Radio Batteries

-they last longer



Volume Four

APRIL, 1924

Number Four

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Editorial Comment

Up an' at 'em

Next to taking a gentle but firm seat on a batch of well sharpened carpet tacks we can think of nothing more unpleasant for a member of congress than actively supporting a tax on radio. Yet there are members of congress who are doing just that thing. Maybe they haven't felt the tacks yet, but we feel certain that should they succeed in putting over this more or less nefarious bit of taxation they will feel them—and the radio public at large should make it a business to see that such members of congress feel not only the tacks but the axe. A good many homes would feel such a tax as a crushing blight on what has proven one of the greatest services ever rendered mankind. The country needs revenue—to be sure. But striking at a very vital bit of family life, a vital service rendered to the halt, the lame and the blind, to the sick and infirm, to the needy and the aged, a service which promises to make us all more nearly brothers than we have been since the day Cain killed Abel—such a blow would be like unto the striking of a friend because one needed bread, like the slaying of a brother because one needed raiment. But has this Union become so impoverished that it must reach into the pockets of this class, must throttle and restrict a vital and growing service to mankind for the sake of revenue? Hardly. We do not know what the verdict will be as this is written, but whatever it is we shall make it one of our aims in life to see that those who supported such a tax have an uncomfortable time of it when that judgment day of every congressman rolls around election day.

The appropriation for radio inspection for the coming year was increased two thousand dollars. Ye Gods! There are that many new receivers within a few blocks of our residence since New Year's day. Some day an enterprising radio salesman is going to invade the halls of congress and sell a few sets—after which even congress will wake up, a consummation devoutly to be wished.

Sulphur and Molasses

Summer is with us once more. We know it by the most familiar sign in radio—we met a merchant who dispenses radio the other day and he asked us about the summer slump. By quite a coincidence we had letters the same day from two large manufacturers of radio equipment who said that their April business had been double that for March and that they confidently expected their May business to exceed April. So we told our dealer friend about the letters and suggested that instead of broadcasting that summer slump stuff he try to double his business for April—and forget it. Of course there are firms who will feel a slackening in the business pulse; and there will be others who will saw wood and get the business. Broadcasting is better than it ever was. Big events are crowding close on one another's heels these days on the air. Every day adds a new listener-in to the ranks of radio, in every dealers territory. Every day sees a new program announced somewhere that is of vital interest to the community served by that broadcasting station. Then the big national events

such as the Republican and Democratic conventions, elections, big public figures of stage, music and platform turning to the microphone—the public will buy radio and keep on buying radio. We knew a man, a real business man with lots of credit for insight and vision and far sightedness and all that line which is usually applied to the successful business man; and he told us several years ago to stay away from radio because it was only a temporary fad and couldn't hold popular favor. He meant it for our own good and all that. Well, we hunted him up behind his plate glass door the other day, and he began to ask us what he could do to clear up the tone of his super—but blamed if he hadn't forgotten all about what he told us a couple of years ago. Forgetting all about the improvement in radio sets and broadcasting since a year ago, forgetting all about loss in range due to warm weather and all that, on the mere fact that radio is making a thousand converts a day to a dozen a year ago we will wager a pink rabbit against a pair of ear muffs—which we don't need in California—that it is going to be a good radio summer.

Troubles that Pass

These glowing days remind us—what about the American Society of Composers, Authors and Publishers. One judge has ruled in favor of freedom in broadcasting while another as solemnly rules that the American Society is right in its attempt to throttle free broadcasting. Meanwhile congress is being asked to give relief to the broadcasters in one form or another by amendments to the copyright act. Meanwhile the country at large has had one thing demonstrated—it can get along without the American Society or its music so far as radio broadcast is concerned and not know the difference. Any time any organization thinks it has all the talent or all the art in America cornered it is letting itself in for a tumble through the bed slats. After all it's a very healthy sign that America and its broadcast stations can get along without the American Society—and the thousands and millions go on listening-in to great programs just the same.

Problem for Jobbers

New York, Boston and Kansas City electrical dealers have adopted firm resolutions against trade discounts. Recently we have heard mutterings from the radio trade anent such practices which, if carried far lead to much abuse. The problem is one for the radio trade to work out conscientiously and seriously, keeping in mind the definite fact that such discounts may, in time, be extended to such a wide circle as to seriously impair the legitimate retail market.

Penny Radio

Drop a nickel in the slot and listen to the radio. It's in operation in the east as an adjunct to the penny arcade. We question, however, whether this form of commercializing free broadcasting will hold interest for anyone for very long.

How to Build the Teledyne Receiver

By H. S. WILLIAMS

The Teledyne, non-re-radiating super-regenerative radio circuit was designed by Dr. Bowden Washington, chief engineer of the Cutting and Washington Radio Corporation. "Tele" means distance and "dyne" power. This article by Mr. Williams, radio engineer, deals with the general features and also explains in detail how to build it. All of the constructional data here given has been approved by Dr. Washington.

THE "teledyne" was designed with two primary objects in view. The first was to produce a powerful and simple regenerative receiver that would not "transmit" or "re-radiate." The second was to increase the range, volume, clearness and selectivity of four-tube receivers.

Both of these objectives were obtained. By a series of engineering experiments it was found by Dr. Bowden Washington that it was possible to eliminate "re-radiation" from regeneration. This accomplishment, in itself, will appeal to the radio fan who is continually annoyed by squeals and cat-calls from neighboring receivers as one of extreme importance.

The average fan may ask why is regeneration necessary? The discovery of regeneration was a great step forward in radio reception. It made a vacuum tube almost a thousand-fold more efficient, bringing about considerable economy in tubes coupled with greatly increased sensitivity and selectivity.

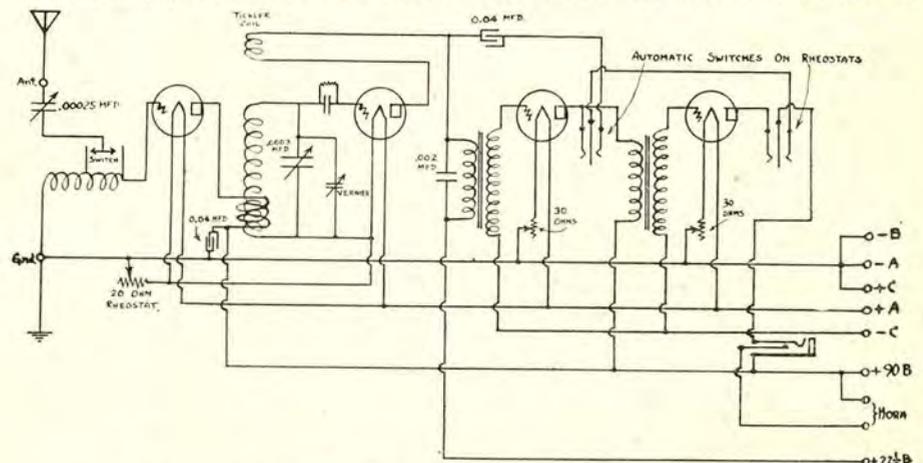
When radio-phone broadcasting swept over the country, regenerative receivers fairly "rained down upon the listening public." Unfortunately, insufficient thought and foresight used in the beginning and the radio-fan was presented with what has turned out to be the course of the ether—the single circuit regenerative receiver. It was this type of receiver with its many

which was at fault, but, rather, the way in which it was used. It is a force, a very potent force, which, when intelligently utilized, opens up infinite possibilities in the field of broadcast reception. No vacuum tube receiver, even with radio frequency amplification, can ever reach any great degree of sensibility unless regeneration is employed. The problem in regenerating radio frequency amplifiers is the tendency to spill over into oscillation. Neutrodyning prevents the tubes from

give coast to coast loudspeaker volume under average conditions.

There is just sufficient regeneration intended in the antenna circuit to minimize to a marked extent ill-constructed antennae. The minimizing of antenna resistance aids volume and selectivity.

The tuned radio frequency stage, in being coupled in a peculiar manner to the grid of the detector, with both tuning and regeneration, gives enormous amplification with great



Complete hookup for the already famous Teledyne receiver.

oscillating, but with a great sacrifice in sensitivity, for it also prevents the tubes from regenerating.

The problem of utilizing regeneration without danger of self-oscillation was solved by Bowden Washington by taking the principle that when a resonant circuit, consisting of an inductance and capacity in parallel, is placed in series with the plate circuit of a vacuum tube, the grid circuit of which is also resonated to the same frequency, the resonant plate circuit will produce oscillations, and just off this resonant point, negative resistance or regeneration. The research finally was simplified down to the point where the coupling was made at a certain critical value, thus preventing oscillation.

Highly Selective

The Teledyne comprises four tubes, namely, tuned radio frequency, regenerative detector and two stages of audio frequency, the circuit being so developed as to be very selective and

selectivity. Under ordinary conditions the radio frequency stage amplifies the very weak incoming signals ten times. This amplified oscillation is then impressed upon the grid of the detector where through means of controlled regeneration it is again amplified as much as one hundred times.

The amplification in the detector circuit is a material aid to ease in tuning. The detector circuit can be made to oscillate without antenna "re-radiation" and therefore pick up distance carriers through the conventional boat or whistle method without the necessary of hunting for the stations.

Once this carrier is located, all that is necessary to bring in distance signals is to tune the antenna control until the signal or boat is loudest. The regenerative control may be tuned back slightly if necessary and the signals left clear and loud. The set therefore has only two major controls, comprising the secret of easy and simple tuning.

The Teledyne also uses a four and

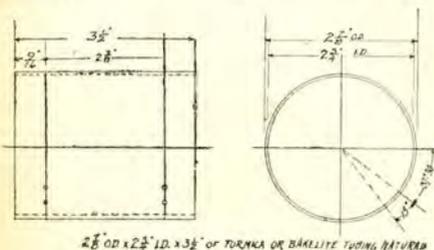


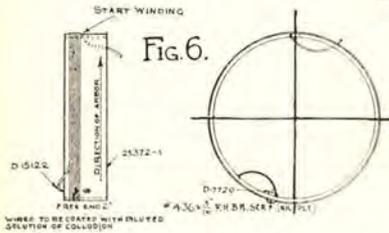
FIG. 1.

drawbacks that brought regeneration into such disrepute. The demand for complete neutralization of the forces of regeneration has mounted to such an extent that many people are under the impression that regeneration is practically dead as far as broadcast receivers go.

It was not regeneration, however,

Lay out the holes for the secondary tube according to Figure No. 4. The three holes marked 13-64" drill may be omitted if the circular bracket as used in the Cutting and Washington set is not used. A different form of mounting will of course require a different bracket and hence different holes. To those who have not had experience in reading blue prints Figure No. 3 will probably suffice. The anchor holes may be drilled approximately correct or as near as can be judged. The only two holes which are at all accurate are the two holes thru which the regeneration coil shafts run. These, of course, should be quite accurate otherwise the dials will probably wobble when attached to the shaft.

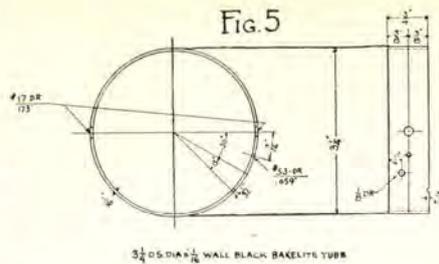
Winding the secondary is next. Start at the left at Figure No. 3. Wind in the direction shown in the drawing and continue until 45 turns of the No. 26 double silk covered wire are closely wound. Anchor as before, leaving several inches for connecting. Coat the coil with collodion as was the primary. Procure the bakelite or cardboard strip. Fasten close to the right hand end of



secondary coil with collodion or a rubber band. This is illustrated in the sketch. Once the wire is wound in place over this strip, it will hold itself. In the meantime, if the rubber band or collodion is not sufficient to hold the strip, a drop of glue may be used on the ends. As shown in the drawing this delivery coil, as it is called, is comprised of four turns of the same size wire as used before. It is wound in the same direction and very carefully placed so that the last turn of the delivery coil is over the last turn of the secondary winding. This is quite important. To aid in holding the wire small pieces of cloth tape must be inserted under the windings, the ends of the coils slipped thru the loops and the loops pulled tight. The coil is then coated with collodion as before and allowed to dry.

Regeneration Coil

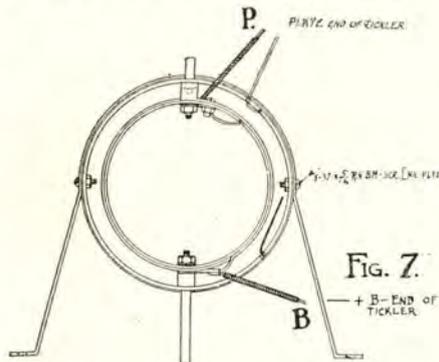
Reference to Figure No. 5 will show how the coil is to be prepared before winding. The two No. 17 holes are for the shaft. Figure No. 6 will show the method of winding. The same size wire is used as on the other three coils. Care should be exercised here as before to see that the windings are close together and properly placed. It likewise should be coated with collodion and allowed to dry before handling.



With the aid of a few shafts and bolts the secondary and regeneration coils may then be assembled somewhat as in Figure No. 7. The inside of the regeneration coil should be that side having the winding on it. If this is true and all the winding directions are as given in the prints, the rear connection or that one marked "P" will go to the plate of the detector tube while the remaining one or that one marked "B" will go to the outside winding of the audio transformer primary and thence to the detector "B" battery. The experimenter will undoubtedly have many ideas as to how to assemble the regeneration and secondary coils so that part will be left entirely to the builder's discretion. All that must be remembered is that the regeneration coil must be swung inside the secondary coil at the end opposite to the one carrying the plate delivery coil of the radio frequency tube. The assembly of this complete assembly in turn will depend upon the particular style of panel layout that the builder is using.

Panel Layout

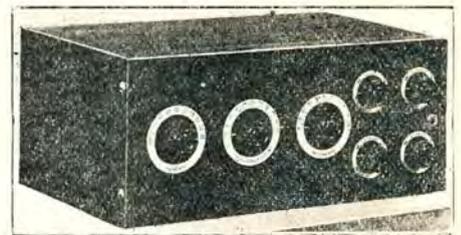
While the assembly and panel layout of the Teledyne will depend upon the particular kind and quantity of apparatus on hand, still there are certain fundamental principals which must be borne in mind while this work is going on. A general idea of this can be gain-



ed by glancing at the accompanying photograph of the Cutting and Washington Teledyne. Here you will note that the primary condenser is mounted at the left with the primary coil fastened directly to it. The coil is exactly vertical. This is important. To the right of this is the secondary and regeneration coil assembly with the regeneration coil by means of a train of gears. The radio frequency tube socket

is mounted directly between these coils. This makes short and direct leads possible. To the right of the secondary regeneration coil assembly is mounted the secondary tuning condenser. This is the one having a capacity of .0003 mfd. The vernier in this case is separate and actuated by a separate control to the right of the main control. This is not essential as any type of vernier condenser is suitable.

In the rear on a special shock absorbed mount are mounted the grid condenser and leak to the left while the detector and two audio frequency amplifier tube sockets are to the right. A patented switching condenser used in place of the ordinary primary condenser make the use of a switch lever and points unnecessary. These are not



Front view of completed set.

procurable on the market so it becomes necessary to use the switch lever and points instead. These should be mounted at the left of the panel so as to make short leads from the primary coil possible. The rheostats may conveniently be mounted to the right since this is the audio side. Likewise it might be advisable to mount the audio frequency amplifying transformers to the right close to the tube sockets. This also makes for short leads.

The mounting of the separate units is also left to the builder's ideas. It may be well to use a base board to which the front panel can be mounted so as to allow the units to be mounted directly on the primary condenser. The radio frequency tube socket can then be mounted on the base along side of it, making short leads possible. The secondary regeneration coil assembly next to this either to the base or to the panel but at right angles to it and with the center line of the primary winding exactly on a line with the center of the secondary. This is important. In other words, the two coils should be exactly in line both ways but at right angles to each other. The secondary variable condenser can then be mounted to the right of this assembly with both the amplifying transformers and tube sockets nearby. The jack is conveniently mounted at the extreme right of the panel.

A word of caution here. Care should be taken when arranging the apparatus to see that all connecting wires will be as short as possible, and at the same

time not come too close to one another. This applies especially to the radio frequency leads. When the binding posts and other odds and ends are connected and assembled the set is ready for wir-

ing as shown in the accompanying diagram.

Next month the author will describe the antenna to use with the Teledyne and how to tune it.

Antipodes Get Across

APPARENTLY 4AA, New Zealand, and 30K, Australian, made the grade to the states during the two way tests just concluded. Myron Hexter, 6CNL, reported first picking up Australian 30K at 8:25 p.m. April 15, and continued getting this station, despite interference and fading, until 8:59 p.m. Pacific Standard Time. It was calling U6AAO. By wavemeter it checked at 182 meters. Toward the last it was QSA. 6ZC was with 6CNL at the time and checked the reception. They phoned 6AAO who immediately tuned in and got the last end of the reception, making a third check. The time of reception and remarkably clarity of the call, which was repeated over and over again, cast some doubt on its authenticity, but a check of American and Canadian stations fails to reveal any duplication. The check has not been returned from New Zealand or Australia as yet.

6CNL was using a modified Reinartz at the time, single 90 foot aerial. 6AAO who reported Australian 30K very clear was using the 9ZN low loss receiver.

M. E. McCreery, 6LJ, of Los An-

geles, Calif., reports 4AA, believed to be Australian, at 3:20 a.m. March 30. Reception was while Mr. McCreery was on a special trip to Balboa. He stretched an aerial from fence posts and reports wonderful reception conditions except for commercial and naval station interference. The Atlantic coast came rolling in.

6LJ was reported in England, reception being in daylight 9 a.m. G.M.T. there, or 1 a.m. Sunday morning, here. Reception was reported on January 6.

Check returned by Canadian and American 4AA likewise fails to reveal either station on, though check has not been returned from New Zealand. It is known however that Z4AA was on consistently.

And last but not least C. D. MacLurcan, on board ship in San Francisco harbor, positively reports reception of Australian 2CM, his own station at home in Australia operating with his ship on special test.

Lawrence Mott, 6XAD, on March 18, reports reception of station calling for "Any American Station" but interference and fading may have killed the call—for he failed to get any sign of a signature.

British Hear Sixth District

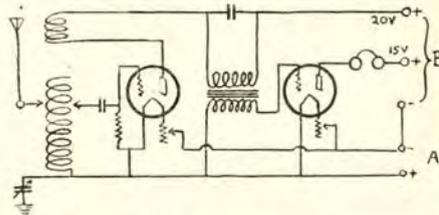
SOME intensely interesting information regarding the type of receiver used by a British Amateur to receive signals from California is contained in a letter from S. K. Lewer, 32 Gascony Avenue, West Hempstead, London, N. W. 6, England. Mr. Lewer, on the night of January 6, heard 6LJ, station operated by M. E. McCreery of Los Angeles, Calif., a remarkable feat in itself. In a letter to Mr. McCreery he writes:

"That night, January 6th, was one of the best I have had, OM. Logged 40 U. S. and Canadian hams there. Conditions were good for the 6's as I logged also 6AWT, 6XAD and 6BR."

Lewer describes his set as follows:

It's only a detector and one step o.m. but it is the thing for D. X. Aerial is very badly screened by houses, trees, etc. There are four metal roofs with a total area of about 500 sq. ft. All this is within 20 ft. of the aerial. Hi! Hi! Two other aerials run 10 ft. below mine! Hite 30 ft. above ground, 10 ft. above metal roofs, length 70 ft.,

single wire. Transmitter, one 15-watt tube, input about 8 or 10 watts (not kilowatts o. m. Hi!) Reversed feedback. Radiation maximum 6 amps. I know this is not good for 8 or 10 watts, but I have not been able to spend much time on the set as I am very QRW with school work. (Say o. m. I am only 15 years old) Until the other day my best D. X. was to South



of Paris 250 miles where I worked French 8AQ. That is with 3a I. C. W. Have worked g 2JF, g 2FNM, g 5HA, all about 200 mi. with 15 amps C. W. The other day I received a report from Glasgow, Scotland, 350 mi. That is my best D. X. Radn then 1/2 amp I. C. W. I expect this small range is due to the presence of so much metal near

the aerial. However, I hope to raise the aerial soon and then I may work you o. m. At present I can't use any more power as we have no mains here and I have to rely on dry batts or spark-coil C. W. Regarding results with the receiver o. m. I have now logged 400 U. S. and Can. hams. Not bad for detector and one step. This is all this season since December 2, 1923. List include 12 of the 6's and 4 of the 7's.

Important Discovery

A DISCOVERY of prime scientific interest has just been announced by Mr. Daniel Nelson Clark, LL.B., author of "The Universal Law of Organic Progress" and "The Constant of Organic Energy." This discovery is an evolution from the numerical expression of the constant of organic energy of 178,275,065423786200 plus (derived as a product of the orbital velocity and the square-root of the distance of any planet of the Solar System from the Sun). Thus, by the use of the gravitational constant, of any planet, its periodic time and its velocity, and equation for the true and infallible relation of the perimeter of the circle to the diameter thereof has thus been discovered.

Heretofore the perimeter of the circle has been a process of repeated attempts to approximate the circle by dividing it into the greatest number of straight lines of a regular polygon. The true mathematical formula for Pi, as it is commonly called after the Greek letter, has been sought for more than 2700 years. The laws of motion and of gravitation are the direct source of this evolution.

Mr. Clark announces the rule, or formula, narratively as follows:

"The product of one-half the periodic time, of any orbital body of the Solar System, and its velocity, when divided by the square of the quotient derived by a division of this Constant of Organic Energy by such velocity, is the infallible perimeter of a circle."

In mathematical formula it may be stated thus:

$$\left[\frac{\text{Periodic time in seconds}}{2} \right] \times \frac{\text{velocity in miles per seconds of time.}}{\left(\frac{178,275,065423786200}{\text{Velocity}} \right)^2} = \text{True Perimeter or Pi}$$

Lawrence Mott, 6XAD, Catalina Island, and Ernest Hobbs, 2ADM, Schenectady, New York succeeded recently in establishing daylight communication across the continent. 2ADM operated on 195 meters and 6XAD on 230 meters. Tests supervised by the A.R. R.L. indicate that transmitting conditions are often excellent until 90 minutes after sunrise.

Building the Neutroflex

By M. S. ADAMS

Harkness fans step forward. We present for your inspection a lineal descendant of the Harkness set, yet one which handles ether-jiggles like a Neutrodyne. Some day a lot of us will get together and give our college yell—"Hark! Hark! Harkness".

A LOGICAL development of a logical set is the Neutroflex. No set, not even excepting the terrific "blooper" single circuit has had popular approval like the tuned reflex designed by Kenneth Harkness. Thousands have been home-built, thousands sold for what they are, and still greater thousands disguised under fancy trade names. However, distance, especially loudspeaker distance is dependent upon a good aerial, a fortunate location, and freedom from powerful local broadcasting. Immediately a howl will go to the heavens, long lists of stations received will be presented, and authentic reports of marvelous reception under adverse conditions shown. For every set doing this, though, there is another that has never received out of town; so the average performance is about as above stated.

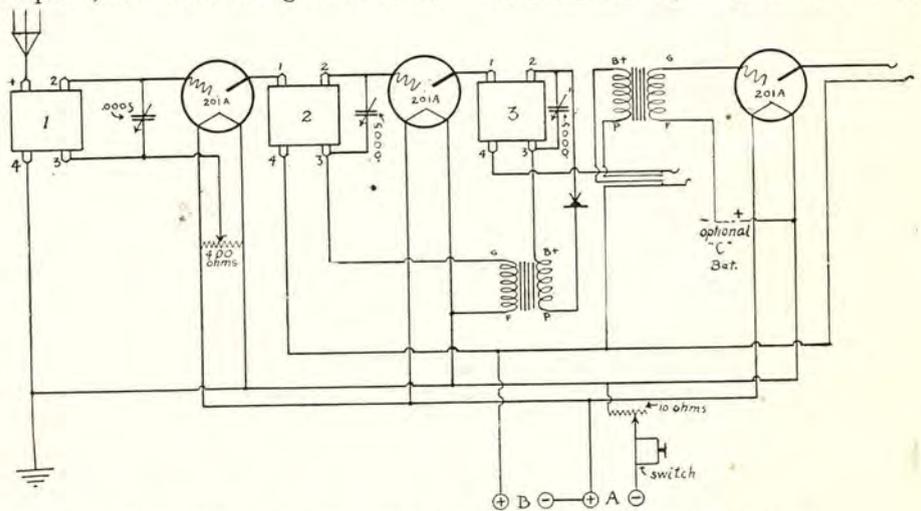
Upon finding the possibilities and limitations of the set the same thought struck every real radio bug at once: a step of radio frequency! All spare couplers, neutroformers, T1's, and condensers were collected, and work started upon a beautiful example of a hay-wire set. Then, trouble, howls, squeals, and trouble. The Harkness is dependent upon absorption into the detector circuit for control of oscillation, and apparently upon antenna absorption as well. When a new neatly wired layout failed to work, the average fan gave up in disgust.

Not so, however, with C. D. Tanner, of 528 W. Washington, Los Angeles. The difficulties were taken up in order

and eliminated one by one. First, in the Harkness end it was soon discovered that coils T1 and T2 would have to be completely re-designed with a view towards increasing detector circuit absorption, and minimizing both induc-

fact that the factory-built sets are often operated on plate voltages up to 175 without any signs of blocking, ringing or injury to the filament.

