

July, 1925

# RADIO IN THE HOME

Edited by HENRY M. NEELY

10 C



*In this issue:*  
**FLEWELLING'S**  
*Super-Het Converter*

R. PALLER  
COLLIER  
1925



**Music Master**  
*Resonant Wood*  
*Insures*  
*Natural*  
*Tone*  
*Quality*

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THE thrill and tingle, the fling and flare of the famous Toreador Song from *Carmen*, poured out in all the flawless perfection of grand opera by the re-creative magic of Music Master. The singer himself—almost—stands there beside your Music Master, singing for you!

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*The Musical Instrument of Radio There IS No Substitute*

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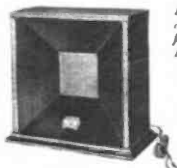
And as to "guarantee," remember: Music Master products are guaranteed without condition, without reservation and without limit, by the dealer, and back of him, the Music Master Corporation.

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Makers and Distributors of High-Grade Radio Apparatus

128-130 N. Tenth St.  
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Chicago New York Pittsburgh Montreal  
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 Bell . . . . . \$18

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Eveready  
Columbia  
Ignitor  
the proven  
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for all  
Radio  
Dry Cell  
Tubes  
1.5 volts

No. 766  
22½-volt  
Large  
Horizontal  
Price  
\$2.00



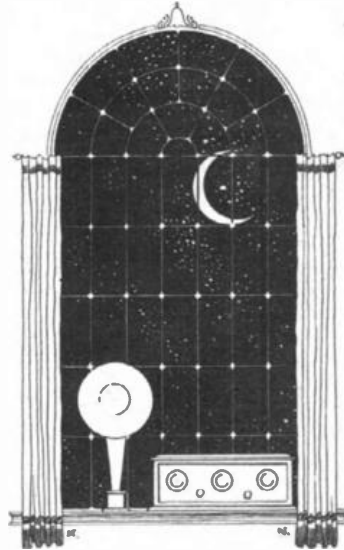
No. 771  
45-volt  
Large  
Vertical  
Price  
\$3.75



No. 771  
45-volt  
"C"  
Battery  
improves  
quality,  
saves  
"B"  
Batteries  
Price  
60c

# RADIO IN THE HOME

## Grimes-Flewelling-Harkness



By R. S. McBRIDE  
Washington Representative of Radio in the Home

# Radio as a Public Utility

**R**ADIO is an industrial Topsy, for it has "jest growed." It has certainly "grewed" so fast that no one, least of all the legislators, has been able to keep up with its development. Now the time has come when not only the public officials concerned over the problems of radio, but also the general public, are beginning to wonder how to keep this new member of the industrial family in order. This is a serious question for so big a child, if it becomes unmanageable, will certainly require most drastic discipline.

Perhaps we can better forecast what the public is going to demand of radio by comparison with public utility companies than by any other means. And if we can but discover what the public is going to demand we can very accurately forecast what the law will become. This is inevitable the case since law is little more than crystallized public opinion for the regulation of human relations.

But if we are to compare radio with the

public utilities of the country it is a good thing first to stop and consider what the public service corporations really are and what gives them their peculiar relationship to the public that is not shared by

other incorporated business. For this purpose, however, there is no use in undertaking to set up some finely phrased legal definition because hardly three lawyers, even experts in the public utility field, could

agree in such a matter. The dictionary definition is good enough for our purpose. It describes a public service corporation as one which is "chartered to follow a public calling or to render service more or less essential to the general public convenience or safety." And it does not take a corporation lawyer to see that this in its major terms defines a radio broadcasting company quite as accurately as a gas company, a water works, or a street railway. Certainly there is no other agency that has so rapidly grown to a point where it can properly be called "essential to the general public convenience."

Less than a generation ago these public service corporations assumed for themselves rights and privileges which were not always considered primarily from the

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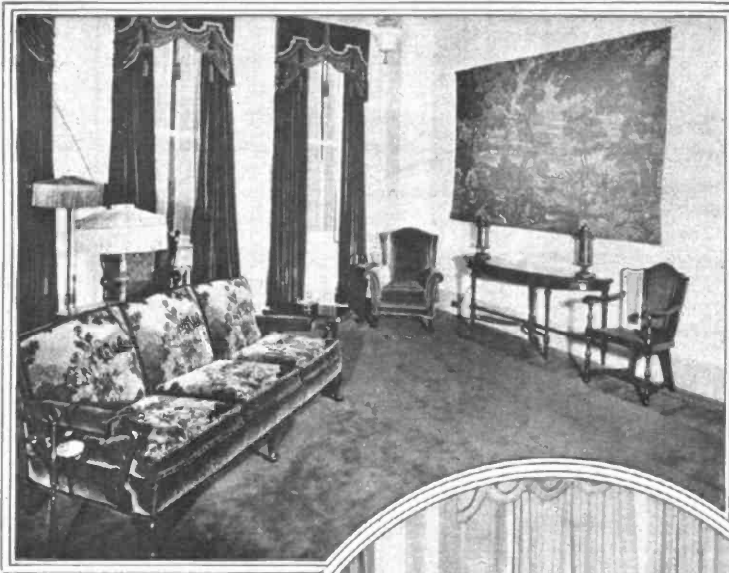
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HENRY M. NEELY.....President and Editor	D. M. MORRIS..... Advertiser Manager
G. W. KEATY.....Secretary and Treasurer	MERRILL NEELY..... Laboratory Assistant
W. L. DUDLEY.....General Manager	G. F. ALLEN..... Bldg.
Washington Representative, E. S. HARRIDE, Colorado Bldg.	
KORHAN NEELY.....Art Director	

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*These views of part of the interior of Station WCAP, Washington, D. C., give some idea of the financial investment required for a broadcasting station. We need a law that will give some adequate protection for investments of this kind. The top photograph shows the reception room, the circle is Studio B and below is Studio A*

standpoint of public interest. That day was well characterized by the rather hot-tempered reply credited to one of the Vanderbilts in connection with a criticism of a company that was charged with not serving the public satisfactorily. He is said to have remarked, "Well, let the public be damned!" But the public-be-damned policy is no longer fashionable; it certainly never was profitable, though the older generation of utility managements perhaps did not always realize this.

The question now is will radio have to pass through such a stage before it will learn the fundamental lessons of public relations which the utilities companies have studied at high cost in money and in loss of public favor? Or will radio, seeing the error of another great industrial group, take advantage of the experience readily available to it and become from the first "public service" corporations, in fact as well as in name?

No two groups of utility companies can work under exactly the same regulations. One of the important matters in fixing the relations between gas company and gas user is the quality, or heating value, of the gas supplied. But in the case of electric light and power companies there is no such thing as quality of energy; there is, however, an important matter of quality of service, determined by uniformity of volt-



age and other characteristics of the current supply. Similar distinctions exist all through the public utility field. So in radio we shall find radical differences in the requirements made by the public of the companies. But there are just as many points of similarity between radio and gas as between water works and electric railways or between water works and telephones. The sooner this fact is appreciated by the broadcast listener and his voice in fixing radio policy made clearly heard, the better for all concerned. Until that time comes there will be no certain substantial basis on which to fix even the fundamentals or radio public relations.

One of the big jobs which city and State authorities have found in regulating public utilities for the mutual advantage of stockholder and patron is determining the extent to which there shall be competition in the business. Some go so far as to say there never should be any competition and that utilities are "natural monopolies." But certainly we can hardly put radio in just that class. It is perhaps better to consider the radio situation much on the same basis as the city transportation situation, involving street cars, buses, and taxicabs. All of these transportation agencies are under public control as to where and when they operate and under what conditions they shall serve the public.