The R. F. now being satisfactory, attention was again given to the re-



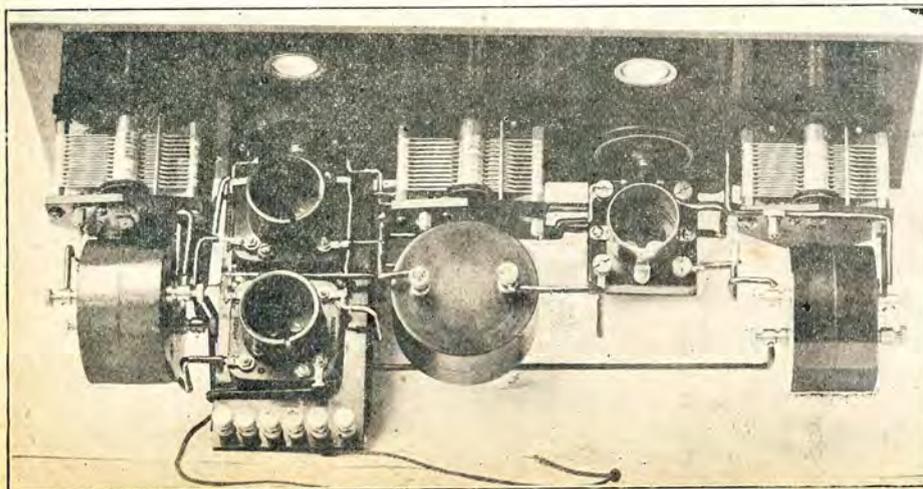
This is the circuit diagram of the Neutroflex. It does the trick too.

tive and capacitive feedback to the R. F. tube. The Harkness tamed fairly well, attention was centered on the straight radio frequency tube. An antenna coupling coil of the Neutrodyne type was tried and proven satisfactory. The still present oscillation was attacked by both the counter E. M. F. and capacity methods, but now such a minute amount of either was needed that the simpler potentiometer grid biasing was made possible. A very slight reduction of the inherent negative bias completely stabilizes the set. That there is a true negative bias is proven by the

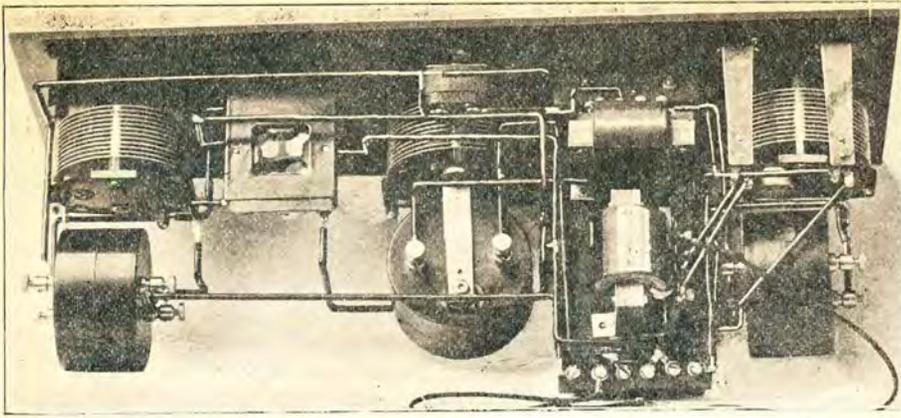
flexed tube. The added volume provided by the first tube permitted, or rather compelled a reduction in the turn ratio of the audio transformer in the reflex stage. This has the effect of even bettering the tone quality of the original Harkness.

This added signal strength also allows the use of a fixed mineral detector with scarcely any loss of volume or distance.

The layout and wiring is not at all difficult, but of course requires more care and thought than a crystal set. A 7x18 panel is recommended, with a 3x7 sub-panel for the last two sockets and the audio transformers, which are mounted on the bottom side of the panel. The three .0005 variable condensers are mounted 7" apart, with the potentiometer between 1 and 2, and the rheostat between 2 and 3. The first radio frequency tube uses a panel mounting socket preferably a Federal, as the undercut feature gives extra room for mounting the potentiometer. The rheostat should be of the semi-circular type to permit the sub-panel being raised enough for the underneath mounting of the audio transformers. Sockets and audio transformers are mounted by machine screws in tapped holes in the panel, care being taken that the screws do not come clear through to the opposite side. The



Showing arrangement of Neutroflex parts, from above.



Showing arrangement of Neutroflex parts, from below. Note fixed crystal mounted on condenser.

sub-panel itself is mounted to the main panel by a brass angle plate. The fixed crystal, visible between the two jacks in the bottom view, is mounted directly on the last variable condenser by means of the regular projecting screw from the stationary plates. The special radio frequency transformers are supplied with brackets for mounting directly on the condensers.

With a correct lay-out wiring is very simple. "A" and "B" battery leads may be bunched, but special care must be taken to keep plate and grid leads separate. Of course the usual precautions about strong mechanical and good electrical joints must be observed. The only difficulty likely to be encountered is in the selection of a crystal. One with a comparatively low resistance and requiring a fairly heavy contact is needed, but after it is installed will give no trouble. The audio transformer next to the main panel is in the reflex stage, as is the socket directly above. The "C" battery of from 3 to 9 volts is connected in by flexible leads.

Minor details of assembly are dependent upon the make of apparatus used, but it is strongly urged that the general layout shown in the pictures be followed. The complete list of materials given below may be purchased for about 50 dollars.

- 1 7x18 panel.
- 1 set Neutroflex transformers.
- 3 .0005 variable condensers.
- 2 single sockets.
- 1 panel mounting socket.
- 1 fixed crystal.
- 2 3½ to 1 audio transformers.
- 1 sub-panel and bracket.
- 1 10-ohm rheostat.
- 1 400-ohm potentiometer.
- 3 3-inch dials.
- 6 binding posts.
- 2 2¼ inch dials.
- 2 bezels.
- 1 "A" battery switch.
- 10 lengths bus bar wire.
- 7 lengths spaghetti.
- 1 single jack.
- 1 double jack.
- Miscellaneous screws, soldering

lugs, etc.

The finished result is a three tube set closely approximating the Neutrodyne in distance and selectivity, yet one possessing a clearness and fidelity of tone almost unbelievable to a person unfamiliar with the original Harkness. Volume on local stations using maximum amplification is literally so great that it is necessary to shout to be heard above the still clear, clean reproduction; while KGO, KFKX, KGW, KPO, WDAF, WSB WFAA WBAP CFCN, KYW, WJAZ, WKY WDAL and many others are had with good loud speaker volume.

In the next issue Mr. A. L. Munzig, whose work in radio is already well known to readers of this magazine, will launch an extended series of articles on the super-heterodyne. This method of reception, in which Radio Journal pioneered the field in publishing articles far in advance of any other publication, is steadily growing in value and interest. In fact Mr. Munzig, in accord with many other radio engineers, believes that the super-heterodyne will prove the greatest advance in radio for some years. Mr. Munzig has been developing some radically new ideas on the super which will be divulged to Radio Journal readers in this series of articles.

Radio was prominent in the discussions of the American Newspaper Publishers Association recently at the Hotel Waldorf-Astoria, New York City.

That the number of newspapers operating their own radio broadcasting stations has decreased from 100 in October, 1922, to 45 at the present time, was disclosed in the report of the Committee on Radio, of which Walter A. Strong of the Chicago News is chairman.

John Hays Hammond, Jr., vice-president of the Radio Engineering Corporation, sailed from New York for Italy, where he said he would carry out a commission for the Italian Government involving a new system of radio broadcasting, whereby the radio "fan" would pay for his concerts.

Mr. Hammond said that receiving sets, mechanically devised to tune in on the station, would be rented to the public. All other sets would be unable to "listen in," he explained.

"The Italian Government is organizing broadcasting on a different basis from that in the United States where the broadcasting is done generally for publicity or advertising purposes," Mr. Hammond said. "The developments which I will introduce will be superior to the broadcasting methods here."

Bishop Thomas Nicholson of the Methodist Episcopal Church, with headquarters in Chicago, Ill., issued a statement urging the establishing of church radio stations. Bishop Nicholson says that radio has unbounded possibilities for good. He maintains the radio will not keep people away from church, as is sometimes said, but "will enable thousands to hear religious messages who could never otherwise hear them." Continuing, the Bishop says: "Radio would even be a money saver, although I am not advocating its establishment for that purpose; it would be cheaper for persons living in inaccessible sections to own receiving instruments than to pay home missionaries to hunt them out."

An improved system of relaying will be installed near London, to facilitate the reception of concerts broadcast from the United States on a low wavelength. Once every two weeks British broadcast listeners will be afforded the opportunity of "hearing America" on their regular receiving sets—even with one-bulb outfits.

It is interesting that the broadcasting will take place between 11 and 12 o'clock at night, which corresponds to between 6 and 7 o'clock in the United States.

The experimenters of the British Broadcasting Company have been listening for American signals every night of late, but the results have varied. Successful transmission and reception depend very much on the darkness.

The impresario of station KFNF, Shenandoah, Iowa, is striving to educate Penelope, a pig, the station's mascot, so that she will be able to give a flourishing signing-off call as a characteristic feature of the station. WLAG, Minneapolis, has a rooster that sometimes crows at the end of the program.

Electrical Units and Fundamentals

By PROF. H. LaV. TWINING

Professor Twining, in this article, begins the real discussion of radio capacities and their relationships. The series, when complete, will have carried the reader through the entire radio equipment list.

IN the last issue it was shown that one watt second is equal to 10^7 dyne centimeter seconds; see formula (15); that one volt is 10^8 times one absolute electro-magnetic unit of potential, see formula (16); and that the ratio between the electro-static system is (3) $(10)^{10}$.

There are two other ratios in which we are vitally interested in radio, i. e., the ratio between capacity in centimeters and farads and the ratio between centimeters and henrys in the case of inductance.

In the case of an alternating current free from inductance and capacity the voltage and current rise and fall regularly and together. They are then said to be in phase with each other, or in other words they are in tune, speaking from the standpoint of radio.

When the current is zero, the voltage is zero. When the current reverses the voltage reverses and when the current is at a maximum the voltage is at a maximum. The reasons for this and the relationships are explained as follows (see Figure No. 1).

Let N and S be the north and south poles of a dynamo and suppose that the magnetic lines of force flow straight across from N to S all over the field between N and S. Let A be the cross section of a conductor rotating left handedly in a circle under the poles N and S, then in the position A no current and no voltage is generated in the conductor. As A proceeds toward N it begins to cut the lines of force at a slight angle, which increases until it reaches a right angle at N where the maximum effect is produced.

Thus the voltage produced rises from zero to a maximum in passing through a 90 degree angle.

It falls from 90 degrees to zero in passing from N to B where it reverses and repeats the process under the south pole coming again to zero at A.

The value of the voltage and the current at any position depends upon the sine of the angle of cutting.

In Figure No. 2 let AB be a conductor moving parallel to itself perpendicular to the lines of force which are represented as going perpendicularly down into the page by the crosses in the diagram. The voltage produced is proportional to the rate of cutting. Suppose AB proceeds from AB to EF in one second. Then 28 lines are cut per

second and hence $(28)10^{-8}$ volts are produced. If the conductor be placed in the position DB making an angle Γ with the lines of force shown in the figure, and if it be moved parallel to itself to the position GH in one second, then it cuts only 16 lines per second and the voltage generated is $(16)10^{-8}$.

In the figure it is seen that the component BO of the conductor DB cuts the lines perpendicularly while the

Perpendiculars are erected at the equal distances N, Q, T, etc. Lines from F, G and H are drawn parallel to OE. The intersections of these parallels with the perpendiculars at M, P, C, etc., are points in what is known as a sine curve and this curve is formed by connecting these points.

The voltage generated at each instant in the face conductors of an armature rotating in a uniform magnetic

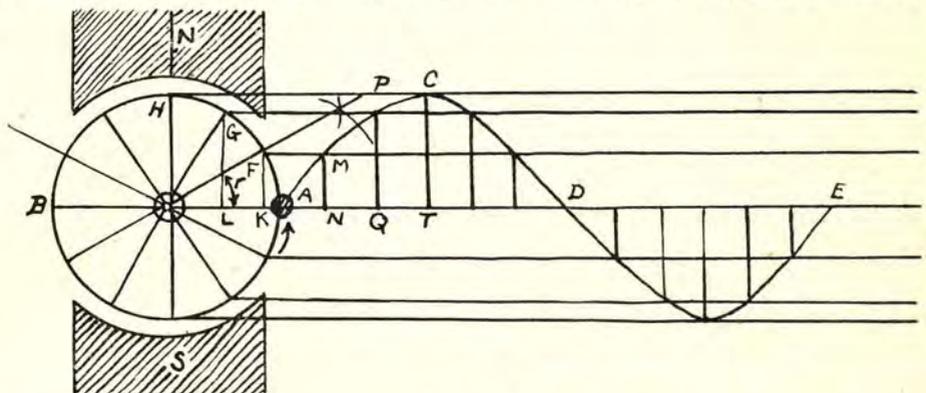


Figure 1

component DO does no cutting since it is parallel to its line of motion. This is very readily seen if the conductor DB is long enough to be bent into a stair shape with as many steps as there are rows of lines. The perpendicular parts do the cutting but the horizontal parts do no cutting. So the voltage is produced by the perpendicular parts of the conductor and not by the parallel parts.

The sum of the perpendicular parts is equal in length to OB.

But OB is called the sign of the angle of cutting.

If CB is moved parallel to itself in the direction CB no voltage is produced since CB will move parallel to the lines.

So when a conductor moves so as to cut a magnetic field or vice versa the effect produced is proportional to the sine of the angle of cutting.

Referring again to Figure No. 1, the effect of the movement at O is zero. The effect at F is proportional to FK which is equal to MN. At G it is GL or PQ and at H it is HO or CT, etc., through the whole cycle.

The circle in Figure No. 1 is divided into twelve equal angles. From A twelve equal distances are laid off to any scale.

field is thus proportional to the sine of the cutting angle and it is found as follows:

In Figure No. 3, let OA be the radius of the armature. Construct AB perpendicular to OC. Then in the right angle triangle, AOB, AB is the sine of the angle Γ . If $AB = E_1 =$ the instantaneous voltage when the conductor is at the point A, E_m which

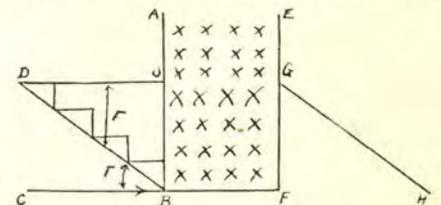


Fig. 2

equals the radius OA is the maximum value which the voltage can attain.

We have:
$$\text{Sine} = \frac{E_1}{E_m}$$

or $E_1 = E_m \text{ Sin} \quad (a)$

also $I_1 = I_m \text{ Sin} \quad (b)$

When everything is in phase or in tune.

The total through which A moves in a given time t is found by multiplying the angular velocity by the time, thus:

$$\Gamma = wt$$

Where Γ is the total angle covered in the time t and w is the angle covered per second. Substituting this in (a) and (b) we have

$$E_1 = E_m \sin wt$$

$$I_1 = I_m \sin wt$$

The angular velocity w is related to the frequency as follows:

Since one revolution per second is one cycle per second assuming the radius to be unity; the angular velocity expressed in cycles is

$$w = 2\pi \text{ radians for one cycle per second.}$$

$$w = 2\pi 2 \text{ radians for two cycles per second.}$$

$$w = 2\pi 3 \text{ radians for e cycles per second.}$$

etc, to — —

$$w = 2\pi n \text{ radians for n cycles per second.}$$

But the cycles per second and the frequency are one and the same thing, hence:

$$w = 2\pi f$$

Where f stands for the frequency in cycles per second.

In a purely inductive circuit the rise and fall of the current produced a rising and falling magnetic field which cuts the conductors of the circuit producing a counter-electro-motive force which is constantly equal and opposite to the impressed electro-motive force; this causes the current to lag 90 degrees behind the voltage.

In figure 4, A, the rising current is shown moving perpendicularly downward into the paper. By the right hand rule the so-called positive current produces a right hand field which moves out and cuts B.

By the induction rule a current is induced in B with a field having the same direction as the field of A at O in the side of contact. When the current in A is at a maximum the current in B is zero because the field of A is then stationary and there is no cutting.

When the current in A is passing through the values near zero the current induced in B is a maximum because the lines of force are rising outwardly the most rapidly, hence the maximum current flows in B. The same remarks apply to the voltage. This is called mutual induction.

The same thing occurs in the case of a current rising in the conductor itself.

In Figure No. 5 the same description applies as in Figure No. 4, but all within the conductor itself. A counter pressure is formed at all such points as B, due to a rising current at all such points as A which is exactly equal and opposite to the impressed pressure.

Thus the current I lags E by 90 degrees because one is zero when the other is a maximum and on reference

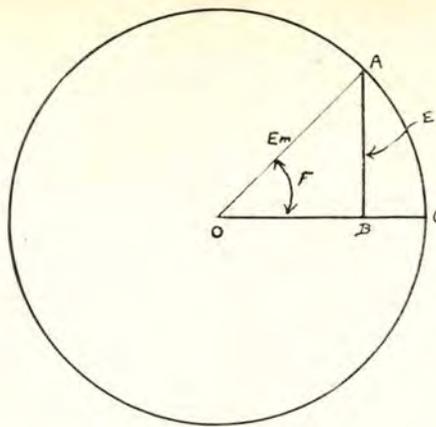


Fig. 3

to Figure No. 1, this is seen to represent a 90 degree relationship since the current is zero at A and at a maximum 90 degrees from A at N.

That physical property of the current which enables it to produce this counter-electromotive force is known as the inductance of the circuit. It is represented by L and since the counter voltage is produced by a rate of cutting

$$-E_1 = -L \frac{dI_1}{dt} \quad (e)$$

Where $-E_1$ is the instantaneous counter voltage, L the inductance and

$\frac{dI_1}{dt}$ the instantaneous rate of change of the current. This is Ohm's law for an inductive circuit.

$$\text{but } I_1 = I_m \sin wt$$

$$dI_1 = I_m d(\sin wt)$$

$$\text{or } dI_1 = I_m \cos wt d(wt)$$

$$dI_1 = w I_m \cos wt dt$$

since w is a constant

$$\text{or } \frac{dI_1}{dt} = w I_m \cos wt \quad (f)$$

substitute (f) in (e) then

$$-E_1 = -w L I_m \cos wt$$

$-E$ is at a maximum at $\Gamma wt = 0 = 180$ degrees or 360 degrees, but $\cos wt = 1$ at 180 degrees or 360 degrees hence

$$-E_{1m} = -w L I_m$$

hence

$$-E = -w L I$$

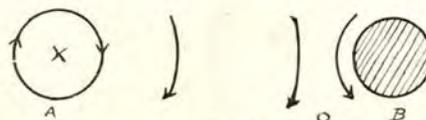


Fig. 4

Since the ratios between E_{1m} and E and I_m and I are equal, it cancels from the equation. This will be shown later.

This is Ohm's law in a purely inductive circuit.

Leaving off the negative signs,

$$E = w L I \text{ in the volt ampere system}$$

and $E_k = w L k I_k$ in the static system.

Dividing one by the other

$$\frac{E_k}{E} = \frac{w L k I_k}{w L I} \quad \text{or}$$

$$300 = \frac{L k}{L} \frac{1}{(3)(10)^9} \quad \text{or}$$

$$\frac{L k}{L} = 9 \cdot 10^{11}$$

also $E U = w L U I_m$

$$E = w L I$$

$$\frac{E}{E_u} = \frac{w L I}{w L m I_m}$$

$$\frac{E}{E_u} = \frac{I}{I_m} \frac{1}{10}$$

$$\frac{E}{E_m} = 10^8 \quad \text{and} \quad \frac{I}{I_m} = 10$$

$$10^8 = \frac{L}{L m 10}$$

or $\frac{L}{L m} = 10^9$

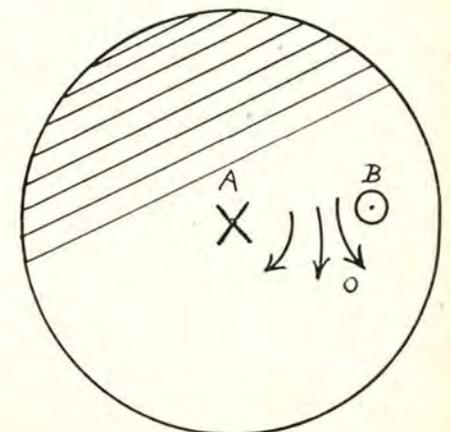


Fig. 5

Radio is rapidly becoming a part of passenger ship entertainment. Some weeks ago the Llewellyn Electric Company of Los Angeles installed a handsome set on the steamer "Harvard" of the Los Angeles Steamship Company and now the same company secured the contract to install similar broadcast receives on the sister ship Yale. Both vessels ply between San Diego and San Francisco.

The Lincoln Radio Company, manufacturers of the well-known Lincoln Fixed Adjustable Crystal will move into their new building, Twelfth and Santee Streets, Los Angeles, Calif., within a few weeks. J. R. Skaletar, general manager, states the new structure, in which the company will have 1250 square feet of floor space, will enable the Lincoln to increase its manufacturing output as well as its rapidly growing wholesale business.

How to Build the Super-Reflex

By EDWARD J. WIGGINS

The set described in this article was originally constructed under the personal supervision of Mr. Wiggins, who is chief engineer for the Electrical Research Laboratories. The reflex, temporarily eclipsed by other types, is coming back, and the newer type reflexes are of growing interest to all our readers.

A NEW receiving circuit with coast-to-coast range on the loud speaker and with only two adjustments, has just been perfected by the Electrical Research Laboratories and is given out to those who "roll their own". It is not a manufactured set. This circuit can be accurately logged on its two adjustments and its selectivity is as good or better than any other circuit yet devised, with the possible exception of the superheterodyne.

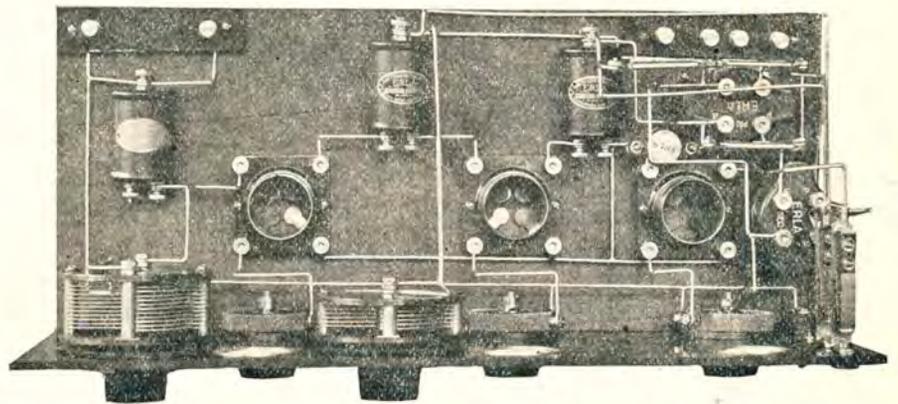
The circuit is a development and refinement of the Erla three tube duo reflex and the secret of its unusual selectivity and volume is the selectoformer, a new device perfected by the Laboratories, which takes the place of a variocoupler, switches, taps, etc., which have always complicated tuning to a greater or lesser degree, depending on the ability of the person operating the set.

The selectoformer requires no ad-

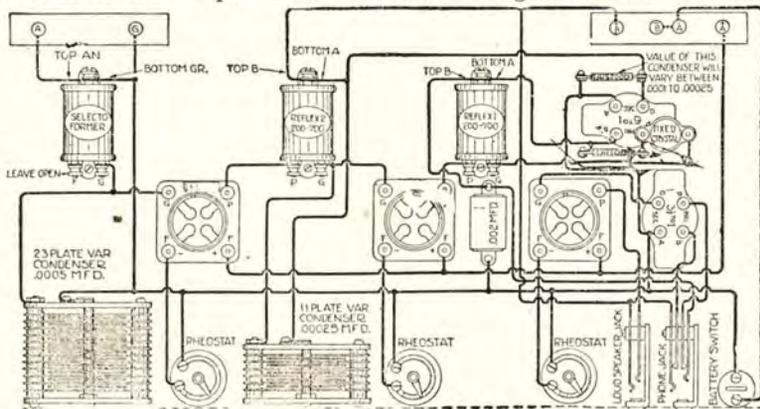
justment and has for its main object full a coupling as if the total inductive and capacitive coupling between the primary and secondary circuits is always fixed at a very low value by the selectoformer. With other couplers,

reducing the coupling reduces the volume of signals. The selectoformer due to its peculiar design, reduces the apparent resistance of the secondary circuit and therefore increases the signal volume.

In addition to this novel tuning device, the new circuit contains one stage of straight tuned radio and one stage of reflexed radio and audio frequency and one stage of straight audio frequency amplification. A crystal detector



Showing peculiar mounting of transformer and condenser.



Wiring diagram of the new Erla Super Reflex with selectoformer.

justment and has for its main object the coupling of the antenna to the receiver without broadening of signals. The antenna circuit is never tuned to resonance with any particular incoming signal, and the coupling of the antenna to the receiver is only sufficient to excite the receiver at the wave length to which it is tuned, without adding the resistance of the antenna circuit to the secondary circuit, which always causes a broadening and reduction of signals.

Cuts Inductive Coupling

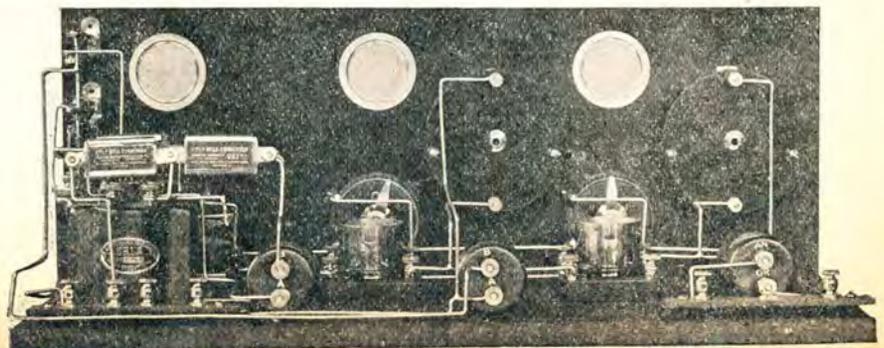
With the usual variocoupler it is possible to reduce the inductive coupling between the primary and the secondary to a fairly low value, but capacitive coupling still exists, which allows as

to its peculiar design, reduces the apparent resistance of the secondary circuit and therefore increases the signal volume.

In selecting the fixed condensers be sure they are marked "tested capacity" not "tested mica", or "tested copper". The guarantee of capacity is necessary to get the proper value.

Tests show that for this circuit, as well as all efficient amplifying circuits, the UV201A and the C301A tubes are the best and these will require 25 ohm rheostats. Of lower efficiency are the UV199 and C299 tubes, which require 30 ohm rheostats. The WD-11 and WD-12 tubes are not recommended, but if used will require 6 or 8 ohm rheostats. In this circuit the first and third

(Continued on Page 189)

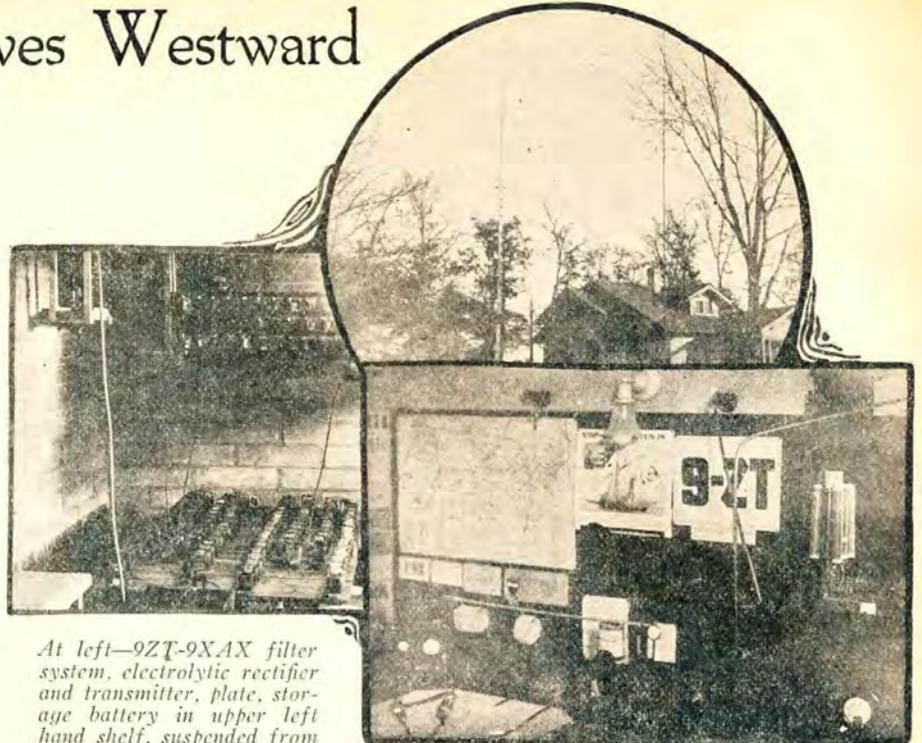


Hoover Cup Moves Westward

THE Hoover Cup moves westward—this time being won by 9ZT, Don C. Wallace of Minneapolis, Minn., one of the best known radio amateurs of the country. Mr. Wallace has accomplished much, not only for amateur radio but for radio in general, through experimental work which he has been conducting for many years. Be it known, moreover, that Mr. Wallace is in no way interested commercially in radio, but all of his work has been done for pure love of the science. Photographs of his station are published in this issue.