In radio the Class B stations are like the electric railway systems. They operate in fixed channels just as the street cars on definitely assigned streets. They, as all other radio stations, must give only safe (that is only unobjectionable) material to the listener-in, just as the transportation agencies must provide safe cars or safe cabs, and run them in the interest of public safety. But there is just as

(Continued on Page 58)



## "The Curb is the Limit" Club

By VERA BRADY SHIPMAN

IT ALL started last October when a man wrote in from Grand Rapids, Mich., asking Uncle Bob, of KYW, Chicago, the daddy of all radio story tellers, why he didn't urge his radio children to remember that the curb is the lifeline.

"That struck me suddenly," said Uncle Bob, smiling, jovial and full of love for the children of his radio family, "and I said on the radio at KYW that night, 'Remember, kids, the curb is the limit. Don't you go beyond the curb unless you want to get run over. I want you children who hear me tonight to write to me and tell me that you are going to watch and count ten before you cross a street, and while you are counting, you will look both ways.'"

A little later that week a letter came from little Edith Rathje, 8 years old, of 8223 South Sangamon street, Chicago, with the signatures of the eighteen children on that block, that they would all obey Uncle Bob's "Curb Is the Limit" rule. Edith went with Uncle Bob to several radio stations telling other children to sign that pledge and at WCBN a half hour program was given for this pledge alone.

The first KYW talk was broadcast the fifteenth of October, and Uncle Bob carried the early campaign alone until November 20, when W. J. Clark, radio editor, and James Curley, managing editor of the Chicago Evening American, pledged the newspaper's support to furnish buttons for

the children who mailed in their signed pledges.

More than 20,000 school children in Chicago have signed the pledge. It reads as follows:

"I, Mamie Brown, living at . . . . . street, Chicago, do hereby promise Uncle Bob that I will never play in the streets, and that I will always stop at the curb and count from one to ten and while counting I will look both directions to see that there is nothing coming that will crush out my little life.

"P. S.—I will also help Uncle Bob to get all the names of children in our block signed in the same pledge."

One small boy wrote in "I do love to play in the mud, Uncle Bob, but I guess I'll have to quit now as the curb is the limit." Another wrote that he lived in the country and there weren't any streets or curbs, but that he had to cross a railroad track on the way to school and would stop and count ten and look both ways before he crossed.

KYW, the Westinghouse station in Chicago, claims the pioneer bedtime story period in America. The first Uncle Bob was a University of Chicago student, who talked to the children and read the Burgess stories from the Chicago Evening American, with which KYW has a press affiliation. But this did not seem to reach the children closely enough, and when Walter Wilson,

It's a happy crowd when Uncle Bob talks to Chicago children. He came out in a great big automobile and showed them all just how they must stop at the curb and count ten, and look in both directions while counting.

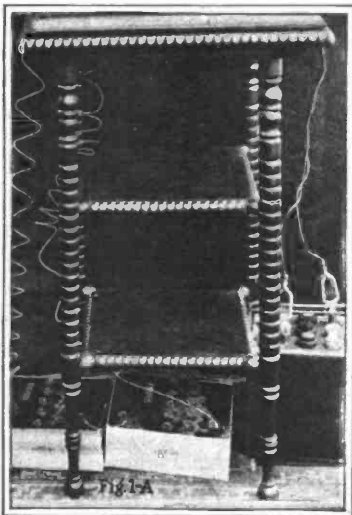
jolly, smiling, "fat and forty-two," was approached at the Joe Morris Music Company, to take the children's story period of KYW, its life (Like Peter Pan's Tinker Bell) was almost fluttering out.

The fourth of January, 1924, Walter Wilson became Uncle Bob, and came on the air six nights a week from 6:35 to 7 P. M., with his curb vernacular, speaking to the children in the language they know and singing and playing the latest popular songs which the children were hearing at the picture shows. He won his place in their hearts instantly. Today Uncle Bob receives an average of 300 letters daily. The only ones he answers individually are those from sick children, shut-ins, who cannot get out to play like other children.

Uncle Bob recently took a well-earned three weeks' vacation from radio and toured into Michigan and Wisconsin, in personal appearances at vaudeville and motion-picture theatres. Everywhere he was greeted by a loving crowd of children.

"Kids will run up to me and catch hold of my coat," Uncle Bob explained with a broad smile, "and say slyly, 'I know you, Uncle Bob,' and then run like the dickens. They know me on the street, they know my voice if I am

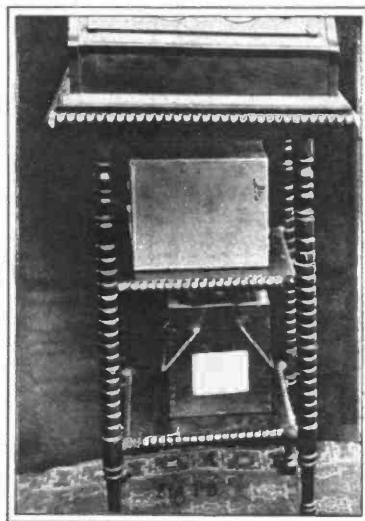
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# What's Wrong With My Reception?

By BRAINARD FOOTE

*Two ways of connecting batteries to a radio set. Which do you prefer? Long "B" battery wires (as in A) are particularly bad with multi-tube sets because of the coupling involved in them between the R. F. amplifier stages*



"I WONDER what's wrong with my set," says every other radio listener you meet. "I've got a 'trans-Atlantic circuit' but I haven't heard the Coast yet. KDKA comes in as fine as silk, and I get Chicago quite often, but she doesn't seem to 'step out.'"

Only the other day a man called to see me and asked me if I could give him a hook-up that would beat a neutrodyne on distance. He mentioned the name of a good neutrodyne which he'd been using for some time. His complaint was that although he heard stations this side of the Rockies with fair regularity, he had never "logged" California. His location was out in the country, too.

He seemed astonished when I refused to suggest any superior circuit. I asked him about the aerial—well, it was 30 feet high and 75 feet long. His ground? Oh, yes, that went to a barbed-wire fence alongside the house. His tubes? Surely, they were only two years old and always had worked well. His batteries? Brand-new, this time. And it was with a distinct feeling of disappointment that he departed with a few words of advice:

Raise the aerial, get new tubes for the R. F. sockets and detector, use the water system for the ground or else bury a large plate in moist earth close to the point at which the ground lead emerges.

The whole business reminds us of the man who tried to run a high-powered car on gas that was half kerosene and had water in it, who used light-bodied oil for lubrication and never paid the slightest attention to the grease and oil for the running gear. He didn't get much "distance," either. In other words, the radio set is only a part of the story. There are other matters worth

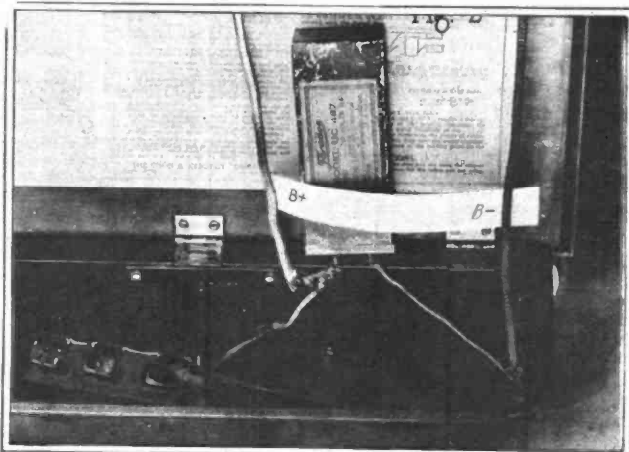
thinking about. The receiving abilities of a radio outfit might be summarized under three main headings for clearer consideration, as follows:

1. The radio receiver itself.
2. The accessories used with it.
3. The installation of the receiver.

We cannot list these "in the order of their importance" inasmuch as it is quite impossible to say which is uppermost in value. So let us think about the machinery to begin with.

Now that the radio public is coming to have a better idea of the meaning of radio reception and how it is accomplished, we hear less and less about the wonderful "long-distance powers" of such and such a circuit. Instead, careful design of apparatus is stressed, together with the greater selectivity and simplicity of adjustment that new features provide. Moreover, we are beginning to realize that, although

*Here's a useful stunt for big sets. Connect a 1 or 2 mfd. by-pass condenser across the "B" battery plus and minus binding posts right inside the cabinet. This avoids resistance-coupling in the batteries and improves both R. F. and A. F. amplification when the batteries are slightly run down*



there may be differences in the ease of tuning control and the number of necessary adjustments for various circuits, they are very much on a par so far as actual long-distance reception is concerned. Of course, this is not absolutely true, for lower losses in the newer apparatus do entail somewhat louder results on long distances, although their chief improvement is in the field of selectivity instead.

And we ought to pause to understand, right here, that there is such a thing as a "noise level" below which no set can possibly get anything. As we increase the sensitiveness of our set, we get myriad oscillations from other receiving sets, static disturbances aplenty, power-line noises to a greater extent and electrical noises generally that become louder and louder in proportion all the time as the stations we try to receive are fainter and fainter. This is the "noise level" and only when it happens to be less annoying than usual are we able to experience good reception over very long distances. And even then we may be surprised to learn that many one-tube sets get the very same stations without much

lowered volume. The receiver then, ought to be well constructed, use efficient apparatus having low electrical losses and high mechanical durability. In choosing between more or less sensitive sets, one should realize that there is more difference in the selectiveness, or ability to pick out the one station desired, when there are several stages of tuned radio-frequency amplification than in the case of a one-tube outfit. The difference in actual receiving power is noticeable, but not as marked as it is in selectivity.

A valuable point of comparison lies in the ease of dial adjustments. The operator of a one-



knob outfit frequently gets stations that the user of the three-dial set never hears. This is due to the greater difficulty with which three dials are set to the exact dial settings and the ease with which one dial may be so adjusted. However, when the three dials are correctly set for a given station, the three-dial outfit will probably give signals considerably louder than the one-dial set.

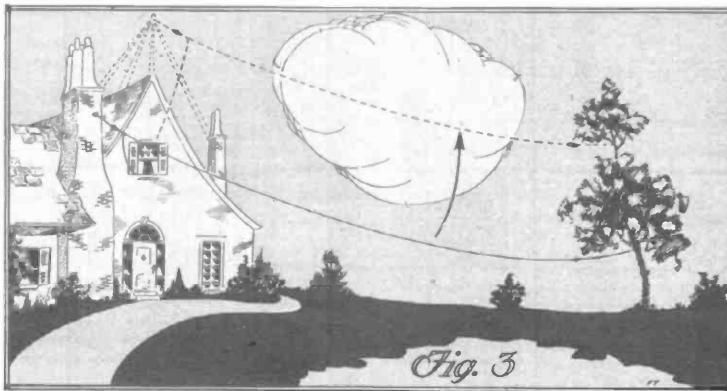
Inasmuch as this article is intended more for those who already are in possession of sets from which the owners expect better results, we shall now pass to a most important point of consideration—the set's accessories. Included here we have tubes, batteries and phones or speaker. The last two are comparatively of less importance so far as reception is concerned, except as they affect the tonal quality of speech and music. But the first two play a much greater part than most of us imagine. Two tubes may look as like as two peas and yet be as different as day from night when placed in service. A good tube, especially in the radio frequency sockets, is absolutely essential to any out-of-town work. Good tubes should amplify well when their filaments are turned down quite a lot—in fact, a good tube should work as well at  $4\frac{1}{2}$  volts as at 5, the normal voltage. A tube that doesn't should be relegated to the audio amplifier, where it will function very well, a hit more brightly illuminated.

For the detector, a "soft" tube is a little bit more sensitive, but on account of the critical nature of its best filament voltage it is very difficult to keep in proper adjustment. Personally, I prefer a hard tube for the detector, with about 45 volts on its plate. It is important that you have the grid return lead to the positive side of the filament for a hard tube, but to the negative for a soft tube. Most sets are wired for a hard detector tube, but if you must use a soft tube and critically adjustable rheostat for greater sensitiveness, be sure to connect the return to the negative. And if you use such a tube, employ as high a resistance grid leak as you can in order that the leakage across the grid condenser won't decrease the signal voltage. If the leak is too high in resistance, the tube will be "knocked" by a loud signal and will not recover for a few seconds. The negative charge that piles up on the grid can't escape fast enough to maintain the tube in operation unless the leak is low enough in resistance. Three to four megohms may be employed with most detectors.

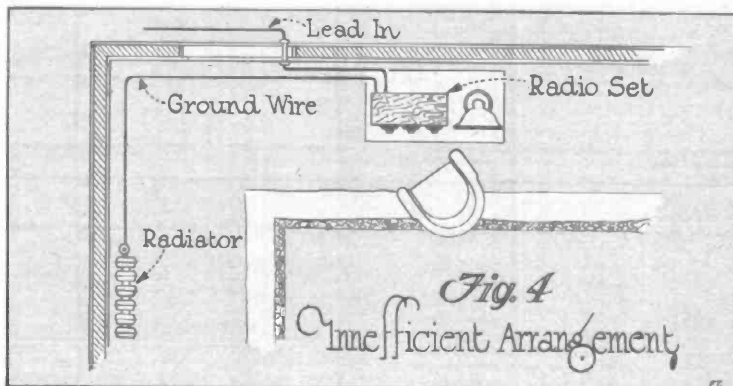
The chief requirement for the filament battery is that of reliability and sufficient voltage. Dry cells that are so run down as to require over-illumination of the filament in order to gain volume ought to be replaced. Storage batteries should not be over-discharged, as they may easily be with quarter-ampere tubes. Use a hydrometer to keep watch on their gravity, keep the plates covered with solution by adding distilled water at intervals just before the battery goes on charge and it will last for years. Clean the contacts once in a while to insure good connections.

A good way to test the C battery is with a three-cell flashlight bulb. When it fails to light with fair brilliancy, replace the battery. Most important of all, however, are the B batteries. One man put it cleverly when he said, "You don't listen to a broadcasting station; you listen to your B battery." For the B batteries supply the energy which operates your phone and loud speaker. With the

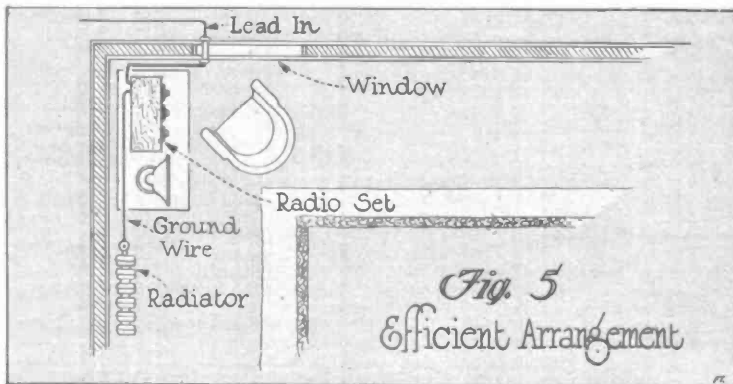
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A change that's often more worth-while than an expenditure of a hundred dollars on a super-sensitive set. The difference in reception is especially pronounced with the weaker stations