Mr. Wallace has just received a request from Chile asking him to send special signals for them, using his call 9XAX. In a letter to Radio Journal he expresses the wish that west coast X calls would get down on 105 to 110 meters. "We are working everywhere on those waves," he writes, "and the Sixth District is only represented by three or four stations down there. Five watts will be enough if it is on 105 meters—tell them to keep about 105 as WGY, KDKA and local harmonics jam below that."

Mr. Wallace conducted a series of experiments which linked isothermal lines with radio reception and transmission, and the results of which we published from time to time. He replies



At left—9ZT-9XAX filter system, electrolytic rectifier and transmitter, plate, storage battery in upper left hand shelf, suspended from ceiling to make leads short to set immediately above. At the top, in circle, is the antenna, wood mast 85 feet, iron mast 60 feet, spread 60 feet six inches enamelled No. 14. Counterpoise spread in all directions for 100 feet under antenna. Below, at right is the set itself, winner of the Hoover cup.

to our most recent query with the statement that apparently isothermal lines are unimportant on 110 meters or below, but that they seem to mean most on other wave-length in the summer time.

exceptionally interesting situation this summer, and a nationwide survey discloses the fact that at no time has the industry been geared to give a higher standard of service to the radio public.

Conventions Broadcast

"In the first place," said Mr. Mallory, "the Democratic National Convention in New York in June and the Republican National Convention in Cleveland during the same month, will place the radio 'fan' right in the thick of the pre-election campaign. For the first time in the history of the United States virtually millions of people will 'attend' the national conventions. They will be able to follow each issue as it is debated on the convention floor; they will hear the nomination speeches of 'favorite sons'; the thunder of applause for popular candidates—the music, the clamor and excitement of the impromptu parades which will spring up from time to time on the convention floors. Elaborate arrangements are now being made so that the greatest possible radio audience may be able to listen in on these conventions.

"Immediately after the conventions will come the Presidential election campaigns. There again radio will play an epoch-making part, for it is clear that every candidate is preparing to broadcast through the air his appeal to the electorate.

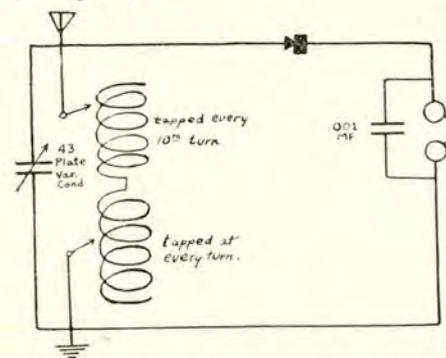
Reception Improved

"The fact that there are more Class B high-powered broadcasting stations in operation this year than last year, is assurance to the radio audience that

Long Range Crystal Set

Your paper and its contents are very good, but there is NO circuit made which does not interfere with somebody else. I have never traveled 'West' or 'East', but the City of Chicago is composed of everything national, mechanical and electrical, and the last word in radiophone interference. Our neighbor can cut us off entirely, at will, which makes our set useless. That is one way, of a thousand and one, of making the many varieties of radio sets a nuisance instead of pleasure! I have had KDKA, East Pittsburgs, Pa., on a crystal set, in Chicago, (a simple set) and, again, I could not even get WMAO, WDAP, and WJAZ faintly, and KYW (Keep Your Wife) with a terrible lot of cutting off and general

interference. KDKA was an induction leak to my line.—JOSEPH GROSS, Chicago, Ill.



With this simple crystal set J. A. Gross, 7803 Bishop St., Chicago, picks up KDKA, while his own very near station WAAF is on.

Big Radio Summer in Sight

PLANS and programs just completed by the larger broadcasting stations in the United States, as well as by the leading manufacturers of radio apparatus, will make the summer of 1924 the greatest radio summer since broadcasting was begun.

This is the announcement made by E. B. Mallory, Chairman of the Radio Section of the Associated Manufacturers of Electrical Supplies, which includes in its membership all of the leading factors in the radio industry. Extraordinary circumstances have combined, he declared, to create an

reception during the hottest summer months will be vastly better. The new allocation of wave lengths, particularly among the higher powered stations, it is generally agreed, will eliminate much of the interference that resulted from conflicting wave lengths.

Improved Receivers

"Another factor that will make for good reception this summer is the striking improvement noted by our technical committee in the new receiving apparatus now on the market. It is impossible of course, to measure mathematically the advances made by the radio manufacturing industry in the course of one year. But this may be

said: one of the results of the many notable improvements made in receiving sets is that day-time reception this summer will be better than night-time reception in previous years. This insures that the splendid program of sports, music speeches and entertainment planned for this summer from many broadcasting centers will be received with great satisfaction by the millions of radio listeners in the United States."

Preliminary reports from radio distributors and dealers, Mr. Mallory concluded indicate the expectation of record-breaking summertime sales of radio apparatus this year.

change and thermo effects at the joints while the graphite or carbon rheostats are subject to microphonic and other effects. The above statement applies to all sets. In the writer's pet circuit the R3 Hook-up a Bradleystat is used. This is written without any prejudice to the makers of this excellent little article that, while they are the best so far, they are not all alike, and the experimenter is advised to carefully check this item for supposed tube or static noises.

Big New Station

A LARGE experimental radio station will shortly be built by the General Electric Company for a more complete investigation of radio phenomena and broadcasting. It is understood that the cost of the experimental station will be approximately \$150,000, and that it will be located on land recently acquired by the company in Schenectady.

While no plans have been drawn for the new station, it is understood that the Central Electric Company will build a power house capable of delivering a high power at various frequencies, and antenna structures will be erected for a wide range of wavelengths so that systematic investigation can be made of the advantages of various wavelengths in solving the many problems with which radio now has to deal.

The requirements of the present-day broadcasting program, including stock reports at noon, an afternoon program for those at home, evening stock and market quotations, weather reports, musical programs, plays and religious services, have filled up the available time. It has also been found that the space available in the power house and operating section of the big broadcast-

What Makes that Set Noisy

By J. T. ROFFY

SOME of the best constructed sets possess a continuous crackling noise which is generally misnamed as static or tube noises, while as a matter of fact it may be any one of the following causes, subject to a quick remedy. It is assumed that the reader knows that all plate and grid leads in a set should be as short as possible. That such units as radio and audio frequency transformers should be placed at an angle to each other and at least three to four inches apart; that the stationary plates of condensers without exception should be connected to the grid side of the circuits and that the rotating plates should be connected to the battery or ground leads. Wires running to and from all condensers whether they be of the fixed or variable type should be of short length, large cross section securely soldered, and without bends or turns and that before assembling any set, tube sockets should be securely tightened on their individual contacts before starting the wiring and further, that in wiring a set soldering compounds or pastes should be used sparingly and wherever two wires are to be joined a mechanical contact should be established, that is clinching one wire upon the other before soldering. If after these precautions the set still possesses a crackling noise it is still not always tube or static fault. The next thing to examine is the insulation of the aerial and its lead-in. Nine-tenths of the aerials examined by the writer lack sufficient insulation and ninety-nine out of every one hundred omit the insulating knobs on the guide wires supporting the aerial posts. It is absolutely necessary that guide wires shall have at least two insulators to break up any radio frequency current that may be gathered by the guide wires, that between aerial post and aerial proper there should be at least

eighteen inches and one or more in-

ulators and leading in wires should not be wrapped around insulating posts. They should be kept at least eighteen inches from the eaves and walls of the building. Further the ground wire should be straight and direct to the ground and the piping in a building is often insufficient as a ground.

Now if your A and B batteries possess the required charge and short and large cross section wires are securely fastened to the contacts then, and only then, can you attribute the crackling sounds to static or tube noises.

In enumerating the above possible causes there has been one item left open for further discussion and that is that in all sets it is necessary to use some form of a rheostat. Whenever a wire wound rheostat is used the sliding contacts should be firm and clean and even then the resistance wire used in some is subject to temperature



Charles K. Field, editor of *Sunset Magazine*, (left), and Stuart Edward White, novelist and big game hunter, staging a "radioview" or broadcast interview before the microphone at KPO, Hale Brothers, San Francisco. In this "radioview", Mr. White discussed a forth-coming article on the "come-back" of the bow and arrow as a real weapon for hunters who want to be real sportsmen.

ing station is not sufficient to permit experimental work without interfering with the regular programs. On this account a new station was considered necessary for intensive experimental work.

The broadcasting station now known the world over as WGY was originally built, several years ago, for experimental purposes. Operating under the experimental license 2-XI it has conducted various radio experiments and added materially to the fund of available knowledge. It is well known by advanced radio fans and those familiar with the workings of the station that the regular programs have been broadcast for many months at two wavelengths—the regular wavelength of 380 meters available to those using standard receiving outfits and also a lower wavelength of 107 meters which has been found particularly well adapted to long distance transmission

for re-broadcasting. On several occasions during the early spring, WGY's programs have been rebroadcast by the British Broadcasting Company in London and thus made available to the British Isles as well as to France and other continental countries. This is only one of the experimental developments to which WGY has contributed.

No one believes that radio and radio broadcasting will remain stationary. The remarkable advances which have been made in the last few years indicate a continued rapid development. The General Electric Company aims to perfect broadcasting so that it may become even more reliable and satisfactory. The service which radio now renders to the farmer and to all that large proportion of the population in outlying districts is invaluable, but it can be made an even greater factor by further perfecting.

Radio Amateurs Rescue Ships

By LOUIS GROMBERG

With the old coast station that used to operate at this city out of commission, due to a storm which completely demolished one mast of the antenna, radio amateurs came to the rescue of a number of lake steamers. For a number of weeks the Duluth-Superior entries to Lake Superior were tied up with huge blocks of ice, which extended seven miles out from the Twin Ports. As shipping from the lower lakes had already started, approximately forty ships were on their way to the Duluth-Superior harbors.

When the boats encountered the ice, they found that the obstacle was too big to overcome, so the only thing to do was to lie in wait until the wind blew the ice away. About ten of these ships were equipped with radio transmitters and receivers and their operators endeavored to communicate with their head offices in Cleveland by working some land station. However, their efforts were fruitless for they found one kw spark too weak to work the necessary distance.

Amateur radio stations 9ADF, 9DOE and 9DFN worked these ship stations, handled traffic for them, and sent weather reports in order to facilitate more immediate release from the ice fields. A Bergtold, operating station 9DOE, took three messages from three different ships and immediately forwarded them to Cleveland by wire telegraph. Station 9ADF took a number of press reports and turned them over to local newspapers in addition to giving several of the ice-locked boats weather reports.

The receivers used by the amateurs were only short wave sets, primarily built for work from 80 to 300 meters,

while the transmitters on the ship stations were tuned to 600 meters. The ships' receiving sets were crystals for spark and phone reception only and, therefore, the amateurs were compelled to switch from CW to phone in order to be heard by the ship operators.

Radio's Penetration

An interesting experiment was carried on recently by ten radio enthusiasts, including engineers and newspaper men to test the penetrating power of radio waves. The test was made in a newly cut tunnel, more than 200 feet underground, at Lakewood, Ohio. The shaft connects the river valley with Lake Erie and when complete will provide an outlet for a service disposal plant now under construction.

All the apparatus had to be carried down a flight of steps leading to the mouth of the shaft. It was estimated that this flight was about five degrees out of perpendicular. To add to the difficulty of their progress they were without any hand rail or any safeguard from falling. The trip down was started at 8:30 p. m. with only small pocket flash lamps to light the way, and the temperature was 20 degrees below the freezing point. A pronounced breeze blew from the lake through the tunnel, the lake being only a mile and a half away.

After having penetrated to the approximate centre of the shaft, the receiver was set up with the aid of spotlights operated by storage batteries.

After much twisting of dials and straining of ears the signal of station WTAM Cleveland, about 20 miles away, came in, the poor results obtained being due to the fact that the aerial was erected too close to the walls

of the shaft, which caused ground capacity and distorted signals.

Another set up was tried about a quarter of a mile nearer the entrance. This time station KYW, Chicago; WDAR, Philadelphia; WJAZ, Chicago, as well as station WTAM came in with fair audibility.

Radio Forbidden

Some months ago the Revolutionary Government forbade by legal decree the operating of private wireless apparatus in Greece. This measure was taken largely to prevent the Greek public from being reached with propaganda unfavorable to the revolution, it is reported.

The Ministers of Finance and Marine of the present government have prepared a law to be submitted to the National Assembly for ratification, by which the operation of private radio sets belonging to Greek individuals will be permitted under certain restrictions and subject to the payment of a license tax.

No matter what type of sets you have, be it a five-tube neutrodyne or a crystal do-hicky, if you use an outside antenna and want to get the best efficiency out of it, take the antenna and insulators down at least once a year, replace the wire with new, and clean the insulators with gasoline. When replacing it, see that the connection to the lead in is either firmly clamped by means of a regulation antenna clamp, or else firmly soldered. The reason for this is that the wire becomes oxidized, or black, thereby offering a high resistance to the radio waves. This is not true, however, when insulated wire is used for the antenna.

Many builders of sets are only partly satisfied with the results of their receivers and are ever looking for hints as to their improvement.

A potentiometer included in the filament grid circuit of most of the single-circuit radio frequency amplifiers, and even triple circuits, will give control of the regeneration and volume of sound to such an extent that the builder will actually be surprised. It is easy to install a potentiometer in the circuit and wherever it is possible it should be used, especially with the UV199 and the other dry cell tubes.

Scotland Yard's wireless equipment includes a motor radio patrol. This station can keep in continuous communication with Police Headquarters even when the car is travelling at 40 miles an hour. Four more of a similar pattern are shortly to be commissioned. The aerial will be placed on the roof of each car and will be mounted on collapsible frames, so that they can be lowered when passing under low bridges or over-hanging tree branches.

Radio for the Banana Route

By I. M. PEEL

Things move so swiftly that we had almost forgotten to wonder what had happened to the shortage in bananas, when we discover that the United Fruit Company is putting in a batch of stations, the most powerful on the American continent, for the handling of this banana business. So we have to sing about something else.

SIX radio transmitters, to be the most powerful on the American continent, operating from vacuum tubes and first to make use of the General Electric 20 kilowatt radiotron, are being installed by the United Fruit Company and the Tropical Radio Telegraph Company at points in Central America and the United States for the purpose of completing the links of an adequate communications system between the Americas.

These transmitters will be located at New Orleans, La., Miami, Fla., Puerto Barrios, Guatemala, Tegucigalpa, Honduras, Managua, Nicaragua, Almirante, Panama.

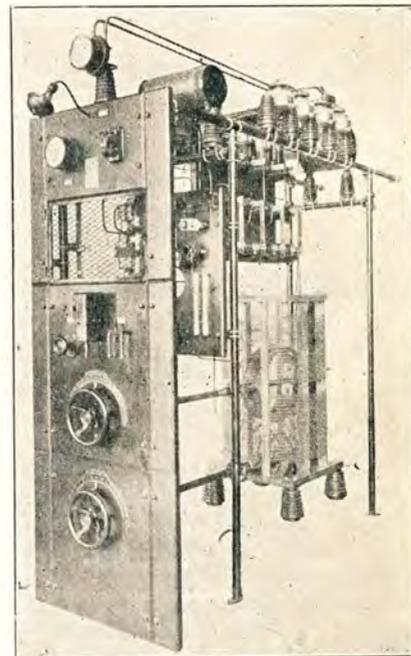
The Tropical Radio Company operate the stations at New Orleans, Miami, Tegucigalpa and Managua while the stations at Puerto Barrios and Almirante are operated by the United Fruit Company.

The sets are being completed and shipped at the rate of one a month and as about two months will be required to install each set it is expected all six will be in operation by the middle of this year.

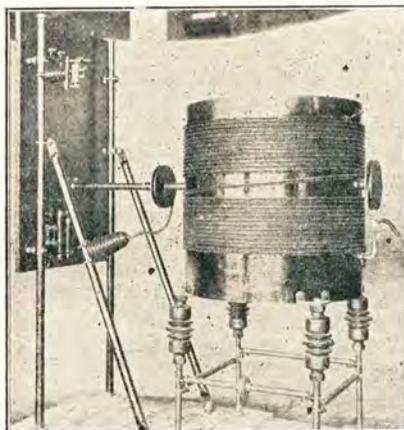
The United Fruit company established the first radio stations in Central America and was the first to establish commercial radio communication between Central America and

the United States. It was shortly after the International Yacht races off Sandy Hook had been reported by radio that the first radio sending and receiving sets were purchased and installed at Port Limon, Costa Rica, and Bocas del Toro, Panama. This was in 1904 and service was inaugurated the following year. The operation of these stations convinced the directors of the United Fruit Company that radio was practical and valuable in a business which handled such a highly perishable product as the banana. So the year following, or 1906, stations were opened at Bluefields and Rama, Nicaragua. All these stations, because of the lack of land communications,

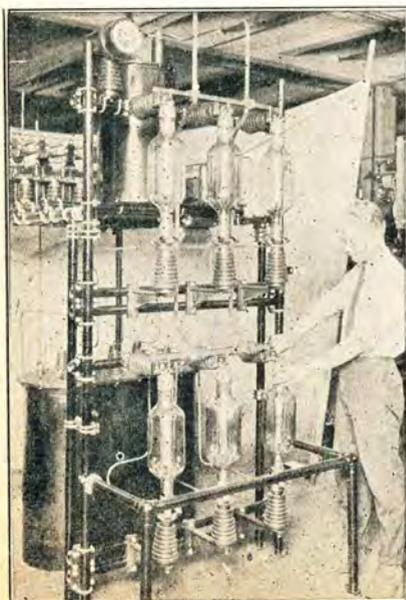
Since 1911, the radio activities of the Company in all its branches have been under the immediate direction of



MASTER OSCILLATOR FOR THE BIG STATIONS.



HERE'S THE VARIOMETER WE ARE GOING TO GET WHEN WE BUILD OUR FINAL SET. THIS IS A SIDE SLANT AT THE INTERMEDIATE CIRCUIT VARIOMETER OF ONE OF THOSE 20 KW BANANA ROUTE OUTFITS. IT MIGHT DO FOR A BATH TUB IF IT WERE FITTED WITH A BOTTOM.



KENETRON RECTIFIER UNIT FOR THE 20 KW SET.

handled in addition to the Company's business a large share of the telegraph business of the general public between these places and the United States and Europe. Other stations have followed since then until now, with the six new tube transmitter stations, there will be a total of nineteen, comprising what is known as the United Fruit Company's radio system. All stations of the United Fruit Company's system, including all their ships of the "Great White Fleet" are to be equipped with tube transmitters of a similar type.

The United Fruit Company has spent more than \$3,000,000 in the development of its radio system and upon the completion of new stations under construction its investment in radio will probably exceed \$4,000,000.

George S. Davis, who is general manager of their Radio Telegraph department. He is also president and a director of the Wireless Specialty Apparatus Company, general manager of the Tropical Radio Telegraph Company and a director of the Radio Corporation of America.

In the operation of these transmitters, in some cases where stations are located in remote places, the primary power is generated at the station by gas or oil engine driven alternators supplying 220 volts. In other stations the power is obtained from the distribution system of the local power company. This power first goes to the service panel where complete apparatus for control, protection and metering is installed. Then it goes to the rectifier which consists of a bank of transformers and six, twelve and one-half kilowatt kenetrons. Here the voltage is stepped up and rectified, to become 15,000 volts direct current. This high voltage is then used for plate power on the pliotron oscillators.

The frequency is controlled by means of a master oscillator employing

(Continued on Page 174)

Set Ailments and Remedies

By D. A. RUNYARD

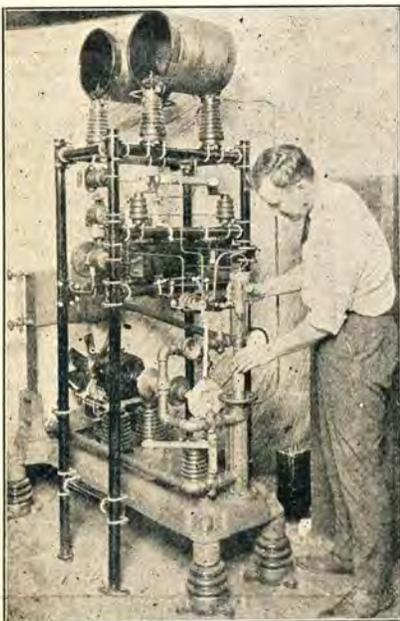
OCCASIONALLY, when you have invited your friends in to hear the Radio, it refuses to respond to your desires. The reason for this phenomena will not be attempted here. However, it is well to be prepared for any emergencies and forestall any grief that may develop when the apparatus does not receive the care that is necessary to insure good results.

In the following paragraphs it is my desire to call your attention to common symptoms of the radio receiver and suggest a remedy in each case. Contrary to general belief, most of the trouble is caused, not in the receiving set, but by the batteries and connections.

When the receiving set refuses to function properly it is well, before doing anything to the set, to inspect the voltage of both the "A" and "B"

(Continued from Page 173)

one, one kilowatt plotron. The master oscillator provides a lower power radio frequency supply which is then amplified to twenty kilowatts of power by means of one of the new water cooled twenty kilowatt tubes. The amplified power is passed through a tank circuit which eliminates harmon-



THE WATER COOLED TUBE UNIT FOR ONE OF THOSE 20 KW RADIOTRON UV-207 SETS.

ics and is then fed into the multiple tuned antenna.

Keying is accomplished by means of a relay on the master oscillator unit. This relay may be controlled from any desired distance and is adapted to keying speeds of sixty words per minute.

batteries. It is difficult to blame queer noises to any one thing. For instance, when you turn down your detector rheostat and the radio squeals, it is well to believe that the voltage of your "A" or "B" batteries has dropped below normal. A test on both batteries will probably reveal that either the "A" or "B" battery's voltage has dropped. It is well to have a small voltmeter reading up to 25 volts with which to make your tests.

It does not follow that old batteries should be used. Great care should be exercised in the care of the "A" battery. To obtain uniform results and quiet operation, a reliable battery should be selected. When having the



HIS SILENT NIGHT.

battery re-charged it is well to see that it is charged at a slow rate; that is between four to six amperes. If you own a re-charging outfit it is well to recharge, as near as possible, to the rate of discharge, and allow one-third more time; that is to say, if you operate for 20 hours at the rate of 3 amperes, you should recharge at 3 amperes for 30 hours.

Battery connections give endless trouble unless they are soldered or clamped. Spring clips are used to a great extent and are certainly not dependable. The clip corrodes and a voltage leak develops on the battery binding post; this robs you of the much needed voltage. A clamp is the most satisfactory arrangement; this insures perfect contact to the battery binding post.

"B" batteries will, if given fair care, last over a year. However, that does not mean that all "B" batteries will last that length of time. When using a high plate voltage, necessitating a large battery, it is well to buy small units of 22.5 volts, then when your voltage drops down, you can remove the low test battery, replacing it with another, thus saving the expense of a whole new battery.

"C" batteries which are employed in the grid circuit of the audio frequency in some sets will cause trouble when they run down. "C" batteries should be tested along with the "A" and "B" batteries, for a voltage drop. "Squealing" may be blamed to a low "C" bat-

tery as well as an "A" or "B" battery. "Fading" and "fuzzy" reception can be minimized by cleaning the tube and socket contacts with a fine file or emery cloth. Corrosion takes place on tube and sockets contacts and causes a great deal of trouble. Fuzzy reception

Mr. Runyard has been engaged in radio activity for the past twelve years. During the war he served in the radio branch of the service, instructed classes and built several stations. Of late he has been connected with several large radio manufacturing enterprises. He will help a lot of folks who have been having "operating difficulties."

may be caused by too high plate voltage; this, of course, can be remedied by the operator by test. On some sets, a difference of 1.5 volts will make a decided change in reception; therefore, it is well to test on numerous voltages in order to secure the best results.

There are numerous people who say they have purchased a loud speaker and can not get good results with it. It is very true that all loud speakers will not work with all sets; however, if you are bothered on that score it might be well to try adding capacity to either one side or the other of your loud speaker binding posts. If you find by testing that you see no betterment, then try shunting a small fixed condenser across the terminals of your loud speaker, from .002 to .005 Mfd. The resistance of all loud speakers, of course, varies slightly and it is well to remember that you should try different "B" battery voltages as well as capacity tests in order to get good results.

Pure tone should be the goal, rather than volume. When you are bringing in a station as loud as your set will respond, you are straining your tubes and also taxing your expensive "B" batteries.

The detector is not efficient when turned on full, hence the "hissing" and "crashing" you hear. Turn the rheostat back and give the set a chance to give you pure tone. The foregoing speaks for the radio and audio frequency as well as the detector circuit.

Any queer sounds which develop in the set can, as a rule, be traced to the batteries or their connections. It is well, therefore, to keep the lid on the set closed and look for trouble outside the set. If, however, you find that everything seems normal outside the set and the tube contacts are free from corrosion, then it is well to call on your radio dealer or one who understands the inner workings of radio to aid you. In this way it may save you considerable grief and expense.

Tuning Your Set and Selectivity

By M. C. BATSEL

Some of the principles underlying radio set operation are here outlined by Mr. Batsel, radio engineer of the Westinghouse Electric and Manufacturing Company. Tuning is a problem, until it is understood thoroughly, and Mr. Batsel has here attempted to make some of the factors which govern tuning understood so the novice can see why he gets certain results when he does certain things.

THERE are between five and six hundred broadcasting stations in the United States. In every locality it is possible to choose from several stations operating at the same time. In order to do this we should know some of the principles underlying selectivity, or the power of choice, which permits us to tune out the stations operating on wave lengths differing from the wave length of the station we wish to hear.

An electric current is caused to flow in a receiver by the waves from the transmitting station. If the receiver is tuned to the same wave length as the transmitter this current is of maximum strength and the sounds received are, therefore, loudest. Currents due to the waves of other frequency or wave length are relatively much weaker. The relative strength of the currents received from two stations of equal power and at equal distances from the receiver, when the receiver is tuned to one of the transmitting stations, depends on the difference in the wave lengths, the design of the receiving instruments, and the receiving antenna.

By properly proportioning the inductance and the capacity of a circuit, the ratio of the current received on the wave length for which it is tuned to that of other wave lengths may be made very great. The use of regeneration still further increases this ratio. The principles just stated govern the design of practically all receiving sets. If there is no powerful station in the immediate vicinity a properly designed single circuit regenerative receiver used with an efficient aerial will select the desired station and tune out all other stations that can be tuned out by any receiver capable of receiving music without destroying its quality. Two stations that are so nearly on the same wave length that a sustained note or howl is heard cannot be separated by any known method of tuning so that the satisfactory reception of music and speech is possible. If the tuning is made so sharp that one of the stations can be selected, all notes in the music of a pitch equal to or higher than the

note heard, due to the interfering waves, will be tuned out. Therefore, it is evident that the only remedy for this condition is an assignment of wave lengths that will prevent two or more stations from transmitting at the same time on wave lengths that will produce such interference.

If there are two powerful broadcasting stations in the vicinity and neither can be received without interference from the other one, it is advisable to use a small antenna. Very often an indoor antenna or small wire concealed by a picture moulding will be entirely satisfactory and does not require lightning protection, as it is indoors. If this very small antenna is not sufficient, an antenna may be used consisting of a single wire strung in the attic. If the small antenna and a single circuit regenerative receiver are used, the sensitivity of the system is in general only slightly less than when using a large antenna, and the strength of the interference is reduced in proportion to the effective height of the antenna.

When using a small antenna the adjustments for tuning and regeneration must be made more accurately in order to bring in weak stations. A very satisfactory and convenient arrangement of antennae is to install a small indoor antenna and another outdoor antenna consisting of a single wire from 50 to 125 feet long with the horizontal span from 25 to 40 feet from the earth. The outdoor antenna should be clear of wires and the metal frame work of buildings. When there is interference from a nearby station, the small antenna can be used to advantage. When there is no interference the large antenna will make it possible to tune in weak stations more quickly and without such critical adjustments of the tuning and regeneration. The very small antenna is practical only when regeneration is employed or when several additional tubes are used for radio frequency amplification.

More complicated receivers can be used with large antennae to obtain a greater degree of freedom from interference by near-by stations, but the adjustments become troublesome and annoying to the unskilled operator. The proper adjustment of the more

complicated circuits requires considerable time even when performed by an expert operator.

There is no doubt that the nearest high powered broadcasting station can render better service than can the station at a great distance, because of fading and atmospheric disturbance. If the reception of very weak stations is not attempted while the more powerful or near-by stations are operating, the small antenna and regenerative receiver will be found to meet all requirements.

If the small antenna with the single tuned circuit regenerative receiver is not preferred for eliminating interference, a receiver with coupled tuned circuits may be used for reducing the interference from a very powerful station. This type of receiver may be made by adding an additional tuner for the antenna circuit and placing it near the regenerative tuner. This additional tuner consists of an adjustable circuit made up of a variable inductance and a variable condenser. The antenna and ground connections on the regenerative tuner are connected together to form a closed circuit. The coupling is controlled by relative positions of the coils in the tuners.

A more convenient method of reducing interference from one station is to connect a circuit tuned to the interfering station between the antenna and ground terminals of the receiver. This circuit will pass the current due to the interfering station to ground and if the circuit has considerable inductance and a small capacity the desired signals are not noticeably weakened. The operation of the tuner is not complicated so much as it is when two circuits must be adjusted to tune to a station. When the tuned by-pass circuit has been adjusted to eliminate the interference, it requires no further attention.

These coupled tuned and by-pass circuits will assist in receiving distant stations when the local stations are operating; but the simplest arrangement and a very satisfactory one for receiving one of several local broadcasting stations or one of the more powerful distant stations is the small indoor antenna.

Cat Whiskers

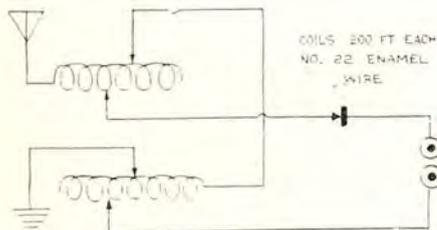
By A TICKLER

Canine Verse

We are all noodled up, as the expert tape slinger said to the waitress. Leon A. Morgan has broken loose again. Without further incriminating testimony let us present:

Editor Radio Journal, Dear Sir:—
With your Radio family I would confer—

About a simple little hook-up,
Just a little Crystal PUP.



THIS IS THE HOT DOGLET DESCRIBED BY MR. MORGAN IN THE ACCOMPANYING BLANK VERSE FOR BLANK PEOPLE. EACH COIL IS MADE FROM 200 FEET OF NO. 22 ENAMEL WIRE.

With me, he is some PUP to hear—
But a bit wild I fear,
His bark is sure loud—
For which I am proud—
If you could keep him out of the crowd.

You see, I keep him down town—
But he thinks its funny, acts like a clown,
So folks—will you help tame him down.

Wish you would help with this PUP—
Cause, I hate to give him up,
Got so used to him now—
And his loud Bow-Wow,
And it's a shame and a sin—

Not to have more patience with him,
And help him while he is a PUP,
To be a better dog when grown up.
Now GIRLS you can help with this—
Help his tail to twist,
Pet him nice until each note,
Comes separate from his throat,
But, keep it loud—
And out of the crowd.

The Editor says—send'm in Folks,
It's real serious and no joke,
Just address then RADIO JOURNAL PUP,

113 Stimson Bldg., one flight up,
Try now FOLKS and tame this PUP.

Sincerely,
LEON A. MORGAN.

All Shot Up

This is the story of a ham
Who had a "5" watt lamp,
He raised the rated voltage up
So he could get an amp.

Few thousand volts upon the plate,
Too quickly it got hot.
He raised the filament to eight,
Which helped him quite a lot.

While listening in one winter nite,
He heard a "1" come in,
And calling same for fifty times,
Switched off, to listen in.

He turned his eyes upon his set,
And there his glad (?) gaze fell.
The plate was melted to the base,
And the filament shot to Oski-Wow!
Wow! By 6CFL.

Earwigs Attention!



We'll bet a horsehair watch chain against a flock of pink earwigs that Shakespeare knew about radio. Why else, tell us, would he have Lady Macbeth say, "Out, Damned Spot!" unless she had been foolin' with a crystal set? Put up your earwigs.

BROADCASTER TO HIS LOVE

My mind becomes a vacuum tube
Whene'er I think of you;
My heart gets quite ec-static,
My headband goes askew.
Your eyes that flash like unquenched sparks,
Your hair like copper wire,
Break down my high resistance
Like a transformed amplifier.
I really think we're both in tune,
And ere through life we roam,
Suppose you hook up now with me,
And share my humble ohm!

—A. C. M. A. in Life.

How We Do It Today

By Charles F. Filstead, 6CU

The following verse was printed in the March, 1900, issue of "Science and Industry." It is so clever and so pregnant with the changes that have taken place since the advent of electricity that it is reprinted here, twenty-three years later, and it is as full of meaning today as it was when first printed. How little they dreamed then that in a few years the same "lightning bolt" would be whispering their children's voices through the sky!

"In olden times we took a car
Drawn by a horse, if going far,,
And felt that we were blest;
Now the conductor takes the fare
And sticks a broomstick in the air
And lightning does the rest.

"In other days, along the street,
A glimmering lantern led the feet
When on a midnight stroll;
But now we catch, when night is nigh,
A piece of lightning from the sky
And stick it on a pole.

"Time was when one must hold
his car
Close to a whispering voice to hear,
Like deaf men — nigh and nigher;
But now from town to town he talks
And puts his nose into a box
And whispers through a wire."

An Eternal Bit

By Ben Field

But yesterday was given birth
The super-conquest of the race—
A subtle voice around the earth.
That vibrates through the realms of space.

Its magic power draws each to each,
Man to his brother, near or far,
Its slender wires receive men's speech--
While yonder shines a waiting star.

Earth's spiral rises round on round,
Nor crushed nor crucified it be
Life's secrets shall amaze, astound—
The while we grasp eternity.

Notes on 100-Meter Transmission

By BEN J. CHROMY, 9CJO

This paper is the result of a lot of research work, and should provoke thought and discussion wherever there are amateurs, which is everywhere. It was read before the Milwaukee Radio Amateur's Club, January 10, 1924, through whose courtesy it is given a wider reading public in these columns.

DURING the spring of 1923 experiments with 100 meter transmission were conducted at 9CJO. Since there was not very much literature obtainable on this phase of short wave communication it was not possible to predict any results, either theoretical or practical. Therefore, everything had to be determined by experiment. However, previous to 1923 the common conception among amateurs and radio men in general was that the antenna should be operated above its fundamental wavelengths. The advice of radio engineers was to operate the aerial at about 1.1 times its natural period. During the time the experiments were conducted it was found that the antenna may be made to oscillate on a band of frequencies within reasonable limits above and below its natural period. For instance the inverted L used at 9CJO had a fundamental wavelength of 135 meters and with proper series condensers it could be made to oscillate on all waves from 100 meters to 250 meters. The common practice of amateurs now transmitting on waves below 150 meters is to "load" the antenna and operate it below its natural period.

Apparatus

The apparatus used for 100 meter work should be chosen with discrimination. Series antenna condensers form one of the most common sources of trouble. However, for a five watt set a good rubber insulated air dielectric variable condenser will function fairly well. A glass insulated air dielectric condenser does not seem to heat rapidly and will function very well in larger sets. Two or three 4x5" coated glass plates connected in series may be used as a series antenna condenser on low powered sets.

Since the set used at 9CJO was of the reversed feedback type a special inductance had to be designed. The best results were obtained when an ordinary white paper tube was wound with 15 turns of number 14 solid wire. After the turns were spaced with cord, lugs were soldered to every turn. No soldering flux with the exception of rosin was used. The reversed feedback coil was wound with ten turns of number 16 wire; this coil must be wound in the opposite direction from that of the main inductance. Figure 1

gives details of the circuit and the constants.

The receiver used during the short wave tests was a two circuit regenerative type. The coils L_1 and L_2 in figure 2 should be wound with 6 and 12 turns respectively of number 16 double cotton covered wire doubly spaced. The wire must be doubly spaced in order that the distributed capacity of the winding may be reduced to a minimum. The coils should be wound upon 3 inch paper tubing in such a way that they

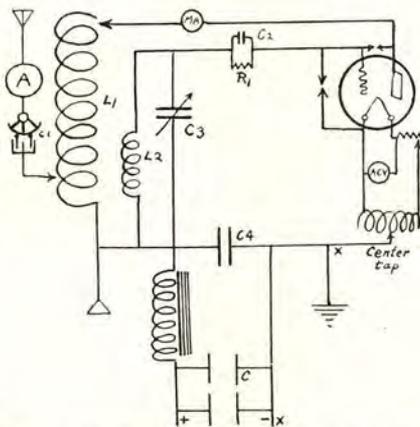


Figure No. 1—C1, series antenna condenser, either a variable mica or glass—or a good variable air condenser (Cardwell), C2, .0007 mf. Coto coil variable. C3, .002 glass plate condenser. C4, .002 glass plate condenser. C1 mf. each mica condensers. C2, .0005 mf. mica condenser. R1, 10,000 grid leak. Key may be inserted in place marked.

may be mounted similarly to the way that honeycombs are mounted. L_3 should have about 20 turns of number 18 wire in order that the set could be made to oscillate on all wavelengths within its range. Refer to figure 2 for constants used in the receiver.

Operation of Transmitter

The capacity of C_3 is set so that the rotating plates are nearly out of the stationary plates. After the plate voltage is on and the filaments are incandescent, the capacity of C_3 is increased until a point is reached where the maximum antenna current is obtained. The capacity of the series condenser is next adjusted until the proper wave is obtained. It is usually best to have a wave meter handy in order to read the wavelength of the set. If you have no wavemeter you can easily make one from instructions given in the various radio magazines and calibrate it from WWV's signals.

The antenna current given out by a set which is oscillating on 100 meters is usually a little over one-half of the current that this same set would give off on 200 meters. However, the antenna is a more efficient radiator of energy on 100 meters than it is on 200 meters. This may be proved as follows:

Radiation is inversely proportional to the square of the wavelength.

$$(\text{Rad} \propto \lambda^2). \text{ Therefore, } \text{Rad} \propto \frac{1}{\lambda^2}$$

From the last equation it is evident that the radiation from the antenna oscillating at a frequency of 100 meters is much greater than that from the antenna oscillating at 200 meters. The reason for the large decrease in antenna current is due to the increase in the resistance of the antenna. However, the major portion of this antenna resistance is radiation resistance which is the property of the antenna to give off the electro-magnetic energy. This explains the greater strength of the 100 meter signals.

Referring back to figure 1 we see small 1-32 inch spark gaps between the filament and grid and between the plate and grid. The purpose of these gaps is to prevent excessive plate voltage from destroying the tube. If a spark discharge took place between the elements in the tube the chances are that the tube would become worthless. The reason for this is that through the action of the spark the brown material coating the glass unites with the filament forming a yellow compound. When the filament is thus decomposed it has a high cold resistance and a low hot resistance. A five watt tube

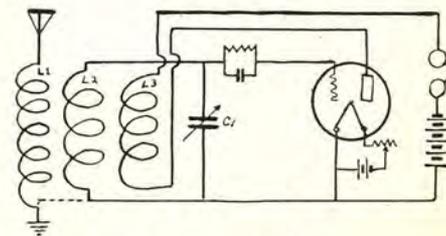


Figure No. 2—C1, .0007 mf. Coto coil condenser. L1, 6 turns of 16 DCC. L2, 12 turns of 16 DCC. Socket for tube should be porcelain. L3, 16 to 25 turns of 18 DCC. 3-inch paper tube. Windings of L1, L2, L3 must be well spaced. Each consecutive turn should be separated with string.

used at 9CJO had an arc take place in it near the glass seal. A voltage of five volts ac., was then applied to the filament; some time elapsed before the filament got red, after it became red it immediately burned out. The reason for arcs taking place in the tube near the sealed stem is because excessive plate voltages are used. The sparking is also due to the high frequency of the 100 meter wave and the comparatively

low resistance of the tube to this frequency.

The value of the 100 meter wave has already been established. Its reliability in the recent Trans-Atlantic two way tests cannot be disputed. Any one listening in 100 meters can judge better than words can express the future of these short waves. Try it by tuning your transmitter down to at least 150 meters.

Interference—What, Why, Where

By T. E. NIKIRK

INTERFERENCE is a subject that every person interested in radio is acquainted with in some form or other. In Southern California I have had the opportunity of investigating many cases of complaints on interference. At the present time it seems that about seventy-five percent of interference in this locality is due to high voltage high line leaks. This is due oftentimes to a cracked insulator or dirt accumulating on the insulator and then moistened by fog or some other precipitation, which often occurs in the evening.

Poor connections in power transformers on the high voltage side sometimes cause serious interference. People living in localities where arc lights of the older type which flicker badly are in use often hear various kinds of noises due to the opening and closing of the arc light circuit, which makes various sputtering and frying noises. Another peculiar type of high line buzz is due to a guy wire being energized from a high voltage wire through a leaky insulator or exciting the guy wire in the same manner in which an antenna is energized. This type often acts

the same as a transformer which is on a given wave length.

It may be heard very sharply at one wave, and twenty or thirty meters either side no interference is noted. Another type which has created much interference for broadcast receivers has been the case of what appears to be a swinging wire, which swings irregular intervals, often times swinging into a tree or some other grounded connection and sounds like a telegraph station transmitting at a rate of from one to two words per minute, in fact so slowly that the dots and dashes can be counted very readily.

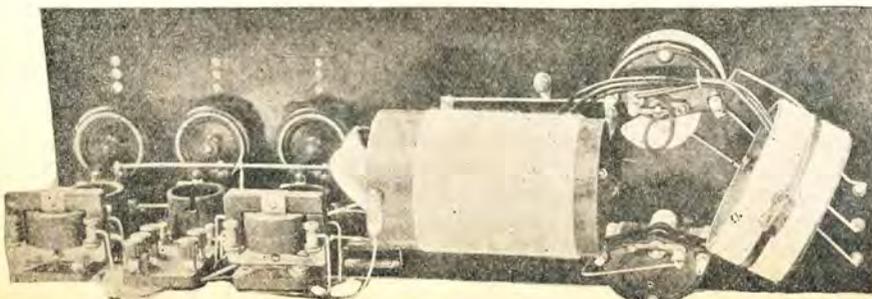
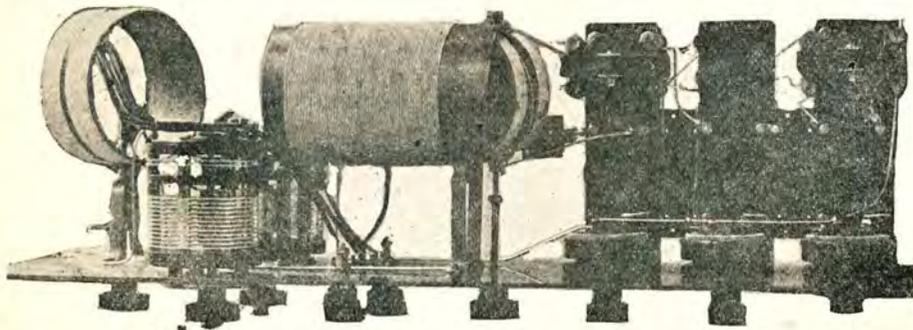
Amateur transmitters are often blamed for this type of interference and are not guilty.

One of the commonest methods of locating these various sources of interference is by locating sparks shooting over or through insulators or wires swinging into some grounded object such as tree etc., causing smoke and sometimes even a flame or sparks. Other types are often not detectable by the eye but a strong hissing can be heard from what appears to be certain insulators. Again other types of leaks are of such a nature that the only true method of locating them is by the use of a very sensitive receiving set, using a loop antenna. With this loop and sensitive receiver, generally located in an automobile, lines which are suspected of having the leak or causing the interference have to be trailed from the substation or from the home where the interference was first noted, until a point is reached where the interference seems to come in louder on the receiver than at any other point.

Who Will Pay?

Five hundred dollars in gold is the cash prize announced by the American Radio Association for the best answer to the question "Who is to pay for broadcasting", according to an announcement made by Alfred M. Cadell, secretary of the American Radio Association, with headquarters at 50 Union Square, New York City.

The terms of the contest require that all answers shall have been placed in the mail addressed to the American Radio Association on or before July 20, 1924. The contest is open to any resident of the United States without regard to sex or affiliation with the radio industry. Contestants are requested not to exceed fifteen hundred words in their statement of any one plan, which should be typewritten and double spaced. In addition to the plan itself a brief summary should also be included. In the possible event of the same plan being received from two different sources, the board of judges will be requested to award the prize to the first one received according to the postmark on the envelope.



A LOS ANGELES RADIO FAN BUILT THIS SET ACCORDING TO THE ARTICLE BY T. E. NIKIRK IN THE JANUARY ISSUE AND, MAN HOW SHE DOES WORK. SOME MORE OF YOU SET BUILDERS SEND 'EM IN AND LET US SEE WHAT THEY LOOK LIKE.

Something About Dead Kings

By J. T. ROFFY

Deceased Kings, and Kings who succeed them have been favorites of history. Mr. Roffy here gives Radio Journal readers his idea of why certain Kings of radio will amble into the ambulance and others trip on the plush rug at the foot of the throne.

THE King is dead, long live the King. You no doubt figure that I will elect one of my pet circuits as king. I hasten to inform you that I shall only make it a prince.

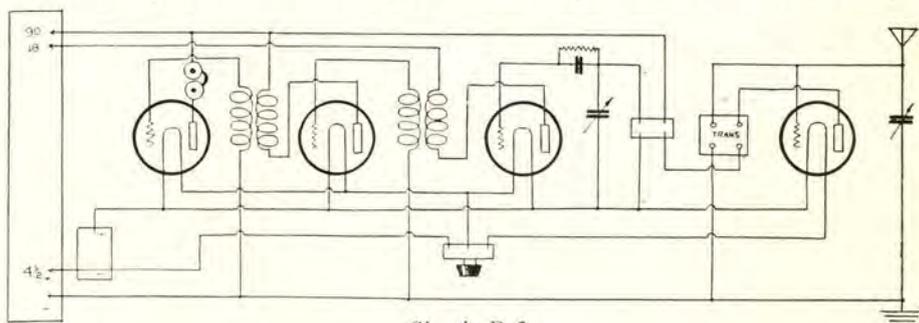
In radio frequency amplification employing air core transformers the secondaries of which are tuned by means of variable condensers, a condition arises where the cascaded circuits fall into mutual resonance, re-amplifying a received wave to the point of oscillations and completely blocking the further functioning of the set. The immediate remedy for this suggests the potentiometer control of the grid circuit or inverse feedback a' la neutrodyne through small balanced capacities and thus you are introduced to the demised king and now for the manner of his death.

The idea of the balancing capacities is or was beautiful except that it balanced through but a narrow band of wave lengths. In widening the broadcast wave lengths the neutrodyne would not "neut" effectively and the locating of new stations was tiresome. So discarding neutrodyne which just means that it is less than a dyne we go to the other extreme and elect heterodyne which in ordinary words means many dynes as the new king. We are now accustomed to the support and maintenance of five tubes and without fear we enter into the maintenance of six or more tubes. If our fancy lies in the direction of complexities we can receive the incoming signal at short radio frequency, pass it through an oscillator, super-impose itself upon itself on one of its harmonics, re-detect it and then reflex it once more upon itself at audio frequency and we have the most beautiful thought of a man carrying himself by his boot straps. The question arises can it be done? The answer is yes.

"Sometimes." Now since we have introduced the royal family of long distance circuits let us have a word or so for the prince. It has long been understood that a short wave radio frequency amplifier is most sensitive to external signals when its plate and grid circuits are in resonance and at the border of self sustained oscillations. Therefore a well known oscillator circuit which requires but a single condenser for tuning having its grid

and plate circuits closely coupled and its transformer turns so deployed so as to possess minimum capacity, can be sharply tuned from its minimum to maximum range with a straight line amplification constant. That is it will respond to the incoming broadcast signal without having a predominant peak or preference to any particular wave length, other than that at which its own condenser will bring the combination circuit into resonance. It is apparent then that in a circuit of this nature there will be a plate current with a cyclic change a true counterpart of the incoming broadcast frequency and super-imposed modulation with a tube amplified magnitude. If we carry this

or what is the method of diminishing grid current flow to maintain control of that finely balanced state of border line between self sustained oscillations and extreme radio frequency amplification. The reader's attention is called to the vernier rheostat in the circuit which accomplishes this function and permits the operator to control the electron emission of the oscillator through the inter range of the condenser setting and maintain that trigger position at an even sensitive point throughout the entire broadcast range. For the experimenter whose fancy runs to complicated circuits, this circuit lends itself to limitless elaboration, but for the portable set, for consistent per-



Circuit R 3

current through a comparatively few turns and closely coupled to this primary, a secondary winding that is subsequently employed with a tuning condenser, grid leak and grid condenser as a grid circuit of a plane detector; we have a similarity to the famous Cockaday Circuit where a tuned aerial inductance is coupled to a detector; the difference is that we have a highly efficient frequency amplifier before the detector. The use of two large condensers and two grid circuits at the first blush would compare the R3 Circuit to the neutrodyne, missing, however, the aggravation of the third condenser to be brought in resonance with two already minutely variant tuning condensers. The perusal of the R3 Circuit shows a further change in comparison to the neutrodyne that whereas in the old circuit the plate passes its amplification to the next tube, the plate in the R3 Circuit returns upon its own grid circuit as a paramount issue to bring about a state adjacent to self sustained oscillations and therefore the greatest sensitiveness to the external wave impulses. The question now arises "What is the method of "neuting"

formance, four 99 tubes, two R-3 transformers, two audio transformers, two condensers, a vernier rheostat, and A and B batteries constitute a great set. Peer of all circuits.

Without Carrier Wave

Radio transmission without carrier waves has been successfully demonstrated by station WRM, it is announced, by the University of Illinois. Further experiments are to be carried on and broadcasting may be materially affected. By means of the new invention only the modulated frequencies of voice or music are broadcast, and these are devoid of the carrier wave tendency to pick up extraneous frequencies. Thus the new method of broadcasting, if it becomes successful commercially, would tend to eliminate all manner of sounds, etc., now accompanying broadcast reception at times.

The new high powered broadcasting station, WTAM, in Cleveland, Ohio, is rapidly gaining a reputation for long distance transmission, the latest evidence coming in the form of a letter from a listener in England.

Oh Brother—Heart Throbs!

TO demonstrate the extreme sensitivity of the glow-discharge microphone perfected by Dr. Phillips Thomas, station KDKA of the Westinghouse Electric and Manufacturing Company recently broadcasted a program of heart throbs. The test of heart beats was heard from Maine to California and from Canada to Mexico, according to reports that came in.

Because of the fact that heart beats have a much lower period of frequency than the voice or a musical instrument, it is exceedingly difficult to find any pickup that will properly register them. After a long series of tests with the Thomas microphone, it was decided that the instrument had the proper sensitivity to record the heart beats. The apparatus necessary for the experiment, which was installed in Dr. Thomas laboratory in the Westinghouse research laboratory, consisted of the amplifying apparatus, such as is used with all microphone pickups, the microphone itself, and a telephone line to the broadcasting station in E. Pittsburgh. The amplifying apparatus was all arranged by Dr. Thomas and consisted of a number of vacuum tubes balanced with other tubes. In the arrangement the apparatus was so hooked up that high frequencies were eliminated and thus the heart beats could register more clearly.

In the actual broadcasting of the heart beats, the microphone was placed

just above the heart of the subject. The heart beats sent out are said to be the faintest sounds ever picked up by a radio microphone but they intensified so clearly that they were audible to all listeners.

To those who heard the heart beats, the sound was most unusual. One radio fan who called up the station said that



We have applied for this job. This broadcaster is registering the young lady's heart beats on the microphone.—Oh, Boy!

the beats sounded something like the telephone when the operator is ringing a busy signal.