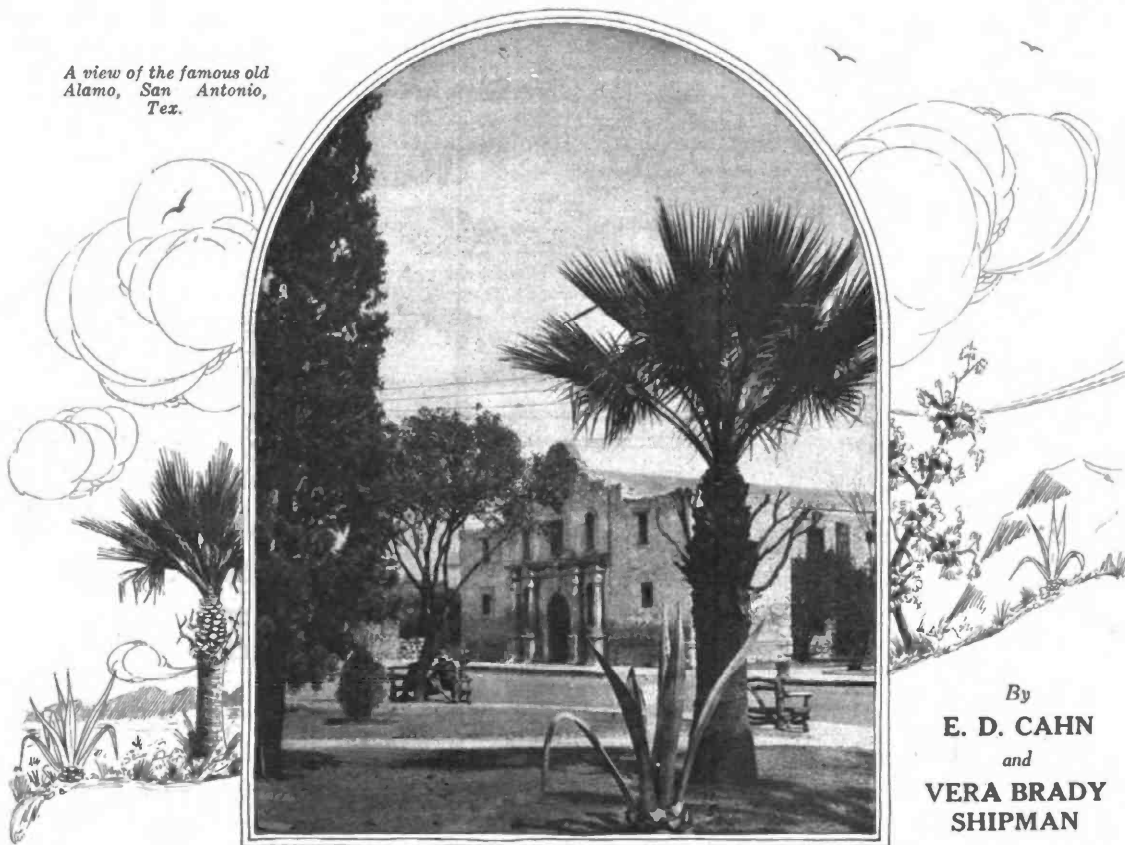


A poor radio installation from the standpoint of efficiency. The connecting wires to aerial and ground run parallel and are much too lengthy. This adds unnecessary wave length to the antenna system and introduces capacity and resistance losses



The installation of Fig. 4 changed about for better reception. Leads aren't paralleled now, nor are they longer than they need be. Put the loud speaker elsewhere for local programs if desired—long leads to the speaker don't matter

A view of the famous old Alamo, San Antonio, Tex.



By  
**E. D. CAHN**  
 and  
**VERA BRADY SHIPMAN**

## Have You Heard *these* Texas Stations?

**EL PASO** is so situated that the radio enthusiast is not bothered much by the interferences which vex his fellows in other parts of the country and so he can pick and choose among the many programs offered and that is one of the reasons why it has only one broadcasting station of its own. **EL PASO** is going to let radio mature a little more before it flings another hat into the ring and is content, just now, to hear more than to be heard.

**RADIO IN EL PASO AND SAN ANTONIO**  
 By **E. D. CAHN**

**WDAH** was first conducted by the city's Chamber of Commerce and later purchased by the Trinity Methodist Church, which broadcasts its services on Sunday and through the week.

O. W. Morton, who was in charge, is an old ship's wireless man who has sailed the seas in many a craft and at last come contentedly to settle in the climatic capital of the United States, the city on the edge of the desert where the sunshine spends the winter beside the storied Rio Grande.

He is moored in the midst of an ocean of land and the gaunt granite crags of the Organ Mountains heave up like gigantic

stone billows all around. Mr. Morton was refused for military service during the war, so he served as Civilian Radio Instructor in the Student Army Corps at Camp Martin, but like many one-time wireless men, though his present interest is with radio, his affection remains with his first love and his chief pride is that he is first of all a wireless operator.

He spins some interesting yarns of his days on the S. S. Augusta, the Hibueras, the Rochelie and many others. But he has quit the sea for good and his faith is in El Paso and her future, bound up as it may be with radio, for all anybody can tell.

He remarks that the **WDAH** set is a 50-watt transmitter, shunt-feed Hartley circuit, and that though it has only one-tenth the power of many stations, it has been heard all over the United States and as far away as San Juan.

**WDAH** is, of course, in no sense an agency of commerce but its influence is great for all that and signs are not wanting of the fact. Mr. Morton marks these signs, says nothing, and lets the future bring what it will in its own good time.

Station **WOAI** in the beautiful and historic old city of San Antonio, Texas, is

owned by the Southern Equipment Company. It is a Class B station on 394¼ meters, 760 kilocycles and is conducted in the most agreeable and up-to-date manner.

Anything enlightening or entertaining is welcome at **WOAI**, but if the offering cannot pass the test of the double E then the station will have none of it no matter who is behind it.

The service is used by two newspapers and churches of different denominations. The musical standard is high and the group of singers called the **WOAI Entertainers** are all of operatic caliber.

**WOAI** has been providing its listeners with a whole course of opera, which has been so well received that several favorites are to be given again. Mrs. Fred Jones, Mrs. Guy Simpson, Mrs. L. L. Marks, Charles Stone and Warren Hull are adding very considerably to their artistic reputations in these programs.

This station has its own Trio composed of Bertram Simon, violin; Michael De Rudder, cello, and Walter Dunham, piano. These players have won their own pleased audience and have made a lasting impression.

J. G. Cummings is the announcer whose



Left—Warren Hull as Plunkett. Right—Charles Stone as Lionel, in "Martha," which was produced by Station WOAI, San Antonio



few pithy sentences introduce his stars. Mr. Cummings never wastes a word and for that reason he is known as "Silent Joe." His quiet, smiling manner is admirably adapted to putting a nervous or temperamental artist at ease and the very sound of his voice is restful to the ear.

Fans who are bored and out of humor with too much talk from other stations can tune in on WOAI with confidence for "Silent Joe" can be depended upon not to talk too much, and yet when he speaks he invariably says something worth listening to.

The dance orchestra feature of this station has won many plaudits from listeners throughout the East. A great deal of their radio mail comes from Philadelphia, Boston and New York, where, to say the least, they have plenty of competition among high-class organizations of the same kind. They are known as Jimmie Joy's Hotel St. Anthony Orchestra and have been playing in San Antonio long enough to be considered as belonging to it.

Actually they are all Texans who met at the University in Austin and developed from a little group of three to their present muster of nine. They used their summer vacations to travel and have appeared on tour on the Keith and the Orpheum circuits. One autumn they secured leave from school and made an extensive theatrical tour.

The leader, Jimmie Maloney, is exceedingly proud of the fact that Paul Whiteman heard his orchestra and wrote him a letter in which he indorsed it in the highest terms.

Mr. Maloney's ambition is to go just as far up the musical ladder as he can get. He realizes that climbing means work and so he literally works night and day. "We have got to give our audiences a lot," he says, "and it's got to be of finer and finer quality all the time. We've made some records for the Okeh people which are going well and we want the next ones to go even better."

There will be no stopping a young man with such ideas, especially as every member of his orchestra is imbued with the same spirit and the same capacity for work. Beginning as college chums, they are friends first of all and know each other's struggles and sacrifices. There is remarkable teamwork among them and they play like one huge instrument.

Though they specialize on the lighter music, they can play the heavier kind with finish and feeling, thus proving, if proof were necessary, that they are all serious musicians at heart.