Combined Crystal Hookup

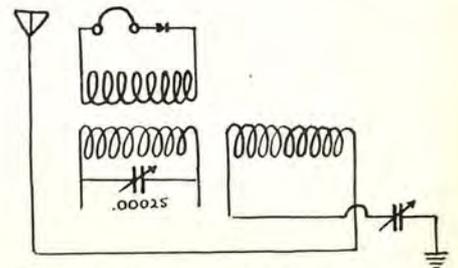
By W. H. H. KNOX

THE writer was one of the entrants in your January crystal contest, my hookup being 7th on the list. I have been experimenting on crystals for over a year for my own amusement, one of the most fascinating hobbies I ever indulged in. In your February number I noticed an inquiry from K. R. Morgan, Long Beach, regarding the incorpor-

ation of the outstanding features of the the 1st, 2nd and 3rd prize winning circuits, and with no intention of criticizing the editor of this department, I must say that the answer to his question, with the diagram, was most disappointing to me, and can only feel that it was the same to the inquirer, as practically none of the ideas of the mentioned hookup were incorporated in the diagram. However, there are two very good principles involved in this circuit, viz; "the link", an old standby for securing selectivity, and the variometer in the secondary circuit. Please note that both of these are in the hookup submitted. Hookup No. 2, you will see by redrawing it, is simply a single circuit with a condenser between the stator and rotor windings, and with the return connected at the center of the variometer, as is usually customary. This is the last

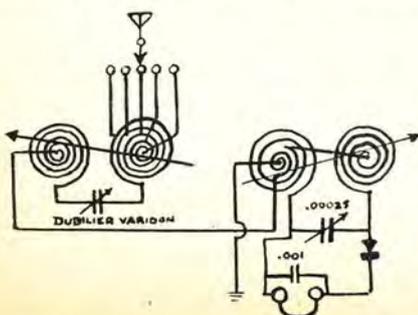
word as to selectivity and you will also notice that this feature is included in the submitted diagram. No. 3 hookup, you will perceive, is simply a single circuit with a tapped variometer, with the stator between the aerial and the detector, instead of the detector being connected direct to the aerial, as is customary, and, in my opinion, the only real feature of this particular circuit is the second switch,—that makes a sort of vernier for the coarser tuning of the first switch.

This feature, you will also notice, is taken care of in the hookup enclosed, by the use of a 15 turn coil connected in such a way as to buck the windings of the taped inductance coil, and kill the current down to the right wave length in the same manner as a variometer. This acts as sort of a vernier for the main inductance coil, and takes the place of the numerous taps, without the danger of dead-end losses. This also helps to adapt the finished set to different aerials, which naturally vary in length. In the case of taps being used, the set would work efficiently only on a certain length aerial. I shall be very glad to answer any questions regarding this hookup, and will welcome any improvements that any of my co-experimenters may chance to work out. I put this hookup on a Modesto horn with Baldwin unit and, while it was not as loud as a phonograph, it was plenty loud enough for a room ten by ten feet, and by using the switch and slightly adjusting the movable coil any of the four stations here in Los



George L. Moxley submits this crystal hookup to supplement his hookup of last issue.

Angeles could be entirely tuned in or out at will. My aerial is eighty feet, single length, stranded or braided wire, with about thirty-five foot lead in and fifteen foot ground to water pipe, and a counterpoise of two strands, seven feet from ground. The aerial is twenty feet high and points directly toward the Times Building, about five miles out. Please address inquiries to W. H. KNOX, in care of Radio Journal.



This is the Knox Perplex crystal circuit

The crossed coil radio beacon developed at the Bureau of Standards has been suggested as a means of guiding ferry boats across San Francisco Bay in foggy weather, and the Bureau believes it will prove very useful for that purpose.

How to Build and Tune 3-Tube Neutrodyne

By C. H. STOUP

Nope! We are not through with the Neutrodyne—not by an old-time jugful. Here's a three tube Neutrodyne, built by a Pennsylvanian, which does the stuff on distance as well as local. And it is as sharp as the W. K. razor.

THE Neutrodyne Receiver is not nearly as difficult to construct as many believe. When properly constructed, with the exception of the Super-Heterodyne, in the writer's opinion nothing else is more satisfactory.

The following instructions combine two stages of radio frequency with detector and is for the use of phones only unless you live very near a broadcast station. If you wish to use a loud speaker it will be necessary to add two stages of audio frequency to the set.

Some of the features of the circuit are: no howls and squeals; no body capacity effect; no re-radiation; automatic tuning; fine selectivity; ability to bring in stations over two thousand miles away. The following parts are required:

- 1 panel hard rubber or bakelite 7x21x3-16" or 3 small panels 7x3x3-16".
- 1 base board 21x6x3/4".
- 3 neutroformers.
- 2 neutrodrons.
- 3 single sockets (not metal base).
- 3-3/2 or 4" dials.
- 1 20-ohm rheostat.
- 1 6-ohm detector vernier rheostat preferably of the carbon pile resistance type.
- 9 binding posts.



Back panel mounting and wiring of three-tube Neutro with amplifiers.

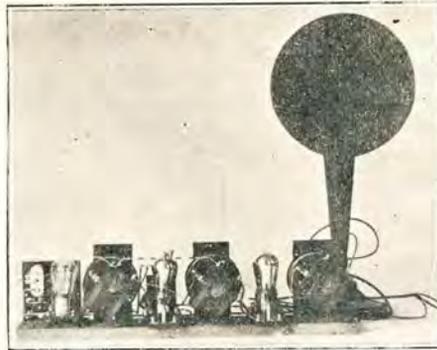
- 20 ft. insulated tubing.
- 20 ft. round tinned copper wire.
- 2 .006 mica fixed condensers.
- 1 .00025 mica fixed grid condenser with 2 megohm grid leak.
- 2 201A or 301A amplifier tubes.
- 1 200 or 300 detector tube.
- 2 45 volt B batteries.
- 1 storage battery (80 ampere-hour or more).

The circuit is really simple to wire if you go after it intelligently.

The panel should be drilled for Neutroformer condenser shafts, binding posts, rheostats and base screws as per diagram and then screwed to the base with round head screws after the base

has first been given a thin coat of schellac to prevent absorption of moisture.

Attach binding posts temporarily and rheostats permanently, then attach Neutroformers at about a 60 degree angle temporarily so as to see about where you will have to run your wires in the order to clear neutroformers. Now locate the radio frequency tube sockets between the transformer coils and the detector socket to the right of the right hand neutroformer. Remove the neutroformers and screw the sockets in order to clear neutroformers. Now locate the radio frequency tube sockets between the transformer coils and the



The three-tube Neutro assembled.

detector socket to the right of the right-hand neutroformer. Remove the neutroformers and screw the sockets in places.

Begin wiring by first attaching tinned wire to the ground post after leaving the end over long enough to attach to the primary of first neutroformer. After insulating with tubing attach the other end to —A battery binding post, and then to —B battery binding post.

Connect one filament terminal of each socket to —A wire, after cutting away enough insulation in order to make a good contact, then wire plus A battery circuit through rheostats as per diagram.

Replace neutroformers in position being very careful to set them at the proper angle. This is very important, a 55 to 60 degree angle is O.K.; however the angle should be the same for each neutroformer. Wire neutroformers as instructed finishing one at a time before going to the next.

Be sure the fixed side of the variable condensers plates are attached nearest the grids, otherwise you will get considerable body capacity effect. Take notice that while the rotary plate side

of the first two variable condensers are wired to the —A lead, the third one is connected with the plus A lead.

Place the grid leak and grid condenser as near as possible to the grid terminal on detector socket. Complete all neutroformer connections also wire fixed condensers before attaching the neutrodrons. After attaching each wire you should check with the diagram and if correct solder the connections.

You can make a good soldering job by having your iron well tinned and hot enough to melt solder quickly, and then holding iron with a drop of solder against the connection to be soldered long enough to heat the connection as hot as the iron itself. A great many make the mistake of not heating the connection enough, which makes a poor appearance, a bad mechanical job and a worse electrical connection.

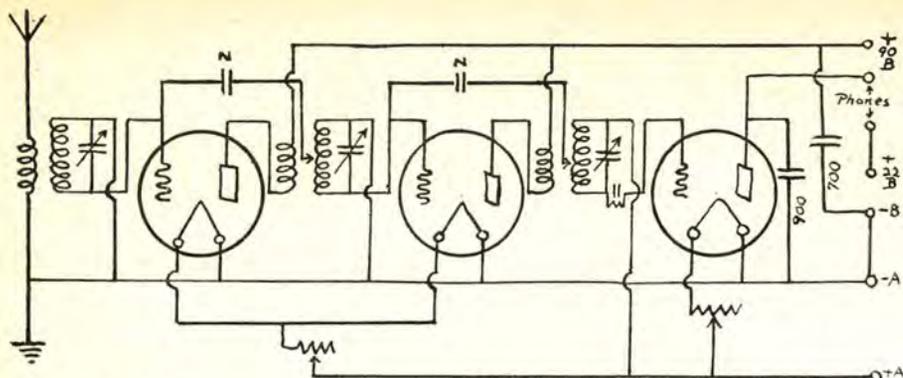
When you have completed the wiring, being sure that at least enough of the connections are insulated to prevent short circuits check again with the diagram. Be sure your connections are all correct for this is absolutely necessary in order to have your set function properly; and then, too, 90 volts of B battery is very unhealthy for the tube filaments.

The aerial should be fairly high and about 100 feet long A longer aerial makes the set less selective and does not noticeably increase the volume. The ground wire should be as short as possible and run as direct as you can from the instruments to the nearest water pipe at a point nearest where the pipe enters the ground. The water pipe should be well cleaned and the connection well soldered.

The instruments should be located as near as possible to where the lead-in enters the house.

Connect aerial and ground to set; also A and B batteries and phones. With rheostats all turned on try one amplifier bulb in the first socket, then remove bulb and place in the second socket and after that in the detector socket and if your bulb is yet O.K. you are safe in placing all bulbs in their sockets. It is advisable to test out the circuits first with one bulb only so in case you do not have the set properly wired, you will only burn out one bulb instead of two or three.

Now connect the neutrodrons. Adjust variable condensers for full capacity or with rotary plates all in, then



Three-tube Neutrodyne mounted on a board 20x6x $\frac{3}{4}$ inches. N-Neutrodon.

attach all dials with the 100 setting at the top. There should be a scratch or mark placed on panel at edge of dials directly above the center of dials. Tune in your local or nearest broadcast station by first setting all dials at zero and then moving each dial and all three dials together, two degrees at a time until you locate your station. Then adjust each dial separately to the loudest point. In all probability your dial settings will now be slightly different and if so, carefully loosen set screw on first dial and without moving shaft in the least place dial setting the same as second dial and then perform the same operation on the third dial, setting it to the second dial reading. Your dial settings you will find will now be approximately the same on each dial for the different stations.

Neutralizing the Set

In an ordinary three circuit regenerative receiver, regeneration is obtained by feeding back the radio frequency currents through the capacity existing between the plate and grid of the detector tube.

It is this condenser effect or capacity that we now wish to neutralize in order to keep the radio frequency currents from being fed back to preceding circuits. By adjusting the capacity of the neutrodon to the capacity of the tube, the feed back currents are forced to take two paths instead of one, one path through the bulb and one through the neutrodon. This causes them to buck or neutralize each other and therefore no current flows. Ten or fifteen minutes will tell you if your set is going to neutralize properly.

You are now ready to neutralize the set but before attempting this you should interchange the two radio frequency tubes and if this brings in the signals louder, leave them this way, and if the signal strength is decreased return them to their original positions. Quite often there is one way they will work best.

Remove first radio frequency tube and place a small piece of paper on one of the filament contacts of socket. Re-

place tube and if your paper has not slipped out of position the tube will NOT light. Before removing tube to place paper on the socket filament terminal you should have first tuned in your local station and after installing the paper and replacing the tube you will find you can still hear the station. You should now readjust the dials slightly for the best signal strength and then adjust the first neutrodon until you cut the station entirely out or as near out as possible.

Before the tube is neutralized and with the piece of paper under the tube filament contact you are able to hear the station louder on account of the capacity of the tube and as you neutralize you balance out this capacity and therefore eliminate or nearly eliminate the signal. After adjusting the neutrodon to this point remove tube from the socket and also remove the paper and then replace tube in socket. The directions for neutralizing the first tube are now followed for balancing out the capacity of the second tube and adjacent circuits, the adjusting being done of course with the second neutrodon.

After removing paper from the second radio frequency tube you are ready for business, provided you have made a job of neutralizing and this you will very readily determine as you tune in short and long wave length stations.

The neutrodyne circuit is a ringer when neutralized properly and all wrong when not fully neutralized.

After making sure that you understand how to neutralize and then find you are unable to do so you may have to change some of your wiring in order to keep high frequency leads that are not at or near ground potential separated well from each other and from the ground potential leads. Leads that run parallel should be well separated as they form a beautiful condenser leak if too close together. All leads that cross should be at right angles.

Care should also be taken to see that leads are well separated from the rotary plates of the variable condensers when the plates are out, otherwise your set may be neutralized on short wave

lengths and not on the long wave lengths or vice versa.

Don't give up the ship until you have her in "Port Neut" and you will be well paid for the time spent for, as said before, the circuit is either all right or all wrong; there is no half way

How to Tune

Set all dials at zero and then move each one and all together two degrees at a time until you hear a station which you should tune in to loudest point by adjusting each dial separately. If you now mark down the dial settings for this particular station you will know exactly where to find him the next time.

After logging quite a few stations in this manner you can pick up distant stations by first knowing their wave lengths and operating time and hunting for them on settings which you will be able to approximately determine from your log. For instance when I first went after KHJ Los Angeles Times on 395 meters from my home in Pennsylvania I tuned slightly over WTAM Cleveland who is on 390 meters. WTAM was on dial settings 1st dial 46 $\frac{1}{2}$, 2nd dial 47, 3rd dial 47, and KHJ I found on 1st dial 47 $\frac{1}{2}$, 2nd dial 48, 3rd dial 48.

If your chief aim in radio life is picking up the distant stations you should provide yourself with up-to-date schedules, preferably obtained from the broadcast stations themselves, and then sort them out as per above instructions, for no matter how well your set is perking you are working at a disadvantage without a correct schedule. For instance, if you tuned all Friday night for PWX, Havana, you would not be able to tune him in for he is only on the air Wednesday and Saturday nights.

The following list of dial settings may be of some assistance. Your own settings will of course be somewhat different. These were reached from Valencia, Pa.:

Sta.	Location	Wave Lngt.	1st Dial	2nd Dial	3rd Dial
KDKA	Pittsburgh	326	32	32	31
6KW	Tuinucu, Cuba	332	37	37 $\frac{1}{2}$	37 $\frac{1}{2}$
WKAQ	San Juan PR	350	39	40	39
KHJ	Los Angeles	395	47 $\frac{1}{2}$	48	48
PWX	Havana, Cuba	400	51	51	51
WDAF	Kansas City	411	53	53	53
KPO	San Francisco	423	56	56	56
CKAC	Montreal, Can.	430	59	59	59
WOS	Jefferson City	441	62	62	62
KFI	Los Angeles	469	68 $\frac{1}{2}$	67 $\frac{1}{2}$	67 $\frac{1}{2}$
WEAF	New York	492	81	80	80

Tuning out Static

On local stations when static is real bad you can eliminate almost all of it, by detuning your first dial to the left several degrees and the second dial several degrees to the right. You will be surprised at the results.

Study your set. The better acquainted you become with it the better operator you will be and the more pleasure you will get out of it.

Questions and Answers

Q.—I am very much interested in your "Reflex Regenerative" Hookup described in the February number of Radio Journal. I should like to build this in a three-tube set, if I could use a Sodian detector tube in place of the 0300, if that is not possible, a low voltage tube of some kind, that would give good long distance work. The 300 tube uses quite a bit of A-Battery, and some of us in the country are rather hard put to keep up our A-Batteries. The Sodian tube seems to be quite a wonderful detector tube but, I understand, has to have a different type of tuning element than the Radiotron detector. I should like to use, as you do, one of the Ray Dee Artcraft's Transformers, as an inductance element. Can you tell me where I can get a blue print working drawing of this set, that would give relative size of panel, etc?—J. E. JOHNSON, Alhambra, Calif.

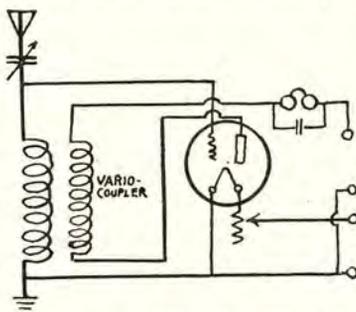
A.—I am sorry to disappoint you in regard to the use of a Sodian tube in the place of 6-volt type detector tube. The Sodian tube will not regenerate and is not the type of tube that can be used in this circuit. In this circuit it is absolutely essential to use the type 300 or 200 soft tube detector tubes, since the various transformers used are designed to be used exclusively with this type detector. The Ray-Dee-Former Type M-33 must be used with the large tubes for best results. For use with the 199 tubes, we have our Type M-66 Ray-Dee-Former which is designed to be used with smaller tubes thus being adaptable to portable sets. This new type M-66 is a new development, because of the pressing demand for a Ray-Dee-Former designed expressly for the small tubes.

Q.—I received your letter of the 1st inst., in which you kindly answered the questions I asked relating to the Reinartz Receiver and your opinion tends to strengthen what I had already begun to think, that it is very unstable. So I am going to take advantage of your kindness and ask you if you will send me either in the envelope enclosed or refer me to a copy of Radio Journal, a hookup with clear instructions (as I am just a novice) of a one-tube set using dry batteries, and which you deem to be of a stable nature and which you think will get considerable distances (I am 600 miles from nearest station). The qualifications of this set sound like the perfect receiver we are all looking for. But I know you have just such a set in mind and I will allow myself to be thoroughly guided by your advice. I am enclosing a hookup which I would like you to pass judgment on and tell me if, in your opinion, it would answer the above requirements. I realize, Mr. Munzig, that a set might get 1000 miles in New York or California, and might receive but 100 miles with conditions around here, and I just want your advice, for which I take occasion to thank you right now and also for previous advice, which has been kindly and obligingly given. I would like to build a set to which amplification may be added.—DAVID C. TAYLOR, Warren, Arizona.

A.—The circuit that you enclose will answer the requirements you desire in every way, since you are located away from everyone. This type of receiver is considered very simple in operation, and will give you a great voltage impress on the grid of detector tube. It can further be improved by inserting a

variometer in series with the tickler coil. Tickler coil should have about 15 turns of large wire, say No. 20 DCC. If you have this variometer suggest that you use it by all means. Regeneration is obtained by adjustment of both variometer and tickler. Amplification can be added with no trouble at all to this circuit.

Q.—Am looking for information in regard to a receiver which will operate successfully with one or two steps radio frequency and two audio. How about the Reinartz,—is R F adapted to this circuit? If so, is it dependable, a good receiver for D X, and is it selective? Also quiet? I now have a receiver using a Lemco tuner, which I believe is similar to the one used in the Radiola IV. Am using two steps audio and it seems to be quite noisy most of the time. However, I have



Hookup for David C. Taylor.

received over seventy stations since January first, but am not satisfied with its selectivity. I believe it is as selective as a Radiola IV (but not as quiet) after having heard several Radiolas in operation. I mention this so you will have some insight as to what I desire in selectivity. I have the following parts on hand,—2UV 712 Trans., 4 Remler UV199 sockets, 4UV199 tubes, 1 Kilbourne and Clark 11 plate condenser, with vernier, 3-30 ohm rheostats, Freshman variable grid leak, double circuit jack, 1-200 ohm potentiometer, and miscellaneous. I have tried four different circuits in the past five months and am still looking for my pet. Perhaps I am becoming a crank, but am having a good time becoming one. I thought the Reinartz would probably fill the bill, as I have seen it well recommended in several publications. Can same batteries be used through out this receiver, with R F? If you have a better circuit please advise me.—LOREN BARNES, Armona, California.

A.—Your interesting letter received. The circuit that you are looking for appears in the February issue of Radio Journal. This circuit is the most sensitive receiver that I have ever used. I highly recommend it. It will give you both volume and distance. The circuit referred to is called the Munzig

Q.—For the last two weeks I have tried to build a hookup according to instructions I found in a late copy of a magazine. I have utterly failed to get any results, although I have taken it to pieces and tried to rebuild more according to heart's desire—results always the same, nothing doing. In looking over my old copies of the Radio Journal, I came across a similar hookup, written, I am sure, by the same person who wrote the first

article mentioned. I am writing for information, if you are kind enough to set me on the road to success. In the Radio Journal diagram the coil is continuous with the rest of the set while in another diagram there is a dead end. I have hooked up according to both diagrams. In the Radio Journal diagram there is nothing to show the polarity of the batteries, and no rheostat is shown. I am only an amateur in radio, though I have built quite a number of sets which gave good results. I have lately built an Erla three-tube set, and get with a loud speaker, Hastings, Neb. However, I made a slight change in the set from their blue print, and improved the strength of the signals fifty percent.—E. W. EVANS, San Diego, Calif.

A.—In respect to this circuit it has been found that using a small tube results are not anything to compare with the results obtained with a standard 6volt tube. I believe if you shunt a variable leak between the plate and grid, that your set will then perform.

Q.—I am writing you in regard to reflex circuit on page 25, January issue Radio Journal, Figure No. 2. Would you please tell me the make of transformers to use to get the best results from the UV 199 tubes?—A. C. OLIVER, Reeding, Okla.

A.—Most any Harkness coil can be used in this circuit.

Q.—I read with interest the article on the Munzig circuit in the February issue of Radio Journal. The article, however, doesn't say anything about the selectivity of the set, and this is what I am most interested in. Is the 2-tube set equal to a single circuit set using two steps of audio frequency? I am now using a single circuit of the type described by 6ZJ in the various magazines, and have obtained wonderful results with only one tube, but am looking for a more selective set, as there are five broadcasting stations in Denver and the General Electric is going to build a thousand watt station here soon. How does the Munzig circuit compare to a 3-circuit set as to selectivity?—OSBORNE HUCKEBY, Denver, Colorado.

A.—About the selectivity of the Munzig circuit, I have completely eliminated KFSG from interfering with KFKX while both were transmitting. This is before KFKX changed her wavelength. This speaks very well for the circuit and in fact it is absolutely the most selective circuit that I have ever listened to, the super-heterodyne excepted of course. This circuit gives only one stage of audio amplification using two tubes, but with a third tube a second stage of audio is added, which brings the vol up enormously. The loudspeaker on D. X. stations operate effectually.

Q.—I have a five tube Neutrodyne set built from the Fada hazeltine blue print. This machine wants to squeal and whistle and I cannot get over five hundred miles with it and even on close stations it is hard to keep it from whistling. I have it adjusted according to instructions. I am using a C-301-A tube for detector and also for amplifiers. I have Jefferson type 45 amplifying transformers. Work-rite transformers and neutralizing condensers, capacity .0004 M.F.D. variable condensers. I would be pleased to

have you tell me what my trouble is.—K. W. JAMES, Prescott, Iowa.

A.—Your trouble is evidently in your neutralizing condensers. Construct larger ones by using a three inch length of $\frac{3}{4}$ " copper tubing with a flexible sliding lead.

Q.—Last Summer I built a radiophone receiver, as described in Radio Journal for June, 1923. I have hooked up several other sets since then, but have found none that I liked as well as your hookup. I have some trouble with squealing on the low wave lengths and the signals are not as loud as they are around 400 meters. What is the cause of this and is there any remedy for it? I am using W. D. 12 tubes. Thanking you for my reply, DEWITT SWIGART, Rt. 2, Box 606, Pasadena, Calif.

A.—Your trouble is in the tube used. Since the WD12 has such low internal capacity it is hard to make it oscillate and regenerate at high frequencies or in other words on low wavelengths.

A C 300 detector tube will give greater volume as well as greater distance.

If you do not care to invest in a larger tube you can shunt a high resistance pencil marks between grid and plate. This will allow the tube to oscillate on all frequencies.

Q.—Just got hold of a copy of the February issue of your magazine and was greatly interested in the "Questions and Answers" columns, as it related largely to a neutrodyne outfit, one of which I built this winter, a five tube set using Fada Kit and a good assemblage of parts. I used All American transformers, one 3—1 and one 5—1, and good rheostats, jacks etc. The set has good range as I have covered the country from coast to coast and brought in the stations on loud speaker.

The only trouble I have had is to neutralize the set and don't seem to be able to get this done properly. Have tried the paper over one of the filament contacts of the radio frequency tubes, in fact both of them, and also by using a buzzer, but I can't seem to get it right. Have the Fada Neutrodons and they ought to be properly built, but whether they are or not I don't know, as my knowledge of radio is extremely limited.

I thought possibly it might be something in the construction of the set. A party here in the city who assumes to know something of radio apparatus and the assemblage of sets told me that I made a mistake in the mounting of the variable condensers and neutroformers. He said that the proper spacing between the center of the rotary shafts of the variable condensers should be six inches and with same spaced thusly the neutroformers should be set at the published angle of 57.4 degrees, and that inasmuch as I spaced these instruments seven inches in my set the angle should be increased to perhaps 60 degrees or thereabouts. The set is constructed on a 28 inch panel so there is no crowding of the parts and is very carefully wired with bus wire uncovered and great care was taken to keep all plate and grid leads as short as possible consistent with keeping all leads at least three fourths of an inch apart, and also not running any wires in close parallel relation with each other. I really did a very good job of wiring and used a lot of care and the set works as a result but not as good as it should and would if I could neutralize it properly. Do you think it would help to make up a small set of neutrodons with wire and tubing and put them in, or do you think it would be better to connect to the Fada neutrodons at one end terminal and connect at the center terminal with the other lead wire. Would'n't this latter plan aggravate rather than alleviate my troubles in neutralizing? I have thought of buying two Shamrock neutrodons and trying them as I like the looks of these but know nothing of their

(Continued on Page 186)

Listening In

6PL and 6MG

Calls heard at 6PL and 6MG, Hollywood, California. Month of March, 1924.

1AII, 1BEL, 1UW, 1KC, 1CPN, 1AUR, 1ER, 2PD 2CUK, 2IW, 2BLP, 2BY, 2RK, 2AWF, 2CXL, 2GK, 3VW, 3AV, 3BVA, 3BGJ, 3BUY, 3BO, 3HG 3JJ, 3AB, 4BS, 4XC, 4HS, 4MB, 4RH 4DV, 4OB, 4IK, 4OA, 4FS, 4FZ, 4GZ, 4FT, 4GH, 4CR, 4EB, 4KZ, 5OG, 5VM, 5NT, 5NA, 5ALV, 5ZAV, 5EH, 5SD, 5SP, 5IG, 5AJB, 5DU, 5TJ, 5VC, 5AIR, 5EK 5QH 5RG, 5RB, 5BE, 5QD, 5AKN, 5LR, 5ADB, 5XD, 5KR, 5KA, 5KC, 5BM, 5NW, 5MO, 5AGH, 5UX, 5QL, 5ALR, 5ALM, 5EI, 5SP, 5EF, 5ZA, 5MN, 5GG, 5LG, 5ADO, 5SD, 5XV 5AIC, 5AU, 5UL, 5AMF, 5AIJ, 5FJ, 5VF, 5AZ, 5AIU, 5ALX, 5AW, 5FV, 5WH, 5AMW, 5JD, 5AMU, 5AMA, 5AC, 6CEU, 6ADO, 6FM, 6FU, 6BXX, 6AJS, 6PL, 6ART, 6RN, 6COM, 6BNZ, 6CMU, 6ALW, 6JY, 6AOZ, 6DDC, 6BCH, 6VQ, 6BKN, 6DED, 6APT, 6CFQ, 6DDC, 6FN, 6CZZ, 6DKS, 6ZZ, 6ZT, 6CUG, 6BFH, 6BGZ, 6ARO, 6CPD, 6BLB, 6OA, 6CZY, 6BQS, 6CGX, 6BDA, 6ADA, 6APN, 6DN, 6DO, 6ZY, 6AFG, 6IB, 6WY, 6BSP, 6BLY, 6BWF, 6AFM, 6BXQ, 6CEH, 6CCM, 6CCV, 6AAO, 6AIM, 6CZM, 6CKM, 6BQJ, 6ATO, 6AVG, 6CZG, 6DJB, 6CLD, 6COS, 6AAU, 6HK, 6APF, 6AMB, 6BAK, 6BIK, 6OX, 6BEY, 6BSY, 6BUN, 6FM, 6YY, 6BKB, 6AAU, 6VK, 6BEZ, 6VE, 6CHO, 6EAK, 6ASN, 6CIU, 6ARU, 6EHJ, 6CSC, 6ENW, 6DAY, 6EER, 6ER, 6CJX, 6BMH, 6BJK, 6BSZ, 6VZ, 6BLT, 6AUW, 6AEM, 6DHG, 6DHB, 6BSB, 6DKQ, 6DKB, 6VM, 6CFF, 6CGL, 6ADY, 6CFI, 6FV, 6DUG, 6DUN, 6CGA, 6AHQ, 6APS, 6ZT, 6BOF, 6BXA, 6DKY, 6MC, 6ZG, 6CYW, 6ARY, 6AAU, 6DRY, 6BPV, 6BRK, 6CAA, 6DGA, 6CKA, 6CDO, 6EM, 6CIC, 6RK, 6AUM, 6DTN, 6APE, 6AP, 6CNY, 6WA, 6DTE 6CTE, 6RC, 6OCZ, 6VD, 6CJT, 6UZ, 6CVO, 6CEA, (9XW fone 100 meters), 6EK, 6AWV, 6CHT, 6FM, 6BGH, 6AA, 6CKM, 6BKF, 6DID, 6DWN, 6AKZ, 6DPX, 6GZ, 6BSI, 6BHW, 6DLR, 6ABF, 6BJY, 6DRK, 6CRA, 6BUW, 6CLX, 6CZX, 6CKZ, 6ADZ, 6AOL, 6DAY, 6AGB, 6CZW, 6CJY, 6EHJ, 6ZFC, 6EAK, 6DRI 6DUI 6DSW, 6WNP, 6DEF, 6KFZ.