They contemplate a new tour—now that they have been graduated—which will take them all over both East and West. Great things are predicted for these boys and it would not surprise anyone familiar with their work to find them at the top of their class within a short time.



Left—Photograph shows Mrs. Guy Simpson as Nancy, and the one to the right is of Mrs. Fred Jones as Martha, both in the production of "Martha"



San Antonio is proud of WOAI—and justly so. It is progressive but it runs after no false gods. Mr. Half, who is the power behind it all, is a man of great liberality of mind and true public spirit. Although the station is conducted as an adjunct to his business he does not use it to advertise either his business or himself, and neither will he allow any one else to use it for such objects.

WOAI is for the intelligent en-



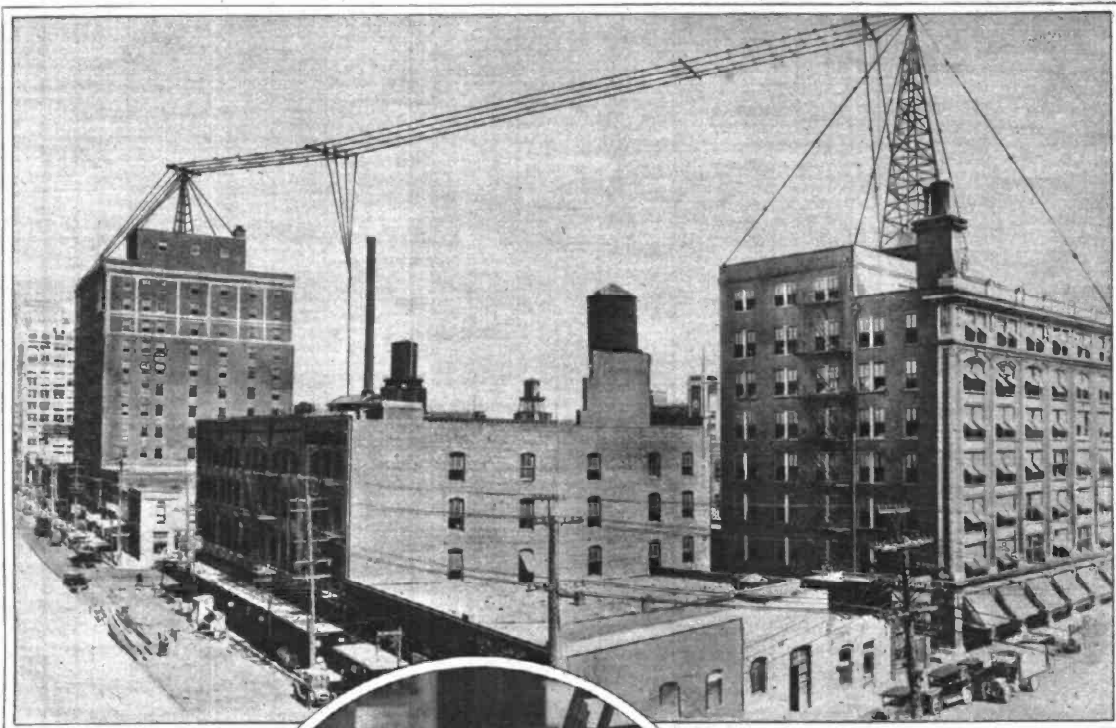
tainment of San Antonio and any one outside of it who cares to tune in. It is a force for the recreation of the people and as such is truly a public institution.

It would be as hard to estimate how much good this all does as to say how much of the charm of this southern city is due to the little river; bordered by green lawns and shaded by leaning trees, which winds through it, with little bridges carrying the streets across; and how



Top of the page is Jimmie Joy's Hotel St. Anthony Orchestra, San Antonio. Circle—Rudolph Coles, the young tenor who sings at Station WEAY, Houston. Left—Ruth Patterson, soprano, and right—Mrs. John Wesley Graham, who arranges many good programs and acts as accompanist to her pupils when they perform at Station WEAY





*Towers and antenna of WFAA, looking across from the corner of Main and Market streets, Dallas*

*Below—The MacDowell sisters, the "Sweet-hearts" of the air. Regular broadcasters from WFAA*

much is due to the presence of the sacred Alamo, shrine of American valor, with its garden walls covered with ivy and roses blooming in the sunshine.

Palms, honeysuckle and china-berry tree shade the fine-looking people for which the place is famous. There is time for good-fellowship. Courtesy is the rule and not the exception. San Antonio has a flair for pleasant living and WOAI is reflecting it in its broadcasting every day.

• • •

**THE LONE STAR STATION**

**T**HE Lone Star Station in the Lone Star State is WEAY, in Houston, Texas, where eighteen railroads meet the sea and WEAY means We Entertain All Year

This station is conducted by Will Horowitz, Jr.'s Iris Theatre and has been continuously on the air since Gerald Chinski, the technical supervisor, and F. M. Austin, the engineer, built the first little 10-watt equipment with which to broadcast the theatre programs in April, 1922.

Though pioneers in a way, they were not the first in Houston, for two other stations, which have since discontinued, were on the air for brief periods before them.

From ten watts, WEAY soon increased to fifty, then to one hundred, operating

*Dwight Brown, organist at the Palace Theatre, Dallas, who broadcasts every Tuesday evening over WFAA*

at 360 meters, and has gone on, step by step, until it has reached 500 and new quarters in the handsome Texan Theatre just completed.

The equipment here is Western Electric 100B and the broadcasting room has every modern feature which science, elegance or health could demand. The walls

(Continued on Page 11)



# Why Not a "Super-Het Converter"?

By E. T. FLEWELLING

Associate Editor, "Radio in the Home"

HERE we are in the middle of the summer with all that that means in the way of wonderful weather and moonlit evenings; when all of the world is out of doors. This year many radio receivers will be taken along to the out of doors in the latest news and furnish entertainment through the summer evenings.

Many, many of our friends will learn this year for the first time perhaps that the little old set acts quite differently in its new location, that the woods and fields and the new antenna, perhaps hanging from a tree, somehow or other affect their receivers to bring in a list of stations that may be totally different from the familiar ones brought in at home.

One of the outstanding things that a good many city dwellers will appreciate will be that because they are more distant from the broadcasting stations they are not so much annoyed by lack of selectivity and can more readily separate the various stations one from the other, and many sighs of relief will be sighed. Having seen and sighed, our friends will return home again in the fall determined to conquer one of the most troublesome phases in radio, i. e., lack of selectivity.

Thousands of others who may not have had the opportunity to try their sets in a totally different location will join our out-of-door friends during the coming fall and winter in a quest for greater freedom from interference from nearby broadcasting stations. The matter of greater selectivity in receivers will undoubtedly be of major importance next winter, and I feel that we can begin now to consider the problem, as it has many, many angles to it, and arguments pro and con on the subject are almost beyond number.

It would be a comparatively simple matter to enter into a long discussion about regeneration, coupled circuits, heterodyning and the effects that these things may or may not have upon selectivity, but if we concentrate our thoughts on only one of these subjects it may be that we will accomplish more in the long run.

In discussing the subject with H. M. N., I started a line of thought that appealed somewhat to both of us as one that should prove of very great value to the public as a whole so far as its selectivity problems are concerned. The thought is not entirely new, because more than one engineer has probably given time to it, but so far as we know it has never been given to the public. H. M. N., with his usual keenness, immediately saw its potential value

and spake unto me in this manner: "No one has ever pointed this thing out." It would be of tremendous help and you should stake your claim at once. Point out the various angles of the subject and put it over with a complete description of how to accomplish the thing."

Now I believe that better men than I could describe the proposition in a much

problem" circus ballyhoo stunts; so you must not expect me to start one here. What I am to discuss will be handled with the hope and idea in mind that it may prove of some little value to many folks who, because they live in cities and close to several broadcasting stations, may not have much choice in what they receive. The idea is, I hope, merely constructive and helpful, not revolutionary, and I shall endeavor to point out some of its disadvantages as well as its apparent advantages.

We have one advantage that might be remembered right here that is of no little value to our readers. To wit: the writer is not connected with any commercial organization whose product he desires to advertise, so no effort will be made to sell anything. Not a bad time, is it, to point out that I never have done this because I have always felt that the greatest value was obtained only by presenting constructively the various angles of a subject without any attempt to give an imitation of a salesman.

I suppose quite a few of my readers have heard of the circuit called the superheterodyne. It is with this circuit that our line of thought is concerned.

Of all the unfortunate, misrepresented, ballyhooed circuits in existence today, the superheterodyne is perhaps the most prominent example. Some day, some one will be moved to tell the truth, the whole truth, and nothing but the truth concerning the superheterodyne; so far as I know it has never been done, but it would very likely be excellent reading.

With all of its faults, however, the superheterodyne stands out above all the other circuits as perhaps the best. Behind it all, the basic idea of the super is about as follows: It is not possible satisfactorily to amplify short wave, high-frequency radio currents; therefore we will heterodyne the incoming signal with a local oscillator, secure a beat note of much lower frequency than the original incoming signal, amplify this new lower

frequency and so accomplish the impossible.

I am not able at this time (in common with the rest of the world), to show how it is possible to amplify any wave no matter how short it is, but it is certain that such a thing is not impossible and that it will be only a matter of time before such a system will be presented. Here's hoping. It is not the ability to get around short-wave (by short wave here, I mean the comparatively short waves used in broadcasting; i. e., 200 to 600 meters)

## A Word of Explanation

By H. M. N.

SINCE sending me this article, Mr. Flewelling has written me to say:

"The superhet converter is working great. I see that another magazine hit at it in the June issue. The thing doesn't work, however. I know several good men who have tried it and found it a dud.

"I guess I must have tackled it right for I have been using it over a week and find it F. B. (fine business) for selectivity and sensitiveness, with the volume the same as the set's own best.

"It's a go, all right."

Since Mr. Flewelling has injected me into the discussion of this new idea, it may be as well for me to explain as simply as possible for the benefit of non-technical readers just what the idea is.

Even the novice in radio realizes that the superheterodyne set has many advantages which have made it extremely popular with advanced radio fans. Now, basically, the thing that the superheterodyne accomplishes is to change comparatively short broadcasting waves into comparatively long waves so that they can be more easily amplified and built up into the volume which we require for efficient loud-speaker reception.

Long waves in radio are very easy to amplify; the shorter the waves are, the more difficulty amplification presents.

The superheterodyne, by means of an oscillator tube, changes the comparatively short waves used in broadcasting into waves of a length where amplification presents virtually no technical difficulty.

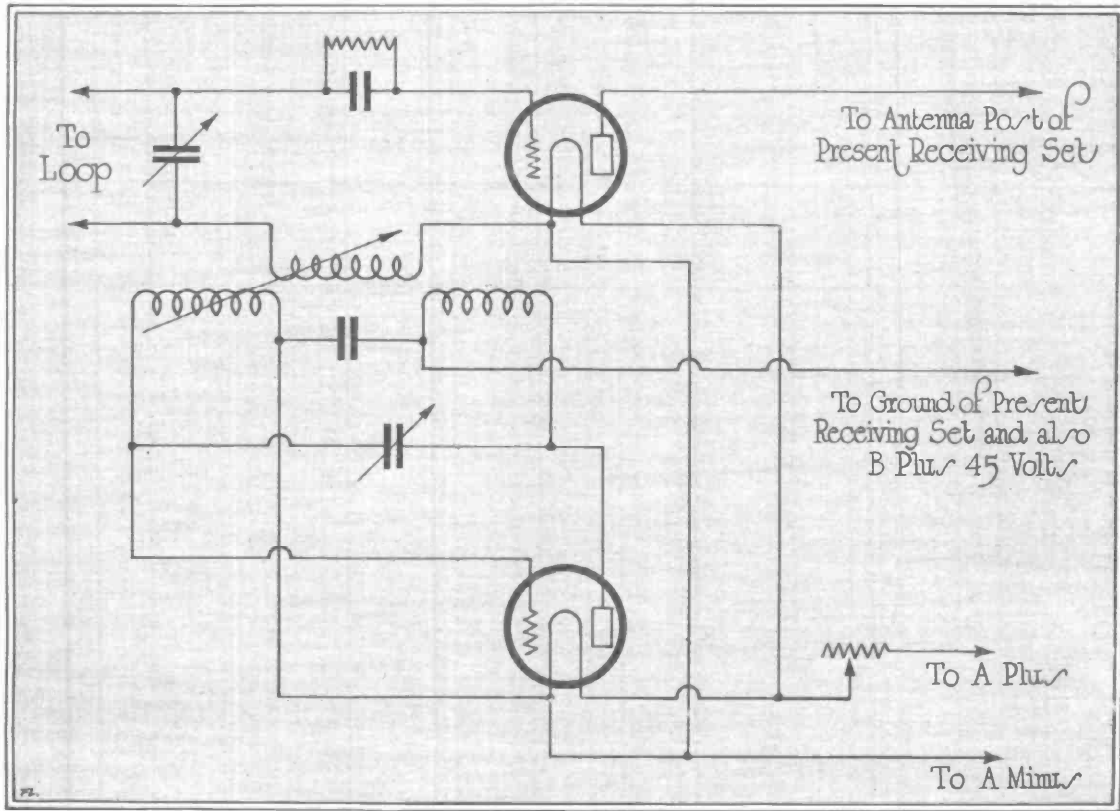
Bear in mind then, that heterodyning for this particular purpose simply means changing the wave lengths.

Now, as almost everybody knows, all of the five-tube sets which are such favorites today—including the neutrodyne, the potentiometer controlled radio-frequency circuits and all of

(Continued on Page 27)

better and clearer way than I can, but because they have not seen fit to do so for some reason or other, or may not even have thought of it, I suppose I shall have to lay claim to it, as H. M. N. says, and do my best with the subject.

Having therefore claimed the thought and given the reason for its appearance in my columns here in *Radio in the Home*, let's see what it amounts to and why. I am too old a bird in the radio field, you know, to foster any of these "Marvelous," "Revolutionary," "Final answer to the



amplification, however, that constitutes the only advantage of the super. The super's real advantage lies in its great selectivity obtained because of its heterodyning action (here again is an opportunity for several nice meaty discussions. As for instance, just what is the length and breadth of this heterodyning business as carried out in superheterodyne reception of modulated, that is, radiophone signals?)

Superheterodynes of a properly built type have been successful in tuning out the local powerful station and tuning in a distant one on a very slightly different wave, even when the super was actually located in the same room with the local station. Such ability as this on the part of a receiver is of great value in our present discussion, and so I shall dwell on it to a little greater extent.

I have said that the super's selectivity was due to its heterodyne action. This is not, however, the entire story. Superheterodynes are as a rule expensively built many tube receivers in which much time and money have been spent. As a result these receivers more often than not contain fine quality materials in their construction and are the result of painstaking effort in design detail to secure super reception. Such effort and care, of course, reflects in the finished product. I have often thought that were the same care to be spent in other reliable and

*This diagram is for experimental purposes, so the value of all coils and condensers must be determined by experiment. It is a suggestion to our readers so that they can have a basis for a Flewelling "superhet converter"*

accepted types of receivers, the results might be interesting.

We have before us the fact that a superheterodyne receiver is very selective, probably sufficient for any and all broadcasting reception requirements, and that it possesses this highly desirable feature merely because it uses a local circuit, which is oscillating, to beat against the incoming signal to produce a note of so much lower frequency that even in our vast ignorance we can properly amplify it.