6EA and 6EB

Log from 6EA, Los Angeles: 1FD, 1FS, (1ABF), (1ARE), (1AWE), 1BSD, (2CLA), (2CWO), (3BVA), (3XAQ), 4BZ, (4IO), (4XC), 5BX 5EK 5LG 5OQ, (5PH), (5QL), 5RG, 5VM, 5ZA, 5ADO, 5AIC, 5AIU, (5AMO), 5AMW, 5ANF, 5ZAV, 7BJ, 7EM, 7EY 7FD, 7FQ, 7FR, 7FS, (7GQ), (7GP), (7GR), 7IH, 7IO, 7IP, 7IW, 7JE 7KE, (7LH), 7LN, 7MI, 7NO, 7OM, 7QC, 7QD, 7TQ, 7VN, 7WM, 7WS, 7ZU 7ABB 7ACM, 7ADG, 7ADQ, 7ADS, 7AEL, 7AFN, 7AGE, 7AGR, 7AHV, 7AJQ, 7AKK, 7ALD, 8ER, 8VY, (8ZK), (8ABS), 8ACM, 8ANM, (8BDA), 8BFM, (8BXX), 8CTP, 8EQ, 8GK, (8MC), 9RY, 9VK 9ZK, 9AMB, 9APF, 9AVU, 9AZG, 9AZR, 9BEU, 9BJK, 9BLY, 9BMU, 9BPY, 9BTL (9BUN) 9BVN, 9BXQ, 9CAA, 9CJY, 9CLD, 9CZG, 9DAY, 9DCW, 9DDP, 9DFH, 9DTE, 9DTJ, 9DUG, 9DYI, 9DYR, 9EAE 9EAK, 9EFK, 9XBA, 9XAX, 9FZ, 9DEF buzzer and CW.

Canadian 4CB, 5GO, 9BX. Above DX worked on five watts and heard on low qrh three circuit regenerative receiver.—H. C. SEEFRED, 343 South Fremont Ave.

From 6EA

The recent rains and winds have delayed 6EA and 6EB in putting up their new 100 ft. pole, so they have decided to wait until summer and build new stations also, to be ready for next winter. With only 40 ft. of it up, they are getting out fine, working every district and being heard in new places. Heard by 6EB: 2ABD, 2BRB, 3QV, 4IO, 4MY, 5ADB, 5ADO, 5AGN, 5AH, 5AIC, 5AIU, (5AMO), 5AZ, 5BE, 5DW, (5LG), 5LR, 5NW, 5PH, 5QD, 5QH, (5RG), 5SK, 5XD, 5ZA, 5ZAV, 7ABB, 7ABY, 7ACI, 7ADP, 7AEL, 7AFO, 7AHS, 7AIV, 7AJD, 7AJQ, (7AJY), 7AKH, 7AKK, 7ALD, 7ALK, 7ALL, 7AOD, 7BR, 7CF, 7CO, 7DI 7DR, 7EI, 7EJ, 7EM, 7FQ, 7FR, 7FS, 7GQ, 7GR, 7HW, 7IO, 7IW, 7JU, 7KE, 7LH, 7OB, 7OM, 7PW, (7QD), 7RY, 7SF, 7SH, 7SY, 7TQ, 7TT, 7VN, 7WS, 7XB, 7ZU, 7ZZ, 8ATC, 8CEK, 8CGT, 8CJD, 8CMY, 8FJ, 8IN, 8KC, 8QY, 8VY, 8XE, 8YN, 8ZK 9AB, 9ABC, 9ACM, (9AEC), (9AHZ), 9AMB, 9AMP, 9AOJ, 9APF, 9AQC, 9AVC 9AWY, 9AZG, 9BCW, 9BEU, 9BEZ 9BKF 9BLY, 9BQY, 9BTO, 9CAA, 9CAJ, 9CCS, 9CDQ, 9CDV, 9CJU, 9CJY, 9CLD, 9CLY, 9CTV, 9CVC, 9CVO, 9CZG, 9CZQ, 9DAW 9DKQ, 9DPP, 9DSW, 9DTE, 9DYI 9DXX 9EAE, 9EAK, 9EAM, 9EEA, 9EIQ, 9ELB 9HM, 9MC, 9SS, 9XAX, 9XBA, 9XBE, 9YAU, 9ZT, 9WNP, 9KFZ, 9DEF; Can.: (4DQ) 4CB, 4FZ, (4SH), 5CN, 5GO, 5HG (9BX). The above list of calls heard were received on a Seefred EA-6 which needs no antenna, just a ground connection. Just had 500 cards printed and if any of the calls listed here have not received one, please write me and also don't forget to let me know if you have heard 6EB, regardless of distance. I am always glad to know and answer all cards. One stage of amplification was used but will have three stage soon. February "Radio Journal" has some more calls heard by 6EB.

From 6BQR

DX Calls Heard by 6BQR, 1422 Allison Ave., Los Angeles, Calif. Kindly notice the new qra 1422 Allison Ave., when u qsl. U. S. CW: 1ABF, 1AJP, 1AKL, 1BCR, 1BQ, 1CI, 1CMP, 1FD, 1GV, 1KC, 1XAK, 1XAM, 1XW, 2AGB, 2BQHH, 2CQZ, 2GK, 2RK, 2XAC, 3BG, 3BJ, 3BK 3HH, 3LG, 3MB, 3PZ, 3XAQ, 4AI, 4BQ, 4CS, 4FT, 4IO, 4OA, 4QY, 4XC, 4XE, 4XU, 8ACY, 8AGP, 8AMM, 8AOL, 8AOQ, 8APN, 8APT, 8ATC, 8BDA, 8BDU, 8BFM, 8BLY, 8BXH, 8BZC, 8BZY, 8CDZ, 8CFD, 8CGJ, 8CHY, 8CPK, 8CUD, 8CWU, 8DAT, 8DHS, 8FM, 8FU, 8GZ, 8HV, 8JJ, 8JY, 8OA, 8PL, 8QK, 8TV, 8WX, 8XBA, 8XBH, 8XBP, 8XC, 8XS, 8YN, 8YV, 8ZC, 8ZZ, Other Dists. too numerous.

Canadian CW: 3AA, 3BP, 3BQ, 3CO, 3KG, 3XN, 4CO, 4CW, 5CN, 5GO, 9BP, 9BX.

North Pole: WNP.
Broadcasting:: KDKA, KYW, KFKX, WBAP, WHB, WGY.

Mexican: CYL.
6BQR is rebuilding and will soon be on with 50 Watter.

Railway clerks, barbers, accountants, farmers, machinists, artists, electricians, lawyers, school boys and university students are among the many who are taking the course in "Radio Communication" now being broadcast from Station WBZ operated by the Westinghouse Electric & Manufacturing Company, Springfield, Mass

Radio Club Activities

Twin City Club

The Twin City Radio Club, at its last meeting, May 1, heard a most enjoyable speaker,—Professor J. C. Saunderson. Professor Saunderson is an ardent student of Esperanto, and is working towards the furtherance of this international languages. He secured many new members to the Esperanto system at the meeting, and practically every one in the room has now enough knowledge of Esperanto to be able to handle it over the air in a more or less efficient manner, depending upon how much education was had before the meeting.

The meeting place of the Twin City Radio Club is now at the auditorium of the main Engineering Building of the University of Minnesota. The next meeting will be the last one for this year, as the Twin City Radio Club shuts down each summer, due to the fact that most of the members go to the lakes or are on vacations during the summer months.

9ZT-9XAX had just received the Hoover Cup the same day, so it was shown at the meeting as well.

Brooklyn Club

Due to the fifth annual convention and banquet of the Third District falling during one of the club's meeting nights, the talk on the super-heterodyne, to be delivered by Mr. A. J. Haynes, was postponed. The board of directors has set aside Saturday, May 24, as the date for the club's annual affair. The affair this year will take the form of a dinner, at which a few prominent amateurs from other districts will be present. Mr. McMinn, 2WC, has been placed in charge. The club maintains a QRM investigation committee, whose duty is to keep the air in Brooklyn as free from amateur QRM as it is humanly possible to keep it. This committee also investigates any report of amateur QRM in Brooklyn referred to it, and proceeds to rectify the cause of the complaint. It plans to include in its activities other forms of interference, such as "static" emanating from poor overhead electrical wiring, from power houses, etc., and will do all in its power to have the conditions remedied. The club also conducts a code class for the benefit of the broadcast-listener who desire to join the ranks of the amateur. This class is in charge of two of two Brooklyn's foremost operators, E. M. Glaser, 2BRB, ARRL assistant division manager for Eastern New York, and W. A. Schudt, Jr., 2CHY, ARRL city manager for Brooklyn.

The club is pleased to announce the appointment of Mr. J. Radford Fincher, 2CXB, to post of ARRL district superintendent for the First New York district, which includes all of Long Island outside of Brooklyn and Queens.

In the Traffic report for last month all stations listed, with the exception of three are members of this club.

Regular open meetings are held the second and fourth Fridays of the month at 2211 Bedford Ave. The house committee always arranges some interesting features for each meeting. Visitors cordially welcome.

Milwaukee Club

A "Broadcast Listener's Night" at which some of the country's foremost radio experts spoke was the big feature on the last month's program of the Milwaukee Radio Amateurs' Club, Inc. At a regular Thursday evening meeting in the Trustees' Room of the Milwaukee Public Museum with an audience overflowing the hall, E. T. Flewelling, Chicago, of flier super-regenerative circuit fame, David Grimes, New York and Minneapolis, known for his inverse duplex and reflex circuits, H. J. Marx, Technical Editor of "Radio Digest," Chicago, Milo Guernsey, the "mystery man," and F. D. Pearne, chief electrical instructor of Lane Technical High School, Chicago, but better known as technical editor of "Radio Age" and technical radio editor of the Chicago "Herald and Examiner", addressed the gathering on various topics. Mr. Grimes discussed the history of radio telephony, dating back to the work of Dr. Alexander G. Bell, Mr. Flewelling and Mr. Marx dwelt on the efficiency of modern apparatus and circuits, Mr. Pearne told what Mr. Grimes wouldn't about inverse duplex circuits, and the "mystery man" gave a humorous talk.

Periodically, events of this kind are staged to encourage the friendliness of B. C. L's who, though invited to all meetings, find that these special gatherings are of more interest inasmuch as the programs are not as technical nor confined wholly to the interests of the transmitting amateur.

Other meetings have included such talks as "The Development Work of Sodium Vapor Tubes at the University of Illinois" given by Ben. J. Chromy, 9CJO, an electrical engineering student. R. E. Lathrop, 9ATX, of the Technical Committee, has presented reports entitled, "The Application of the Mercury Arc Rectifier to Radio Telegraphy" and "The Construction of Electrolytic Filter Condensers." Another regular program feature is the description of local stations by their owners. Stations 9ATO, which was recently in contact with WNP near the North Pole, 9CKW, and 9ELD were recent ones described with the aid of stereopticon slides.

Power line interference and its mitigation has somewhat superseded commercial spark QRM in the attention of the traffic committee, but with this trouble it is found that the electric light and power company must do most of the work, aside from some locating tasks, which amateurs may do.

The last two meetings have been taken up mainly by discussions of ICW vs. CW, and finally the CW's have won out, and the ICW's have agreed to stay off the air until after midnight at least, and practically all have agreed to keep to CW exclusively.

The meeting before last, V. R. Lucas from 9UH located at Fargo, North Dakota gave us a talk on amateur activities in that state. Following that was a talk by Mr. White of the Radio Corporation of America. Mr. White's talk consisted mainly of some hair-raising stories, both of and about everything, some of it radio.

At another meeting of this body, Ira E. Drew gave an accurate account of the government stations NPO at Cavite, Phillipine Islands, and NPG and 6XAG at San Fran-

cisco. Rarely does the amateur gain admission to the high powered government arc stations, so this talk was doubly interesting, for Mr. Drew's remarkable memory brought back even the dimensions of the antenna insulators.

The experience of a Radio Editor is a subject that is bound to attract attention, so when Robert E. Knoff, Radio Editor of the Milwaukee Journal, rose to address the club, he found a capacity crowd expectantly waiting for his talk. Nor were they disappointed, for Mr. Knoff raised the roof with his tales of incidents that were as true as they were humorous. The head of the radio department of newspaper who is bitten by the "hambug" is a sorry individual, and the various stages in the education of such a person afford many a good laugh, as well as much serious consideration.

Edward T. Howell, 9CVI, President of the Milwaukee club, was featured on another program of the association, when he spoke on the history of radio, tracing the course of its progress from the earliest beginnings to the present day status.

The problem of publishing a club organ was solved for this season, by deciding to get out a report of the year's progress. These "proceedings" are now being prepared.

South California Association

The trial of 6KA on the charge of being a BCL was the feature of the March 3 meeting of the Southern California Radio Association in Los Angeles. Vice-President Schifferman, 6CGI, presided and acted as judge of the Kangaroo court. Secretary Wiggins, 6CHZ, was clerk of the court; Mr. Palethorpe, 6CFY, bailiff; T. E. Nikirk, 6KA, defendant; the Southern California Radio Association, plaintiff; Mr. Hardy, 6CMS, attorney for the defense; Mr. McCreery, 6LJ, attorney for the prosecution. The cross-questioning of witnesses and argument before the club as jury occasioned plenty of fun, with Announcer Hastings of the Herald studio coming in at the last moment with an impassioned appeal which changed what looked like verdict of guilty to one of acquittal.

L. A. Bloon and S. Ellis, 9BJK, of Denver, were guests. Chief Blodgett of the traffic department announced his plans for checking stations and running down "out-laws."

6KA gave more dope on 100 meter transmission, outlining drop in radiation but increase in audibility. Mr. McCreery, 6LJ, supplemented these remarks with his own experience at 100 meters.

Highgate, London

Mr. P. R. Coursey, B. Sc., President of the Radio Society of Highgate, gave a lantern lecture before that Society on Friday, March 21, the subject being "Modern Condensers and their Manufacture". After dealing briefly with the theory of the action of a condenser, Mr. Coursey indicated the difficulties met with in designing condensers with a high power factor to withstand high pressures. Some interesting slides were shown indicating the working of a mica mine, and the transport of the raw material to the Dublier Condenser Company's works in

Shepherd's Bush, where the mica is split, gauged, sorted and tested for dielectric strength. The assembly of the small condensers used in wireless receivers, and the manufacture of gridleaks and anode resistances were followed step by step, special mention being made of the very thorough tests to which every condenser and resistance is subjected before leaving the works. The manufacture of various types of large condensers was then dealt with, and it was stated that the efficiency of these condensers exceeds 99.99%. Mr. Coursley concluded his most interesting and instructive lectures by showing a few slides of the experimental transmitting station 6XX, the station of the Radio Society of Great Britain.

The hundredth meeting of the Radio Society of Highgate, England, was held on Friday, February 7, when a most interesting lecture was given by Mr. G. G. Blake, F. Inst. P., M. I. E. E. on "The Modern View of Electricity and Its Relation to Matter." Mr. Blake began by discussing in a simple manner the theory of Relativity, and some analogies were given to convey some conception of the smallness of electrons. We shall never be able to see electrons, said the lecturer, but existence was conclusively proved by Sir William Crookes and others. The constitution of solids, liquids and gases was dealt with, and a striking experiment was shown to illustrate the motion of the particles in a liquid. The uses of X-Rays to study the constitution of molecules was very clearly explained by means of lantern slides and experiments, and the existence and properties of ultra-violet light were also demonstrated by means of experiments. Lantern slides and experiments were also shown illustrating the properties of waves and the action of the thermionic valve. On February 15 a lecture on "Analogies" was given by Mr. E. S. Anderson, F. R. A. A simple electrical circuit was explained by means of water system and its pipes. The properties of inductance, capacity and oscillatory circuits were also clearly explained by means of mechanical and hydraulic analogies. An ingenious analogy was given to explain the flatness of tuning of waves radiated from an open aerial, and the modulation of a telephony carrier-wave was compared to the corrugating on a gramophone record disc. Full particulars of the Society will be gladly supplied on application to the Hon. Secretary, Mr. J. F. Stanley, B. Ss., A. C. G. I., F. R. A., 49 Cholmeley Park, Highgate, N. 6.

An interesting debate took place on Friday, February 22, on the motion that "In the opinion of this Society the whole of the proceedings of Parliament should be broadcast."

Mr. D. H. Earle and Mr. J. D. Steele proposed the motion, which was opposed by Messrs. J. F. Stanley and G. A. Y. Lowter. The main point in the argument of the proposers was that there are at present no reliable sources of information on parliamentary proceedings readily available to the general public. Newspaper reports are abbreviated and biased. Further, the proposers maintained that broadcasting would tend to raise the level of the debates, since all M. P.'s would realize that their words were being heard by thousands of people. The opposers of the motion suggested that M. P.'s would be so anxious to make themselves heard that they would get up and speak without really having anything to say, a proceeding which is not conducive to the transaction of business. In the case of ordinary broadcasting the broadcasters are specially trained to convey their personality to the broadcasters through the voice alone, whereas M. P.'s have not had such a training, and a long parliamentary debate would not make very interesting listening. It is admitted, of course, that special events in parliament should be

broadcast, but to broadcast the whole of the proceedings would be sheer waste of power, since nobody could afford the time to wear the headphones all day long and far into the night.

After the motion had been fully discussed by the Society a division was taken, as a result of which the motion was lost by 17 votes to 9.

On February 29, a Question Night was held, when a very interesting exchange of ideas took place. One member raised a discussion on Frame Aerials and Power Amplifiers, and Mr. Stanley gave an account of his recent visit to the 2LO Studio. The technical difficulties involved in the use of long wave-lengths for telephonic transmission was discussed, and some useful information was given concerning the position of the grid-leak and filament rheostat.

The Society has pleasure in reporting that the Hon. Secretary, Mr. J. F. Stanley, A. C. G. I., B. Ss., F. R. A., has been elected Hon. Secretary to the General Committee of Affiliated Societies, which Committee is composed of representatives of Societies all over Great Britain.

(Continued from Page 184)

efficiency. One party here says the cambric and wire, home constructed affair has done the trick for him. Those who profess to know here in Fargo say that everything has been done for my set that can be done, but in this I feel differently, and their statements to the contrary rather induce me to the belief that they don't know as much about radio construction details as they would like to have the public believe. If the spacing of my neutroformers to seven inches apart hasn't made any material difference, then there is nothing wrong with the set and it can be neutralized if the proper apparatus is used and it is properly adjusted, but in this I am at sea as to what to do and do it right, hence am writing you and will thank you for a response setting forth such suggestions as you think might serve to correct the troubles designated.

I was also interested in the Neutrodyne Super Heterodyne hook-up as it is called by Mr. Ludlow of Monroe, Wis., and read the article by Mr. Munzig, but having a very limited knowledge of radio don't exactly understand it. Am I to understand that the construction data as outlined is for the building of a set in addition to the Neutrodyne to be later connected with the Neutrodyne, or does it contemplate the wrecking of the Neutrodyne and rebuilding same. Am interested in something better than I now have, and was greatly interested in a Super Heterodyne hook-up as outlined in the March issue of the Radio in the Home written by Neeley, supplemented by full details by one Morgan and also by one Clark. If this machine will do what they say it will, it is quite some set and should please the most fastidious radio fan.

However, my Neutrodyne is working, has worked and will work again and as I get to both coasts now, can probably get up and down the Mississippi Valley country during the summer, and it has done quite as well as anything I have yet heard in this city, range, volume, selectivity, etc., considered, and if I could get it neutralized as I feel should be done, would be as good a machine of its kind as there is out I believe. —L. H. AMIDON, Fargo, N. D.

A.—The spacing of your Neutroformers is O. K. I personally believe that you can remedy your trouble by constructing Neutrodons as follows: Cut a three inch length of copper tubing $\frac{3}{4}$ inch in diameter. In this slide a $4\frac{1}{2}$ length of flexible lamp cord. This capacity will be much greater than the FADA Neutrodons and as evident in your set, it will be necessary to have more capacity for proper neutralization. The construction of the

Super-Heterodyne will require a separate undertaking. Unless you wish I don't believe I would wreck your present set. Try to dispose of it to some one so that you may get your money back anyway. Then construct the Super—which indeed is a separate undertaking.

The British Standard List of Terms and Definitions Used in Radio Communication, just off the press, is really a vocabulary of radio. The list of terms and definitions numbers about 170 in general use.

Owing to the rapid growth of the subject it is not possible to include every term used in connection with radio science, and such new terms as survive will be incorporated in future revisions of the list. Where the same definition applies to more than one term, the term recommended for general use is printed in bold type, the other terms being given in lighter type as synonyms of the preferred term. In this way the committee responsible for drawing up the list hope to encourage uniformity in the matter of nomenclature, a step which is specially desirable in the case of such a rapidly developing science as radio communication.

Copies of this publication are obtainable from the B. E. S. A. Publications Department, 28, Victoria Street, London S. W. 1.

From calliope to chariot races, from spectacular opening to the ballyhoo of side show "talkers", the circus has gone over the radio. Westinghouse Station KYW recently broadcast for the first time in radio history the Metropolitan opening of a big show—the fifth annual premiere of Sells-Floto circus in Chicago's Coliseum. With a three-way switch, KYW presented the big show performance far beyond both coasts, sending forth side show and menagerie "High Lights" to give the typical big top atmosphere to the interesting achievement.

W. H. McFarland, dean of "kid" show managers, toured the circle of freaks and curious peoples with the fans. Each platform was visited, and, after a rattling old-time introduction by the veteran impresario, the freaks greeted the fans. The wild man growled, the fat lady gave her weight and the colored minstrels strutted their bits. A darky quartet broke in at intervals with racing lilt of syncopated mammy stuff, and Captain Jacobs, "fearless lion fighter" fought the good fight for the sixteenth time that day.

A. G. Farquharson, secretary of the Los Angeles Music Trades Association and of the Radio Trades Association section of that organization is installed in new quarters, 612 Commercial Exchange Building, Eighth and Olive Sts. Los Angeles, California.

With the Western Amateurs

A Department Conducted by A. L. Munzig

New A.R.R.L. Chiefs

The names of the new directors of the American Radio Relay League have been announced by the executive committee at the A.R.R.L. headquarters following official count of the ballots from all divisions throughout North America. Because of its position as a non commercial association and the democratic nature of its constitution, peculiar to an organization of the kind it is required that the directors be selected by the membership.

Between 15,000 and 16,000 ballots were distributed and in several divisions rather strenuous campaigns were waged by the supporters of the candidates. After a complete survey of the votes cast by the League's membership in the United States and Canada the following men were declared officially elected:

Atlantic Division, George L. Bidwell, Washington, D. C.

Central Division, Clyde E. Darr, Detroit, Michigan.

Dakota Division, Cyril M. Jansky, Minneapolis, Minn.

Delta Division, Benjamin F. Painter, Chattanooga, Tenn.

East Gulf Division, Harry F. Dobbs, Atlanta, Ga.

Midwest Division, L. Boyd Laizure, Kansas City, Mo.

New England Division, George H. Pinney, South Manchester, Conn.

Northwestern Division, Karl W. Weingarten, Tacoma, Washington.

Pacific Division, Allen H. Babcock, San Francisco, California.

Rocky Mountain Division, Paul M. Segal, Denver, Colorado.

Roanoke Division, W. Treadway Cravely, Danville, Va.

West Gulf Division, Frank M. Corlett.

A. H. Keith Russell becomes a director through his election as Canadian general manager of the A.R.R.L. Although Canada is divided into several operating divisions, it is represented on the board by this office created in the League's new constitution. The election of the foregoing candidates becomes effective July 1, 1924.

The annual meeting will be convened by the president, Hiram Percy Maxim of Hartford, Conn., the latter part of July.

New Station 6COS

Editor, Radio Journal: I am writing this letter to let you know that I have just received my station license and call letters. I am also going to describe my transmitter and receiver.

My transmitter is a 5-watt set, using one 5-watt tube with 135 volts on the plate. It is a portable set and the panel measures 7"x5½". It consists of a plate and grid coil, honeycomb used as a radio frequency choke coil, radiation meter reading from 0-250 milliamperes, .0015 Micadon Condenser, and a 5-watt tube. I am going to use a microphone and a key with this set.

My receiver is just an ordinary single circuit C.R.5 receiver.

My aerial is an inverted L type 50ft. long and 50ft. high with four wires.—WM. M. SEELEY, 6COS, Los Angeles, Calif.

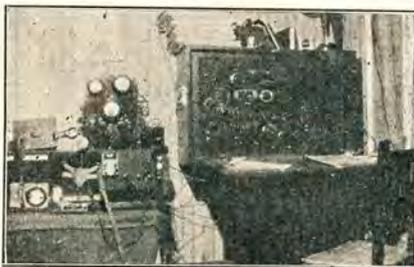
The QRA of 6XBQ is: L. Picker, San Ysidro, Calif. Any reports on CW and phone signals will be greatly appreciated. Picker also has call 6ZH.

Dope from 9ZT—9XAX

Here is some real dope from D. C. Wallace, ADM, A.R.R.L., 9ZT, 9XAX, 1923 Hoover Cup winner:

Practically all of the amateur stations in the vicinity of the Twin Cities who are able to tune to 150 meters and are allowed to do so on their license, have found that this wave length enables them to communicate with many stations and many districts that were out of the question heretofore. Several of the stations have reported that on 150 meters they find conditions as satisfactory as are the conditions on 110 or 120 meters.

It seems that if the station transmitter is tuned below the fundamental, it makes very little difference where it is tuned, and whether the wave length will be 200, 150, or 100 meters. In other words, if the an-



This is 6AVA

tenna has a natural period of around 175 meters, the best working wave would be below that and not above it. This of course, means rather low antenna current, but we have long been familiar with the saying that antenna current does not determine range.

In the vicinity of 200 meters, communication is being carried on as usual, but under greatly improved conditions, as the interference that has heretofore prevailed on 200 meters has reduced down to the point where practically no interference exists. Stations in the Dakota division have been endeavoring to improve the pureness of the emitted wave, and now it is rare that we hear spark or ICW, and pure CW seems to be the rule.

We are rapidly approaching the day of the "silent transmitter" and we hope that some day we will be able to have several hundred communications going on simultaneously from every large community in the Dakota Division.

From 6ARB

Report April 1 to April 30, by 6ARB, C. E. Duncan, 3029 Acton St., Berkeley, Calif.: (1KA) (1BCR) (1BSD) (1CPN) 1XAS, 2GK, 2ADK, (2BRB), 2XAB, (2XNA), 3ME, (3YO), 3ZL, 3AEC, (3BVA) 4EB (4XC) 5KC, 5OV, (5AFH) 5AIC, (5AJH), (5AJJ), (5APH), 5ZAV, (6BUO), 7ABB, (2ABS), 8APT, (8ZK), 8CTP, 8XBH, (8XBL), (9AMB), 9BTL, (9CAA), (9CIP), (9CJY), 9CLQ, 9DWN, (9DYZ), 9DXY, Can.: 1BQ, (3BQ), 3CN, 3PZ, 4CB, (4CR), 4DQ, 4HH, (4IO), (5SG), 9AV. All districts worked in one morning twice during April, using a 250 watt bottle and a Grebe 13.

Tests With Paris

Radio amateurs of the United States and Canada are listening for test signals from the Eiffel Tower in Paris through special request to the American Radio Relay League from General Ferrie, director of telegraphs for the French government.

A special short wave radio transmitter has been installed at the tower for this purpose and reports of reception by amateurs of North America under varying weather conditions are to be sent to the A.R.R.L. and forwarded to the French government.

During his recent visit to Paris, where the International Amateur Radio Union was formed, Hiram Percy Maxim, president of the A.R.R.L. learned from General Ferrie that his government was desirous of obtaining the co-operation of American amateurs.

Radio Legion

The recently formed Radio Legion of America, whose ambitious goal is to bring all factions in the field of radio activities into one vast organization with a membership that will total a million, came into existence through the efforts of a small group of enthusiastic broadcast listeners in Chicago. It is the wish of the legion that the public generally know that no officer nor anyone else connected with it has the least affiliation with any commercial activity in the radio field.

John J. Funk, president, is a devoted electrical experimenter, and earns his living as a motion picture operator; M. Herschman, vice-president and treasurer, is a cigar manufacturer and retailer; M. E. Donegan, secretary, is in the business of renting high grade furnished apartments; Hill Bernstein, organizer, is an advertising expert and is employed by theatrical interests.

Officers are not on salary nor are they compensated in any other way. The Radio Legion operates on a strictly cost basis and pays out money only for work actually done, and other necessary expenses such as printing, mailing, etc.

Anyone interested may secure full information by addressing the Legion national headquarters in the Garrick Theatre Building, Chicago, Ill.

French Concert

The first radio concert heard in America transmitted from the Eiffel Tower, Paris, France, was intercepted Saturday night, March 29th, by Bert Moulton, Chatham, Mass. Moulton is employed at the Radio Corporation of America coastal station at Chatham, Mass., besides operating his own experimental station.

Trade Talk

from
Radio Dealers & Manufacturers

Coast on One Tube

Getting Los Angeles with a single tube dry cell receiving set powered by two National Carbon Company dry batteries is the record set by Allen T. Haas, of Magnolia, N. J. Mr. Haas, who has been a DX radio fan for only two months, has a single tube (WD11) Westinghouse Aeriola Sr., and uses a Columbia dry cell for his A battery and an Eveready for his B battery. His outside aerial is 100 feet long, seven strand copper wire, running from the house (30 feet) to a tree twenty feet high. Aerial runs east and west—pointing due west.

Magnolia is about ten miles from Philadelphia, far enough away so that the powerful Philadelphia stations do not interfere too greatly. In a period of two months Mr. Haas has tuned in 56 distant stations, including Tuinucu and Havana, Cuba; Montreal and Ottawa, Canada; Miami, Fla.; Atlanta, Ga.; Kansas City, Mo. and Hastings, Nebraska. The latter station comes in over his set more distinctly than anything else over 1000 miles distant.

Mr. Haas was looking for a Texas station to add to his string and when around 395 meters, tuned in KHJ at 11:40 P. M. Eastern Standard time. He heard a speaker, singing, and music. The announcement and call letters came in quite distinctly. He retained the station for fifteen minutes. A description of the program was immediately sent to this station which is operated by the Times at Los Angeles, California, and verification of the reception was received from their radio department.

New Radio School

The Western Radio Institute has opened a radio school in Los Angeles under the direction of E. S. Farnsworth. The school will give courses in all branches of radio. Mr. Farnsworth is an experienced radio operator and was in charge of the Y.M.C.A. radio school prior to assuming leadership of the new institute. The demand for radio operators, according to Mr. Farnsworth, is such that any really qualified student can secure a position

immediately and it is to fill this need for trained men that the new institution has been launched. The address of the school is 625 South Hope Street, Los Angeles, Calif.

New Bradleyohm

The Allen-Bradley Co., 286 Greenfield Ave., Milwaukee, Wis., has added another item to their increasing list of radio products known as the Bradleyohm. The Bradleyohm is an adjustable resistor which is similar in operation to other Allen-Bradley graphite disc rheostats such as the Bradleystat and Bradleyleak. The resistance of the Bradleyohm is varied over a wide



range by applying or removing pressure on the two columns of treated discs by means of an adjusting knob. The Bradleyohm is suited for such purposes as: providing an adjustable resistance across the audio-frequency transformers to reduce distortion; providing resistors to be used in coupling radio frequency or audio-frequency resistance amplifiers; adjusting push-pull amplifiers.

New "B" Battery

A vertical type 45-volt "B" battery has just been announced by the National Carbon Company, manufacturers of Eveready batteries, as the latest addition to their radio battery line. Their vertical type 22½ volt battery No. 754 has become so popular, that it logically led to the development of a big brother to this space-saver, and there was felt a well-defined demand for a compact, long-life 45-volt battery, which re-

quires the minimum of space for installation. This new vertical type battery takes less than half the table space of the horizontal type of 45-volt battery. It fits perfectly in the battery space compartment of the new Radiola Super-Heterodyne, and any cabinet of other makes which take the large sized 45-volt "B" batteries. Many multi-tube receiving sets uses a hard detector tube which does not call for a tapped "B" battery, so the No. 772 has three plainly marked terminals, —negative, plus 22½, and plus 45-volts. Connections are made to regular large size Fahnestock spring clip connectors. It has the same service capacity and is of the general electrical characteristics and construction as the No. 767 Eveready, and will sell at the same list price.

Sixteen Battery Stations

"Events move quickly in the radio world," said Guy Owen of the Western Auto Electric Co., distributor of Willard Batteries. "Radio Broadcasting Station WTAM, at Cleveland, O., boasted last fall, when it opened, that it was the only station without a generator hum and the only station using storage batteries for transmission power exclusively. There are now sixteen stations scattered throughout the country that have installed Willard broadcasting batteries as their only source of power. This was on the strength of WTAM's success with these batteries. Besides the sixteen stations there are over one hundred more using Willard broadcasting batteries in connection with their generator or rectified A. C. power for voice modulation and other purposes. The radio staff at WTAM has been reading the handwriting on the wall and in order to maintain the reputation for excellence of transmission, gained when WTAM was the only battery powered station, have turned their attention to improving other features of the station. If you hear a strong station broadcasting under the call letters 8XG, it is WTAM trying out some new broadcasting stunt to improve transmission. The experimental call letters of the Willard Storage Battery Company are 8XG."

(Continued from Page 169)

rheostats need scarcely be touched during the period of operation, but the second rheostat is more critical.

From 90 to 135 volts of plate battery are needed to get the best results. This is due largely to the characteristics of the low amperage tubes used.

Antenna Specifications

The antenna should be from 60 to 100 feet, single wire, well insulated at its ends. If you have too much antenna and do not wish to go to the trouble of cutting it down, you can reduce it by placing a fixed condenser of .00035, .00025 or .0001 in your lead-in wire. Tests will show which will give you the best results.

Here are the parts used by the Laboratories in building this set:

- 1 selectoformer
- 2 bakelite dials
- 3 rheostats
- 1 23 plate variable condenser (.0005 mfd.)
- 1 11 plate variable condenser (.00025 mfd.)
- 1 single circuit jack
- 1 double circuit jack
- 3 sockets
- 1 Erla reflex transformer No. 1
- 1 Erla reflex transformer No. 2
- 1 Erla 6 to 1 audio transformer
- 1 Erla 3½ to 1 audio transformer
- 1 crystal rectifier
- 3 fixed condensers of .001, .002 and .00025 mfd. respectively
- 1 panel 18x7³/₁₆
- 6 binding posts
- 25 feet tinned copper bus wire

This set is easy to assemble and even more easy to operate, there being an entire absence of body capacity and, for the benefit of your neighbors, no re-radiation. After a station is once logged and the numbers from the two dials jotted on your chart, you can return to this station practically at will.

How to Tune

Tuning is done by adjusting the two variable condensers. The 23 plate tunes the selectoformer and input circuit while the 11 plate tunes the radio frequency amplifier. These two adjustments should be about the same on the dial positions and care should be exercised to keep them somewhat in step when tuning. They must also be turned slowly or stations will be missed. A little practice will make perfect on tuning.

If a howl is encountered it may be due to low A or B batteries, rheostats turned too low, or the use of too large a by-pass condenser where the .00025 mfd condenser is indicated in the circuit. Changing to a .0001 or a .00015 will improve this condition, but too low a value will lessen distant signals.

Line Radio

Experiments with line radio and carrier currents in mines indicate that this method is feasible for two-way conversations between miners below the surface and the mouths of mines, both for every-day use and in emergencies, according to the Bureau of Mines.

The difficult problem of communicating with underground workers and surface stations of mines, especially after severe disturbances or accidents have taken place, will be solved, ac-

ording to Assistant Engineer J. J. Jakosky, of the Interior Department, by the development of the "wired wireless" telephone, utilizing existing "carriers", such as trolley wires, mine tracks, water and compressed air pipes, and cables. In tests, which he supervised at the Pittsburgh experimental mine, no difficulty was experienced on the surface in receiving the messages from a transmitting set on a mine locomotive, 400 feet below the surface, as long as the apparatus was near any metallic carriers.



"The Loveliest Thing I've Ever Heard Over the Radio"—Mary Garden

Only the most flawless reproduction, free from distortion and parasitic noises, could earn a tribute so unreserved from America's queen of song.

The exquisite tone quality and purity of Duo-Reflex reception that appealed so irresistibly to Miss Garden is finding equally enthusiastic appreciation in the homes of super-critical radio lovers everywhere.

Not only in sheer tonal perfection, but in range and volume, have Erla Duo-Reflex receivers demonstrated decisive superiority. Tube for tube, they are the most powerful receivers known.

Complete Erla parts, including celebrated synchronizing radio and audio transformers that enable vacuum tubes to do triple duty, guarantee success to the amateur who "rolls his own." Easily understood blueprints guide every step of construction and assembly.

Ask your dealer for free Erla bulletin No. 20, giving latest Erla one, two and three-tube diagrams; or write direct, mentioning your dealer's name.



Increased range and volume, as well as elimination of distortion, follow installation of Erla transformers. Reflex and Cascade types, \$5



Exclusive ability of Erla audio transformers to amplify three stages without distortion assures improvement in any receiving set. List, \$5

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Is bringing pleasure and entertainment to hundreds of passengers on the palatial steamships, the "Yale" and the "Harvard", plying between San Francisco and San Diego.

We feel a pardonable pride in the fact that a two months test of our Radio Frequency set on the "Harvard" brought us the order for identical equipment on the "Yale." YOU may own a duplicate of these sets.

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Mr. W. S. Percy, the well-known stage comedian and etcher, who was lately in Australia as a member of a J. C. Williamson comedy company recently broadcasted from London a specially written play entitled, "The Man Who Would Sing in His Bath." To add realism to the piece, a thousand guinea bath-room, situated in the Savoy Hotel, was commissioned, and it was from there that the splashing of water was heard over the country. In an interview with the London representative of the Sydney Sun, Mr. Percy said: "I took the opportunity of rehearsals to go into training and so I shouted into the microphone. The engineers were alarmed and rushed in and said I would burst the machine unless I was more careful. I thereupon spoke from eight feet away. I have heard of a man breaking a camera when he was photographed, but I did not think it possible to burst a broadcaster with a voice."

South of Munich, Bavaria, is the mountain Herzofstand, on the summit of which is being erected a huge wireless station, which will lift its antennas higher than those upon the Paris Eiffel Tower.

On the other side of the valley, from the 6,000 feet high peak, is another eminence almost as high. From these two peaks is swung a long wire cable, by which means the costly construction of steel towers is avoided, while the stupendous electrical energy required to work a station of this nature is developed from water power.

On account of the great weight and length of the cable, together with the strength of the wind-pressure, an ingenious system of counter-weights is used to compensate this. The sides of the peaks away from the valley are gently inclined, and easy to climb, but those which form its inner walls are almost inaccessible, and make the locality an ideal one for radio purposes.

E. W. Vogel, a marine wireless operator, recently picked up and took down in full a radio telegraphy message transmitted from France while his ship was somewhere in the 180th meridian in the Pacific. This meant that the sending station was over 12,000 miles away—half-way round the earth. The feat is thought to be a world's record for long-distance reception.

There are some 290 radio stations in Russia, Moscow being the center with three very powerful broadcasting and telegraphic sets. One is Shabalovsk, (RAJ) called Mossoviet; with a power of 150 kw.; the central radiophone station of Kodinsk (RAI) now called October.

A new method of determining distances at sea was described by George Lewis, assistant to Powel Crosley, Jr., in a talk before the Ohio Academy of Science at Columbus. Mr. Lewis was a lieutenant in the United States Navy and holds the first license issued to radio operators. For several years he had charge of experimental work for the navy. "A specially designed radio transmitter sends out a series of dots, one second apart, which, used in connection with the sound of a bell thru the water, enables the observers on a ship automatically to determine their distance from a given object, such as a ship or shore."

Does interference with radio waves carrying a sermon constitute a violation of the Kansas law prohibiting interference with religious worship.

That is the question that has been submitted to Attorney General Griffith by the congregation of a little church at Norway in Republic County. This church is without a pastor at present, but the trustees of the church determined to continue the regular services every Sunday, so they installed a radio receiving set and have been getting the services from Omaha.

Legal questions arising out of interference between users of radio could probably be settled by common law,

according to Stephen B. Davis, Solicitor of the Department of Commerce, who discussed the subject at a meeting of the Federal Club of the Bureau of Standards.

Mr. Davis stated that while common law was based almost wholly on precedent, it often was modified by court decision to meet new conditions, such as have been created by radio and aircraft.

The Bureau of Standards is transmitting special signals of standard frequency about twice a month. The last previously announced schedule was published in the March, 1924, issue of the Radio Service Bulletin. The next schedule is announced below. The signal 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 stations operators, and others in standardizing wave meters and adjusting transmitting and receiving apparatus. The transmissions on June 5 will be of special interest to ship operators, those on July 7 to amateurs. All transmissions are by unmodulated continuous-wave telegraphy. A complete frequency transmission includes a "general call", a "standard frequency signal", and "announcements" at eight minute intervals from 11 p.m. to 12:32 a.m. eastern standard time.

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Antenella eliminates all unsightly wiring, lightning arresters, etc., and precludes the possibility of dangerous grounding on a power line. It also stops "canary bird" re-radiation from nearby oscillating sets interfering.

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is not only a real distance getter but also successfully overcomes static annoyances.

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Plus a few cents postage

SEND NO MONEY

Order by mail if your dealer cannot supply you and we will ship immediately. Written 5-day money back Guarantee with each set.

Our next year's production schedule of two million phones UNDOUBTEDLY places us as the

WORLDS LARGEST HEADSET MAKERS
THE TOWER MFG. CO.
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Five-Day Money-Back Guarantee If Not Fully Satisfied. We Guarantee the Scientific to be

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Made for U. S. Army Aeroplanes
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This is Don C. Wallace, 54 Penn Avenue N., Minneapolis, Minn., one of the best known radio amateurs in the United States and winner of the Hoover cup. His calls are 9ZT and 9XAX.

The San Francisco studio of KGO in the Hotel St. Francis was to be formally opened on Wednesday evening, May 28, at eight o'clock. Ralph McLaren, acting Mayor of San Francisco, was to speak. The KGO Grand Opera Company, under the direction of Carl Anderson, with Florence Ringo, Blanche Hamilton Fox, Gregorio Artieda, Marion Vecki, and Elsie Hilton Cross in the cast were to produce "Cavalleria Rusticana" with Augusto Serantoni conducting.

Ground wires under San Francisco Bay connect the San Francisco studio with the control room and power house of KGO, located about ten miles away on East 14th Street and 56th Ave., Oakland. With this arrangement, it is possible to produce a number on a program in San Francisco, and so quickly switch to the Oakland studio that listeners will not be aware of the change. Complete programs will be given by San Francisco talent from time to time, and prominent people stopping in San Francisco will be asked to speak to the KGO audience.

The West Indies, Bermuda, Cuba, Haiti, Canada. All in one day's mail. Although the Chicago Tribune-Zenith Broadcasting Station W.G.N. located on the Edgewater Beach, Chicago, is used to distance communications since its establishment of a world's record by confirmed reception in several Australian cities, the studio staff experienced quite a thrill when from one morning's mail delivery letters were extracted bearing postmarks from the five countries named above.

New interest in radio in Canada is revealed in figures issued by the Dominion Department of Marine at Ottawa. Since December last eleven licenses for broadcasting stations have been issued by the department, making a total of forty-five broadcasting stations in Canada. The new stations are, by provinces: Ontario, 5; Nova Scotia, 1; Quebec, 1; British Columbia, 2, and Alberta, 2.

Station CYL, at Mexico City, has been heard in many sections of the United States. The station has been on the air every night since December. It is rated with a power of 500 watts. All broadcasting is done on a wave length of 500 meters, and the programs consist of news bulletins and music.



RADIO HORN

Has clear, natural tone and an exceptionally fine appearance. Your receiver fits in base. Mail a dollar bill for horn like picture, knocked down, prepaid. Easily assembled by anyone.

\$1.00

FOX MFG. COMPANY, DEPT. M
247 So. Broadway Los Angeles, Cal.

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Special Sets Made to Order

Let me quote you on any circuit.
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**STERLING ELECTRIC
COMPANY**

MINNEAPOLIS, MINN.

Radio fans have discovered that it is static of the mind—not static of the air—that has given credence to the myth in past summers, that radio was largely a seasonal feature. This was the keynote of a recent conference held by a group of prominent radio men in New England, with Elmer E. Bucher, Chairman of the merchandising committee of the radio section of the Associated Manufacturers of Electrical Supplies which includes in its membership all the leading elements in the radio industry of the United States.

“Statistics and reports discussed at this conference developed many startling facts concerning radio”, declared Mr. Bucher. “Did the average American, who has kept abreast through the newspapers of the latest developments in the radio art, expect to forego the pleasure and profit of radio reception whenever there happened to be a stray interloper in the air? He did not, it was agreed.”

Among Canadian records claimed by the Manitoba Telephone System's station CKY are the following: Broadcasting of the first service from a church; the greatest number of church services to date; the first regular series of Agricultural College talks and the greatest number to date; the first broadcasting of speech received over a long distance telephone line. and the

first successful re-broadcasting of a concert from an American city. CKY also claims possession of the greatest number of wire connections with churches, theatres, skating rinks, dance halls, etc.

Enthusiasm for radio telephony continues to grow throughout Great Britain, according to Acting Commercial Attache Hugh A. Butler. Up to March 1, 1924, over 600,000 licenses for receiving sets had been issued.

TRIMM PHONES

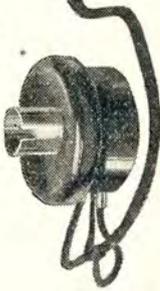


Dependable . . . \$5.00



Were selected by MacMillan on his trip to the North Pole. A safe and sure instrument to use at all times for clear reception and to bring in faint distant signals.

“Professional” Headsets	\$7.65
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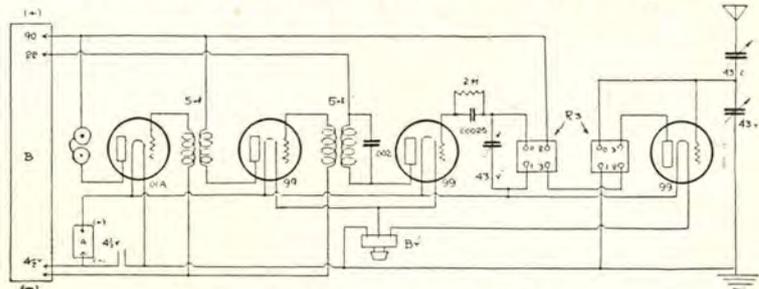
“LITTLE WONDER” UNIT \$4.50

ROFFY Circuit No. 3

The fundamental diagram of Roffy Circuit No. 3 was published in the February issue of the Radio Journal and as in all circuits the professional fine touch makes the Circuit keener, more flexible and sharper. The flood of inquiries on the master set prompts the publication of the Circuit in detail. The experimenter is cautioned against imitation Roffy Transformers. Prefer U. S. Tool Condenser, Amer Tran Audio, King Sockets and Bradleystat for best results.

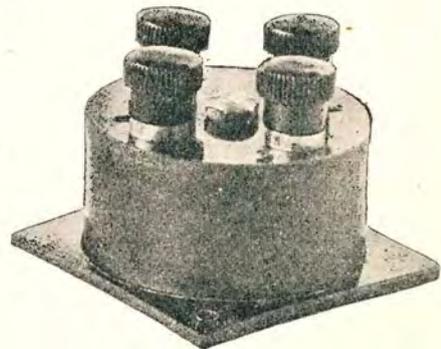
Roffy Circuit No. 3

Portable Roffy Circuit No. 3 with Power Amplifier



Build Set Reading Right to Left

**No. 3
Transformers
\$ 8.50
at All Dealers**



J. T. ROFFY

725 State Street

P. O. Box 94

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Further Helps on Moise Reflex

By Alfred H. MOISE, R.E.

PRACTICALLY all of those from whom I have heard who have tried out Moise Reflex circuits as described in the last issue of Radio Journal find the straight Moise Reflex by far the best with 199 or 299 tubes, and there seems to be a feeling that the Moise Harkness hook-up is better for A tubes. This is really due to the fact that A tubes are more easily set into oscillation than 199's, thus making the regeneration control or A Tubes more critical than in 199's in the straight Moise reflex.

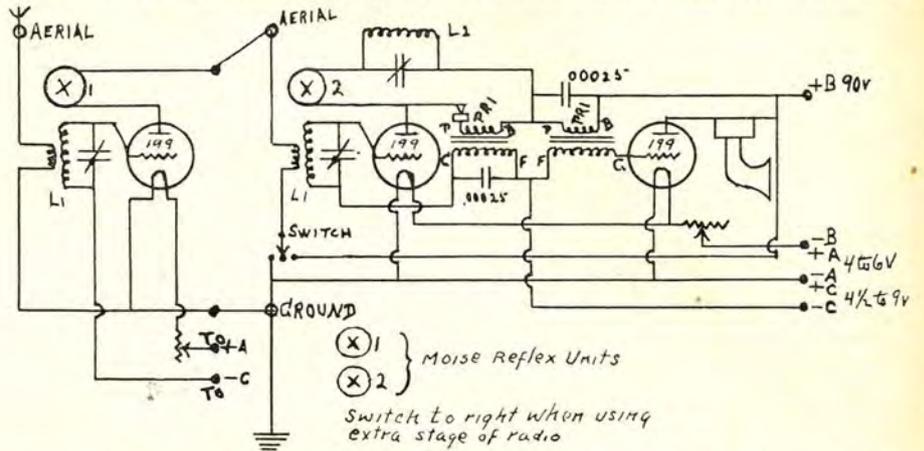
199 tubes need the extra tendency toward oscillation found in the Moise reflex and it is due to this, with the reflex units control that 199's practically do the work of A tubes. First I will answer questions which seem to bother some of the experimenters.

1st—Most audio transformers of 4 or 5 to 1 ratios function well in this circuit. Among the particularly satisfactory ones of medium price which I have used are Modern and Hegehog.

2nd—The second audio transformer in the Moise reflex circuit has two sets of audio frequency currents in its primary. Of course when everything is

properly connected these currents are in phase and working together make the second tube a more powerful amplifier than the usual reflex second tube.

3rd—Follow the accompanying dia-



gram and have an extra stage of radio which can be kept connected though not necessarily in use.

By taking the aerial wire off the extra stage and connecting it to the aerial post on the reflex set, and throwing the switch to the left the set functions as a two tube reflex. It is advisable but not essential to disconnect the

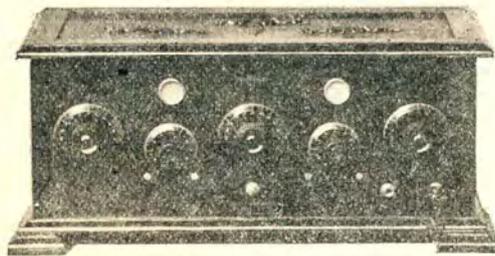
wire connecting the extra stage of radio to the aerial post of the set.

5th—When tuning with the extra stage of radio amplification set the Moise Unit No. 2 for very weak oscillation and you can pick up the whistle of stations as you cross their carrier waves. Of course keep unit No. 1 set for regeneration just short of oscillation if very best results are

wanted, and after you have tuned in your station adjust unit No. 2 slightly to make the reflexed tube just stop oscillating.

6th—The set will sometimes work better with the primary of the first audio transformer reversed from the connections as shown in the accompanying diagram.

STONE TRUTH



Neutroflex III

At last---a set that doesn't tell you that a violin is a flute---that a piano is a harp and that all announcers have a bad cold.