Here then are our cardinal features: heterodyne and amplification. Remember both these points a moment and consider your present receiver. Perhaps it is a plain one-tube receiver; well, let's make a little list of what your present receiver might be. It might be a one-tube regenerative or non-regenerative receiver, a transformer or otherwise coupled radio-frequency receiver of the tuned or untuned variety; perhaps it is a reflex or one of the popular three-dial five-tube tuned radio-frequency or neutrodyne receivers. It is barely possible that our idea might cover any or all of these types. When you purchased or decided to build your receiver you were told that it was the best (Oh! always!), because the incoming signal was

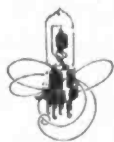
received on the first coil, sent through the tube or tubes and amplified lo, these many times!

Amplified? Heterodyne? We still have our two cardinal points before us.

It is too early in our subject to cover the entire situation thoroughly; we'll try to do that as we go along, sort of progressively as it were, each thing in its turn, but suppose for instance the following case: Suppose you own a neutrodyne receiver. You have then two stages of tuned radio-frequency amplification, a detector and two stages of audio-frequency amplification. Now think of a superheterodyne. Here we have the following layout, a first detector tube and oscillator, two or three stages of tuned or untuned radio-frequency amplification, a detector and two stages of audio-frequency amplification. If, for instance, you own a neutrodyne receiver and build for yourself a little two-tube set of the very simplest type, the little two-tube set would consist of detector and oscillator tubes. Then you have all of the requirements of a superheterodyne.

The two-tube set of oscillator and detector would or could be an entirely separate and distinct unit from your neutrodyne and need not bother it in any way. Provided that your neutrodyne receiver, however, was set, say, to tune a sta-

(Continued on page 25)



# Counterflex Circuits for Experimenters

## Part Two

By **KENNETH HARKNESS**

Associate Editor of "Radio in the Home"

**UNDOUBTEDLY** the two most popular circuits brought out during the past season were the Roberts Knockout, developed by Radio Broadcast, and the Harkness Counterflex, developed by this magazine. Each circuit has its ardent advocates who claim it is better than the other. The probabilities are that it's about a fifty-fifty break. That's what makes radio so fascinating.

Mr. Harkness began the detailed discussion of his Counterflex in this magazine in the issue of last January and has had a further article in every issue since. The complete set of six numbers will solve all problems that may arise in the building or operation of the Counterflex receiver. They also contain the simplified 3XP-Style Wire-Ups from which the merest novice can build the set.

We can supply a limited number of the complete collection of six issues and will be glad to do so at the special price of 50 cents. Address our Circulation Department.

H. M. N.

**I**N THE first article of this series, published last month, I explained, in some detail, a new type of Counterflex circuit in which direct magnetic coupling is used instead of ordinary transformer coupling. This circuit, with one and two stages of audio-frequency amplification, was illustrated in Figs. 5, 6 and 7.

This month, in Fig. 8, I show the same circuit with three stages of audio-frequency amplification, counting the reflex tube and transformer as one stage. I am including this circuit because a great many readers have asked me to show a hook-up of this type. If you particularly want to use three stages of audio you will find the circuit of Fig. 8 practical and, if the parts are well spaced, howling will not be experienced.

The construction of coils L1 and L2 was given last month. The coils are identical, each being tapped in the center. You will notice that a grid leak is connected across the secondary of the reflex audio transformer. This leak prevents howling caused by the capacity of the body when tuning C1. It is also necessary to connect a fixed capacity across the secondary of the last audio trans-

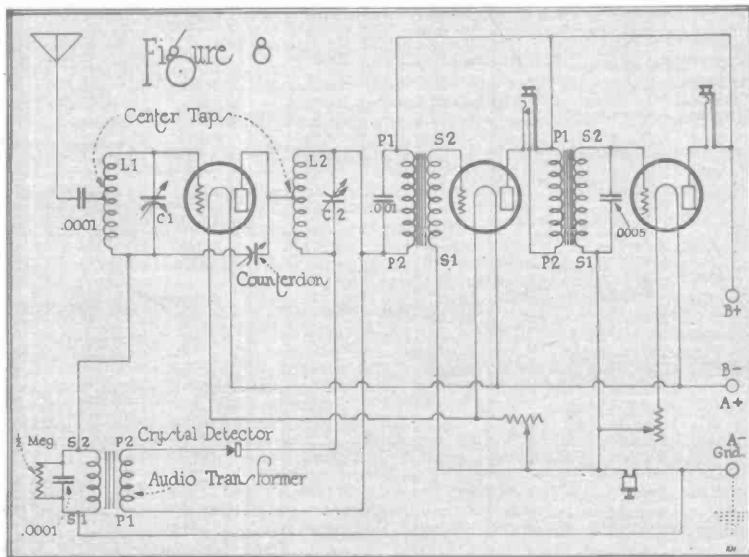
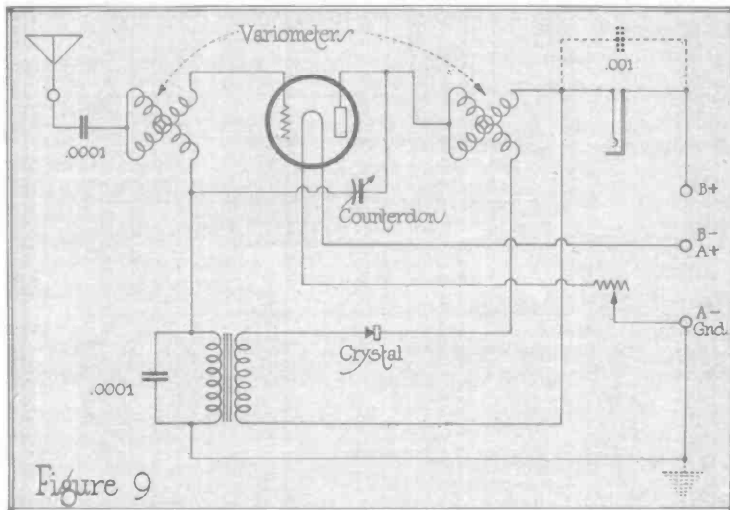
former, as shown. It is sometimes necessary also to connect one across the second transformer. If the parts are well spaced, however, and carefully wired with short leads, no trouble will be experienced in eliminating any tendency to whistle or howl.

Although I am publishing this circuit, in response to the numerous requests I have

received for it, I do not particularly recommend its use. It would be much better to use two stages of radio-frequency amplification and only two stages of audio. An additional stage of r. f. amplification would increase audibility without increasing static interference to the same extent. Later in this series I shall give circuits with two stages of radio-frequency amplification

which I consider preferable to the arrangement of Fig. 8.

In Fig. 9 there is a suggestion for owners of variometers. Variometers seem to have lost their popularity, so I imagine a good many experimenters have variometers on hand which they are not using. If you do have a couple, try the circuit of Fig. 9. Add a stage of audio if you like. The results will surprise you. This hook-up, of course, is practically the same as that of Fig. 5, except that the circuits are tuned by the variometers instead of variable condensers. Incidentally,