THE NEUTROFLEX

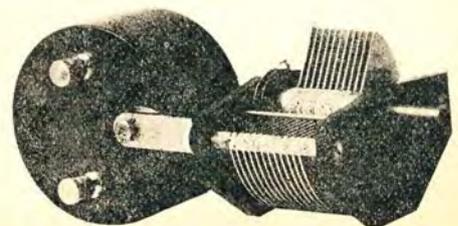
A three tube set in the five tube class---with a reserve of volume that you will never draw upon---with a range that gives you the pick of the best broadcasting and a fidelity of tone never before attained

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

Name.....
Address.....
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C. D. Tanner Co.
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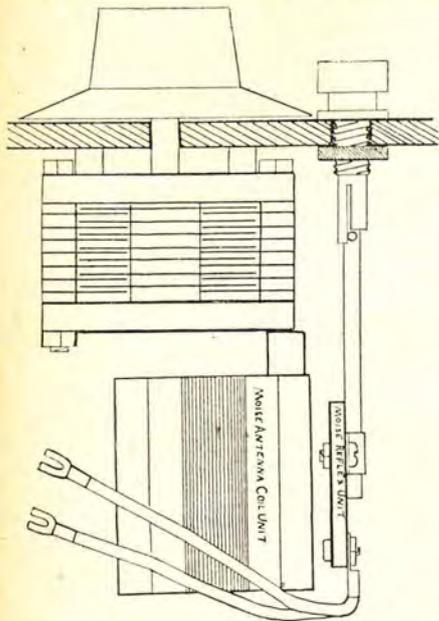
Dealers write for
proposition



NEUTROFLEX TRANSFORMER
Mounted on Kilbourne and Clark Condenser

7th—Accompanying sketch shows how to mount the Moise Reflex unit. It is better to have the coil up close to the unit.

8th—I do not know of any circuit



better than this for consistent combined quality of reception, volume, distance on two tubes and selectivity.

Harkness coils can be used though they are not as efficient in this particular circuit as Moise coils, nor quite as selective. For L2 strip the primary

winding off the Harkness T2. The Moise reflex unit can be mounted at either end of coil L1 but the grid connection should go to the same end as the result.

The following parts are recommended for building this reflex thirty ohm rheostat, 2 sockets, 2 seventeen or twenty-three plate variable condensers, 1 Moise reflex unit, 1 Moise No. 1 antenna coupling coil, 1 Moise No. 2 rejector coil, 1 7 x 12 panel, 2 three-inch dials, 1 crystal detector with high grade crystal, 5 binding posts, 2 4-1 or 4 1/2-1 audio transformers, Modern or other other high grade, 90 volts B battery, 2 UV199, UV201A or C391A tubes, A battery to suit tubes, loud speaker, cabinet, C battery 4 1/2 volts, aerial and ground.

I am always glad to answer questions accompanied by a stamped self-addressed envelope.

On April 2 Tamaki Miura, Japanese opera singer, actuated the microphone of station KYW, Chicago. Her voice was heard as far west as Hawaii. She promised every listener who acknowledged reception of the program that she would send an autographed photograph, and up to the present time 10,000 letters have been received.

Radio receiving sets in Denmark now number 3,109.

Catalogs and price lists for American receiving sets and parts for amateurs assembling are wanted by radio enthusiasts in India. Firms interested are requested to send such literature to the American Trade Commissioner, James E. Miller, Esq., Room 29, Grosvenor House, 21 Old Court House Street, Calcutta, India, who will be glad to make it available to those interested.

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

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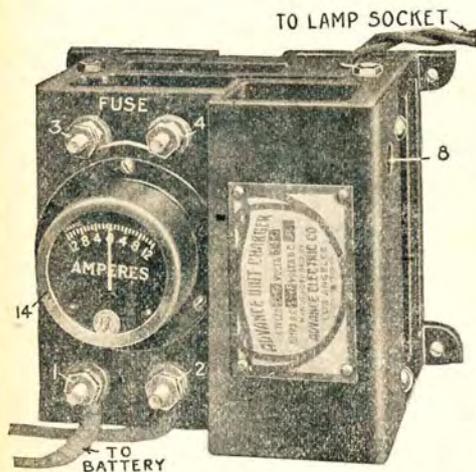
or send 50 cents for the Ma Jong set alone.

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

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A NECESSITY FOR EVERY OWNER OF AN AUTO OR RADIO SET

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When your battery needs charging the Advance Unit Charger may be connected to the ordinary alternating lamp socket and your battery will be charged over night. Radio owners find this charger adds to the pleasure of operating set. It is not necessary to move the battery when using the Advance Unit Charger.

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GUARANTEED for ONE YEAR AGAINST DEFECTS.

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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.

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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; Brandes 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.

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

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

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

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

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 of money back. Send money order, Williams Radio, 2339 W. 8th St., Philadelphia, Pa.

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.

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A. B. C. of Radio by Waldemar Kaempffert—over 600,000 copies sold at 25c. a copy. One of best beginners' radio books on market. Special price 16c. each, postpaid. Western-Radio Supply Co., 418 Stimson Bldg., Los Angeles.

MISCELLANEOUS

ONE MILLION GERMAN MARKS either hundred thousand of fifty thousand denomination. Genuine guaranteed currency. Fifty cents. Agents wanted. Write or wire wholesale price.—Di Foti, 561 Washington St., Akron, Ohio.

FOR SALE—C.W. and Phone Transmitter, 10 watts. Electric Specialty 100 w., 500 volt generator, 110 volt 50 cycle motor; \$100 complete with tubes, microphone, key, buzzer, etc. Address Box B-42, Radio Journal.

Homespun Tobacco—Chewing—5 lbs, \$1.25; 10 lbs., \$2.50; 20 lbs., \$4.50. Smoking, 5 lbs., \$1.25; 10 lbs., \$2.00; 20 lbs., \$3.50; Farmers' Union, Mayfield, Ky.

MAIL ORDER METHODS—\$50 WEEK, evenings, I made it; mail order business. Booklet for stamp tells how. Sample and plain, 25 cents. Free 12 articles worth \$3. Alraj Scott, Cohoes, N. Y.

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RADIO FANS AND PROFESSIONALS—How many of you know the correct CODIFICATION of all characters, punctuations and signs (such as \$, per cent, etc.). We dare say that nine out of ten don't know them correctly! Our instructor who has had 35 years' experience, eight years of which were with Uncle Sam as MORSE and RADIO TELEGRAPHER, has just published the first and only CHART known to give fully a true and correct CODIFICATION of ALL characters used in both codes. This CHART is indispensable to all up-to-date beginners and veterans alike. Fifty cents (money order preferred) will bring CHART, also much information extremely interesting to BOYS and GIRLS; because, with this information and a little PEP on your part, you can qualify shortly (as scores of our graduates have done) and secure positions paying \$1,500 to \$3,000 yearly. (See Civil Service Bulletins 215, 357 and 54.) We are registered with the U. S. C. S. Com. at Washington, and can help you. AMERICAN TELEGRAPHIC STUDIO, BOX 793, WORCESTER, MASS.

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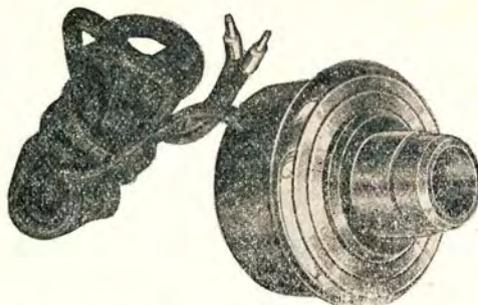
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We have dials, sockets, jacks, plugs, variometers, variocouplers, variable condensers, crystals, grid leaks, by-pass condensers, audio-transformers, radio transformers, reflex transformers, reflex coils, neotrodyne condensers,—in fact anything you want to complete your set. And we are giving them away with subscriptions to Radio Journal.

Write for what you want and we will see that you get it. It will cost you nothing but a little spare time.

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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This Super-Speaker embodies a new and novel application of the *Cantilever* principle. Handsomely finished in nickel, it is just the speaker unit you have been longing for. It sells for \$10. We will send it to you *free*, if you will make up a club of *five* (5) yearly subscriptions to Radio Journal, at \$2.50 each. Send us \$12.50 with the names of five subscribers, new or renewal, and the speaker is yours. Your own subscription will count.

Advance Fixed Crystal



Actual Size

This \$1.50 Advance fixed crystal, molded bakelite base nickered binding posts, special tested crystal with an 18-K gold point,—guaranteed,—*free with one subscription new or renewal.*



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A radio concert in any room in the house—think of it. Just screw this *Antenna* into an electric socket anywhere,—no aerial, no bother. Renew your subscription now, or send us a friend's subscription, and we will send you an *Antenna* free.

If there is anything you want and are willing to do a little work for, write us and we will get it for you.

RADIO JOURNAL PUBLISHING COMPANY
113 Stimson Building Los Angeles, California

KGO, the new Oakland station of the General Electric company, has already established a place for itself in the sisterhood of broadcasting stations. From vessels in the Atlantic to Honolulu and vessels in the Pacific have come reports of the station's reception, as well as from all over North America. The new station is the most powerful on the Pacific slope and is a bit unique, as broadcasting stations go. Using power of 1,000 watts, the station is situated far away from any masses of absorbing structural steel and the like. The structure in which it is all housed is built specially for KGO, and the appointments throughout are handsome.

The antenna system is supported by two steel towers, each 150 feet high and 260 feet apart, and is located half a mile from the studio building. Under the antenna proper is the power house, housing the mechanical equipment, which is similar in design to the radio broadcasting station WGY at Schenectady, the big brother of KGO.

Trans-Atlantic broadcasting tests conducted during the week of November 27, demonstrated the extraordinary transmitting radius of WGY, the Schenectady, N. Y., station of the General Electric Company. According to the Wireless World and Radio Review, an English radio magazine, WGY was the most generally received of the American stations participating in the tests. Some of the English fans reported their reception of WGY as perfect and one wrote that reception was "perfect on loud speaker."

"The weather conditions," states the English magazine, "were by no means ideal and a number of correspondents state that their aeri-als and insulators were enveloped in hoarfrost. According to many reports atmospheric were prevalent, and in not a few cases fading was very pronounced. The chief ground for complaint, however, appears to be the interference caused by the use of extreme reaction by many listeners, who thus drowned the American signals."

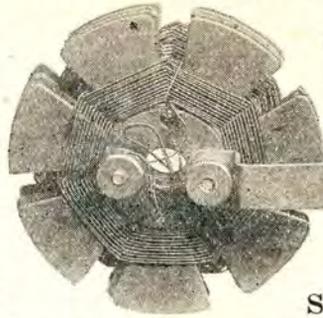
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23 Plate Condensers	1.25	4 Tube Reflex, complete	54.00
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Let them all meet our standard, and the day of bum radio crystals is gone!

To make BETTER crystals for you, we are going to MOUNT AND TEST THEM AT THE MINE! Out in the desert, beyond Death Valley, where the static is the worst on earth, EVERY CATWHISKER CRYSTAL WILL BE TESTED ON LONG DISTANCE CONCERTS. Does that mean anything to you? Our nearest station is 400 miles. Our farthest—well, WE HAVE PICKED UP CHICAGO AND FORT WORTH ON A CATWHISKER CRYSTAL! Think that over.

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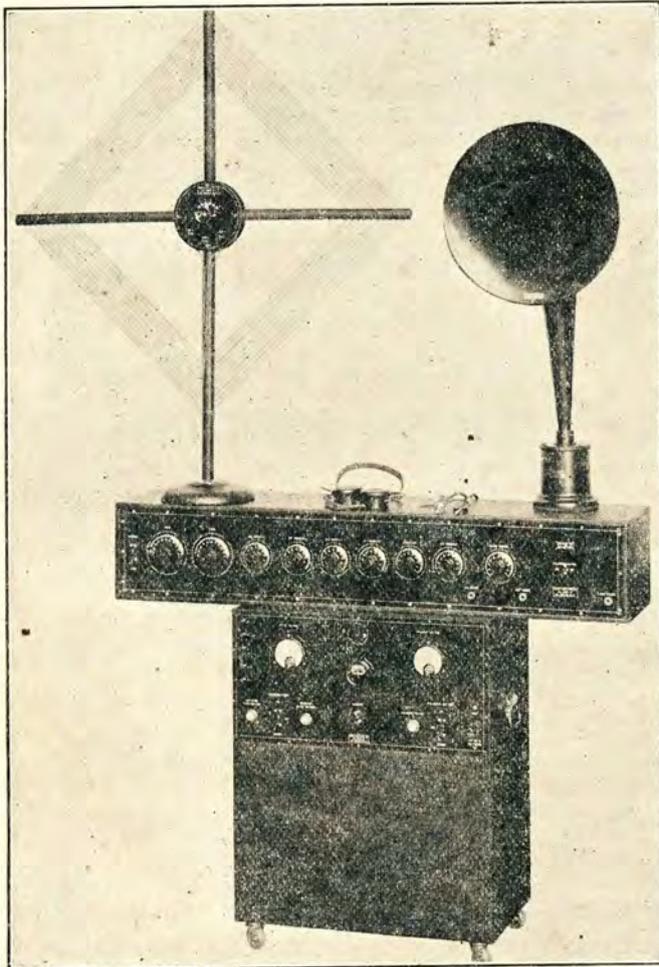
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To Be SURE — Patronize Radio Journal Advertisers

A novel method has just been adopted by the Australian commonwealth wireless authorities for protecting broadcasting stations, says a report to the Department of Commerce from Assistant Trade Commissioner Elmer G. Pauly, Melbourne. The regulations recently promulgated require that every prospective purchaser of a receiving set must present to the radio goods dealer a certificate of license showing that he has subscribed to the service of the station operating on the wave length to which the instrument being purchased is adjusted. If a radio enthusiast desires to "listen in" on additional programs he can have his receiving set so adjusted, but only on the production of certificates showing that he has made separate subscriptions to each. What next?

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC.,
REQUIRED BY THE ACT OF
CONGRESS OF AUGUST

24, 1912

Of Radio Journal, published monthly at Los Angeles, California, for April 1, 1924.

State of California,) ss.
County of Los Angeles }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Hugh Harlan, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the Radio Journal and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are:

Publisher, Radio Journal Publishing Co. (Inc.), Los Angeles, Calif.

Editor, K. P. Frederick, Los Angeles, Calif.

Business Manager, Hugh Harlan, Los Angeles, Calif.

2. That the owner is: (If the publication is owned by an individual his name and address, or if owned by more than one individual the name and address of each, should be given below; if the publication is owned by a corporation the name of the corporation and the names and addresses of the stockholders owning or holding one per cent or more of the total amount of stock should be given.)

Radio Journal Publishing Co. (Inc.), Los Angeles, Calif.

Hugh Harlan, Los Angeles, Calif.

Anna E. Harlan, Los Angeles, Calif.

A. C. Humphrey, Los Angeles, Calif.

K. P. Frederick, Los Angeles, Calif.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, to state.)

None.

4. That the two paragraphs next above, giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bonafide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is (This information is required from daily publications only.)

HUGH HARLAN,
Business Manager.

Sworn to and subscribed before me this 4th day of April, 1924.

(SEAL) JOHN VINCENT MORRIS,
Notary Public in and for said County and State.
(My commission expires Oct. 19, 1927.)

Step Forward

The Radio Association of Southern California has taken a big stride in engaging the interest of the Broadcast listeners and dividing the organization into two sections, one of which is devoted entirely to the interest of the seeker after broadcast. The two sections, ham and broadcast, meet on alternate Mondays, and any member is privileged to attend both, but in actual practice it has been found that the plan divides the organization pretty well on the lines of interest. The club has definite plans for assisting the broadcast listener as well as the amateur. Among other things it will install, with the cooperation of active broadcast listeners, a special set to locate trouble and interference for members. It will likewise plan special constructional helps meetings and the like. N. E. Brown is president of the organization.

A. H. Grebe & Co., Inc., have just placed on the market a separate stage of tuned radio frequency amplification, known as the Grebe clarifier or Type RORQ. It is claimed for this unit that it effectively prevents radiation yet, increases signal intensity, as well as increases distance range, selectivity and quality. It operates on either 99 or A tubes. The western branch of the company is located at 451 East 3rd St., Los Angeles, Calif.

WGN has succeeded in broadcasting phonograph records of its opening program which were recorded in New York. The broadcast of them was sufficiently clear to make it possible to record the disks. When WGN went on the air with its inaugural program March 29, Mr. Frank Hoyt, inventor

of a new method of recording broadcast reception, tuned in at his laboratories in New York and recorded his reception of the program, on aluminum disks. He succeeded in recording virtually all of the program, which continued from six p.m. Saturday evening to six a.m. Sunday morning.

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In
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DISTANCE and
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Use the Ray-Dee-Artcraft

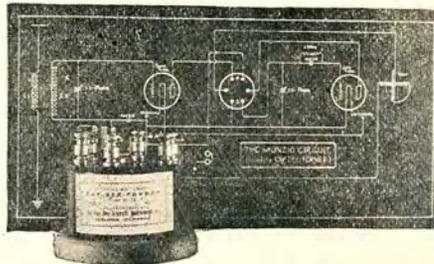
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In the Super-Go-Getter **MUNZIG CIRCUIT**

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illustrated with blueprint and instructions for assembling.

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Watch for the **RAY-DEE-DYNE RECEIVER**, the receiver that really reproduces perfectly. No squeals—no howls. — 1000 mile range guaranteed under average conditions. Ask your dealer for a demonstration as soon as possible.

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To Be SURE — Patronize Radio Journal Advertisers

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The Seashore Sands of the Southland's many attractive Beaches are especially alluring these days.

This railway reaches all of them very quickly, comfortably and economically.

Travel the Electric Way—the Big Red Trains are always ready to serve you.

Ask Our Nearest Agent for Information

Pacific Electric Railway

O. A. SMITH, Passenger Traffic Manager, Los Angeles

New Detector

The well known navy type variable detector is again growing in favor with the radio public, according to D. C. Phipps, 726 South Spring Street, Los Angeles, distributor for the entire line of the Wing Radio Products. Greater efficiency, he says, brings a steadily increasing demand. Likewise its simplicity and beauty add to the appearance of reflex sets. New crystals can be installed in quick time, thus giving a choice of any preferred make of crystal. This, he adds, is the only sure way to get distance on a reflex set.

The Chicago Tribune-Zenith Broadcasting station and the Prest-O-Lite Co., Inc., of Indianapolis, have just completed armments whereby the international 500 mile automobile race at Indianapolis Memorial Day, May 30, will be broadcast from WGN. The running story of the motor classic will be detailed through a microphone placed in a specially constructed booth directly over the start-finish line and, carried by an American Telephone and Telegraph circuit to the station in Chicago. Other microphones placed about the speedway will carry the sound of the exhaust from the motors, the cheering of the crowds and other incidental noises to the ears of millions of listeners.

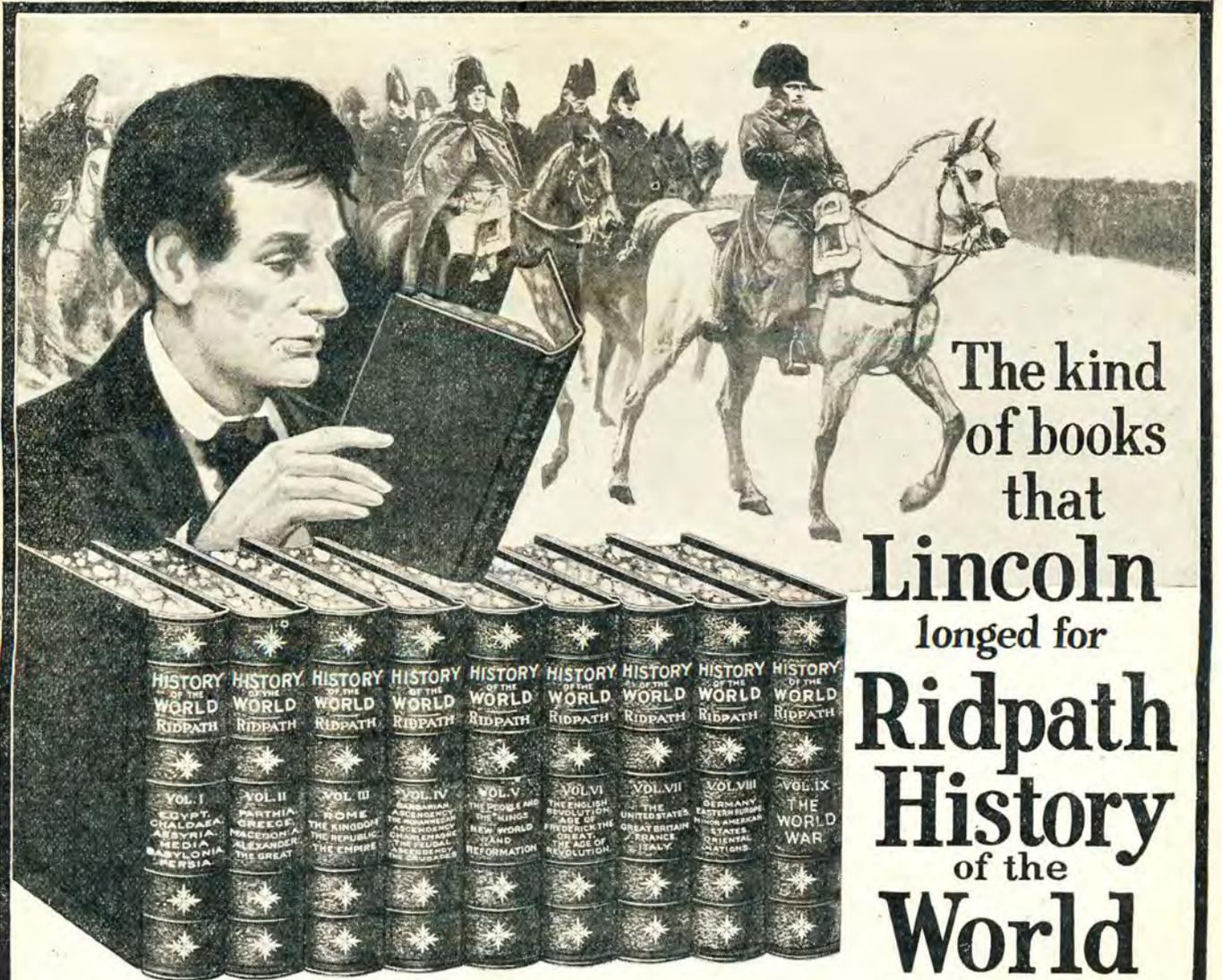
When all press and commercial telegraph wires connecting Chicago with the rest of the world, except those leading to the north through Canada, were put out of commission by the most terrific sleet storm of the winter, representatives of two press associations depended on radio and the American Radio Relay League to get press through the world's largest news relay point. One of the several important stories handled was a bulletin on the mine disaster at Crosby, Minn., giving a list of the dead, which the newspaper correspondent addressed to an office in New York City. D. H. Hiebert, operator of amateur station 9BQQ at Minneapolis, who handled this message, stuck by his set with only three hours sleep in as many nights transmitting both news and private messages.

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NAME

ADDRESS



With The Editor

Television, or seeing by wireless, will become accomplished fact this summer, but probably in a crude form, according to an eminent physicist E. Fournier d'Albee. The scientist based his prediction upon remarkable progress made by M. Belin, the French inventor, in perfecting the receiving side of the invention. Mr. Belin has calculated that to transmit a moving image satisfactorily it will be necessary to send 30,000 signals a second. The rapid sending is far simpler than

the rapid receiving, and it is to the receiving end that Mr. Belin has recently been devoting his attention. Mr. soon when anyone can sit in his home or at a movie show and witness what is going on anywhere in the world where camera man with a sending device is busy. Thus we all may witness anything from shipwrecks to battles while they are actually occurring—some of these days.

Hot Mon! Here's the letters we like to open:

"I'm for you every time. Radio Journal is getting better and better. Keep it up.—LEE ROY POTTER, 6AKW, Lancaster, California.

The H. L. Dodge Music Company of Long Beach, California, has installed a radio department, with John B. Hughes in charge. Mr. Hughes intends to specialize in the installation of complete sets in phonographs. The store is located at 228 East Broadway.

A well-established corporation in a profitable phase of the Radio business has reached the threshold of a large expansion which will greatly increase its usefulness and profits. I have a small block of the Common Stock of this Corporation which I am offering subject to prior sale. The proposition is sound and the possibility of large profits attractive. Your inquiry will bring the complete story by mail and, of course, will obligate you in no way.

Fayette Marsh

611 Pacific Finance Bldg.

Los Angeles

California

Wolverine, Mich.—My first copy of Radio Journal was fine. Am quite a radio bug and have used my set often at the start of the Church Services and for social events. With a four tube radio frequency set we have listened to services in Schenectady, Pittsburg, Boston and Kansas City, using a non-power Magnavox and 75 volts of B battery. This is a small town with nothing doing during the long winter and the set has been quite an entertaining feature, though now I wish mine was a neutrodyne. That's the way it goes, first a crystal, then a one tube, next two step or audio in a single circuit, then radio frequency, and still wishing for something better and different. Have heard Los Angeles, San Francisco and Portland, Oregon, three times each—but can't make the grade now.—REV. T. H. JONES.

The experiments with direct wireless communication between England and Australia, with the new beam system of short wave lengths is completely successful.

The government will abandon the proposed large station and build a station adaptable to the new system, thereby saving four-fifth of the cost.

The tests to obtain secrecy which is a feature of the new system gave every satisfaction.

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That is what our portable sets do. No aerial to install. All batteries and loud speaker enclosed in a neat, compact and very attractive cabinet, just like a suit case.

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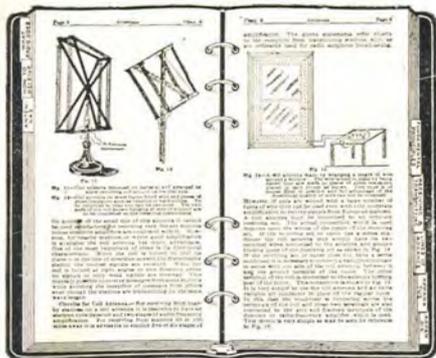
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is told in this loose leaf book. Note the rings—they unsnap easily and leaves can be taken out or added as they come in. The material is prepared by the two chiefs of the Radio Department of the Bureau of Standards at Washington, Dr. Dellinger and L. E. Whittemore. Keeping abreast and ahead of radio development is their sole business.

These men are two of the foremost radio experts in the world. You have the opportunity to have these eminent radio experts guide you, too; to point out to you step by step what to do.

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The Well Known TUNE SHARP Brand

Knocked down, ready for assembly, including the following material for one complete set, packed in carton:

- 1 300-turn primary coil, No. 28 wire.
- 3 550-turn primary coils, No. 28 wire.
- 8 550-turn secondary coils, No. 30 wire.
- 8 pieces 3 1-2 x 3 1-2 Radion.
- 8 binding posts.
- 4 mounting screws.

The above coils are duo-lateral wound by an automatic winding machine, to specifications, and all coils are accurate as to the number of turns, which is a very important feature.

The Complete Set as Above for

\$12.00

Assemble this Set and Save \$13

Ask your jobber for duo-lateral wound Ultradyne transformer sets, knocked down, the well-known *Tune-Sharp Brand*.

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Tune Sharp Brand Radio Products

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