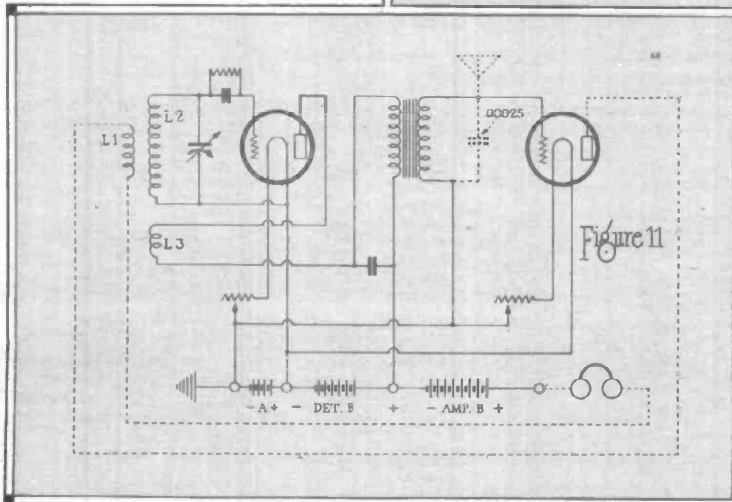
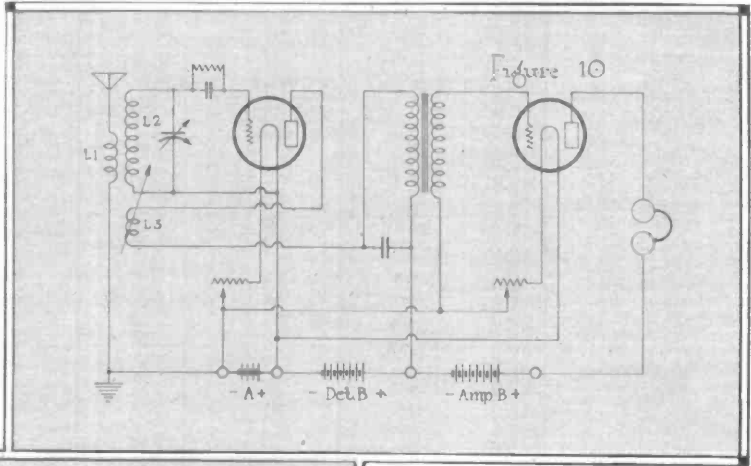




the tuning of the variometers changes the coupling between the antenna-grid circuits, in one case, and the plate-detector circuits in the other. The coupling increases as the frequency decreases, which is desirable. Theoretically, the amplification should be fairly uniform at all frequencies, without adjusting the counterdon.

When constructing a set using this circuit, be sure to keep the variometers well separated and mount them at right angles to each other. You will notice that a connection is made to the junction of the stator and rotor of each variometer. A fairly high capacity value is required for the counterdon and its adjustment is somewhat critical. The fixed condenser across the phones (or primary of the second audio-frequency transformer, if a second stage of audio is used), is shown in broken lines as the operation is sometimes more stable without this capacity.

*Reflexing Regenerative Circuits:* In

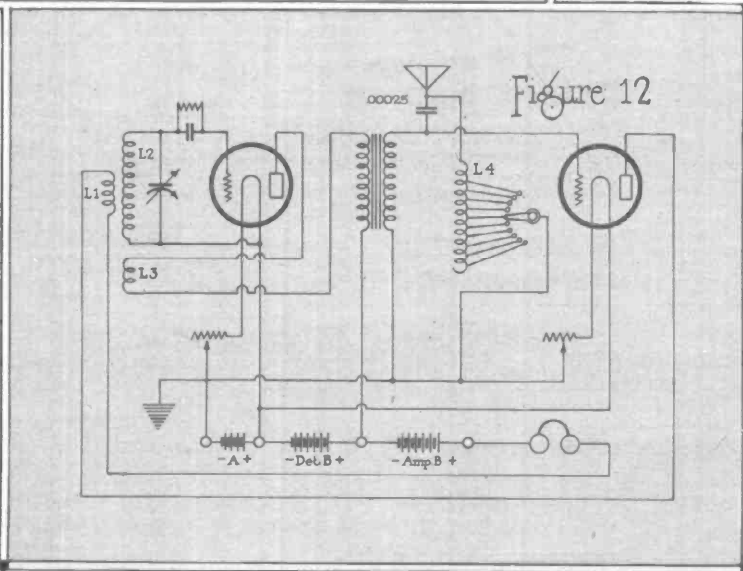


terferes with radio reception. By utilizing the reflex principle it is possible to eliminate this undesirable feature of the regenerative circuit. Therefore, for the benefit of those who are anxious to "do their bit" toward reducing interference I show, in Figs. 11 to 14, some regenerative circuits which use the reflex principle to prevent radiation. In these circuits, continuous oscillations are not present in the antenna when the detector tube is in the oscillating state and interfering waves, therefore, are not radiated.

The diagram of Fig. 11 shows how the popular circuit of Fig. 10 can be made non-radiating in a very simple manner. It will be noticed that, with the single exception of a fixed condenser, no additional apparatus is required. It is only necessary to make a few simple changes in the wiring of the receiver. These changes are indicated in broken lines.

As shown in the diagram, the antenna is removed from the coil L1 and connected

Fig. 10 I show a standard regenerative circuit with one stage of audio-frequency amplification. Of all radio circuits this regenerative hook-up, with tickler feed-back, is undoubtedly the most popular. L1, L2 and L3 form what is known as a "three-circuit tuner," of which several million, more or less, have been sold. Unfortunately, regenerative sets of this type radiate continuous waves when the detector tube is in the oscillating state and cause most of the "whistling" which now seriously in-



directly to the grid of the audio-frequency amplifying tube. The ground is also disconnected from the opposite end of L1, although it remains connected to the negative side of the filament. The coil L1 is then connected in series with the plate battery and telephones, or output, to the plate of the A. F. amplifying tube. A fixed capacity of .00025 mfd. is shunted across the secondary of the audio-frequency transformer. These changes transform the circuit into a reflex system of an elementary nature. Incoming signals, received by the untuned antenna, are impressed on the

grid of the audio-frequency amplifying tube and reproduced in the plate of the circuit of this tube, in which is included the coil L1. The audio amplifier also acts as a "blocking tube" to prevent continuous oscillations from being set up in the antenna when the detector tube oscillates. The radio-frequency resistance of the audio-amplifying tube circuits is more than sufficient to damp out these oscillations.

The arrangement of Fig. 11 is so simple and can so easily be adopted by owners of radiating regenerative receivers that I almost regret the necessity of calling attention to its defects. Unfortunately, however, it has some disadvantages which must be considered. The most serious will

only be experienced by those who are located near powerful broadcasting stations. A strong local signal, impressed on the grid of the audio-frequency amplifying tube, is

rectified by this tube and heard in the telephones. It cannot be tuned out by adjusting the tuning condenser across L2; in fact, strong local signals are audible with the detector tube entirely removed. This interference is much more noticeable if an additional stage of audio is used as the local signals, detected by the first audio amplifying tube, are magnified by the second. This interference is not caused by lack of selective tuning arrangements, in the ordinary sense, and is consequently more difficult to avoid. If the receiver, however, is not located near broadcasting stations, the selectivity is just as good as the standard circuit of Fig. 10. The second defect

(Continued on Page 20)

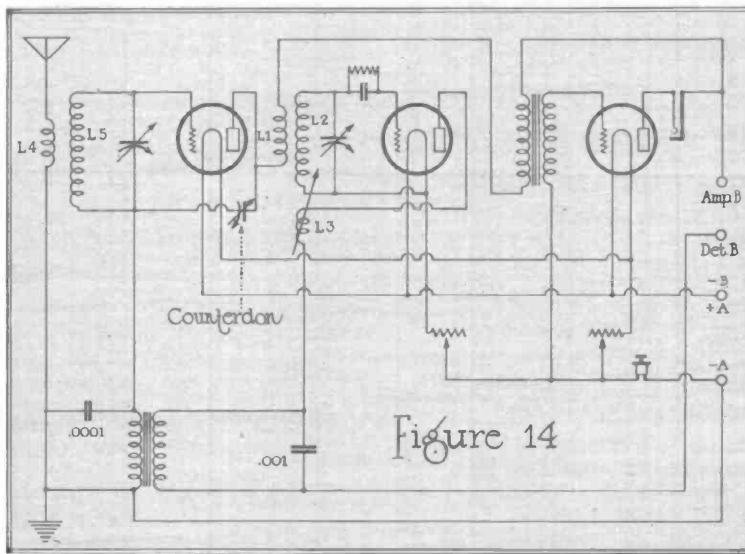


Figure 14

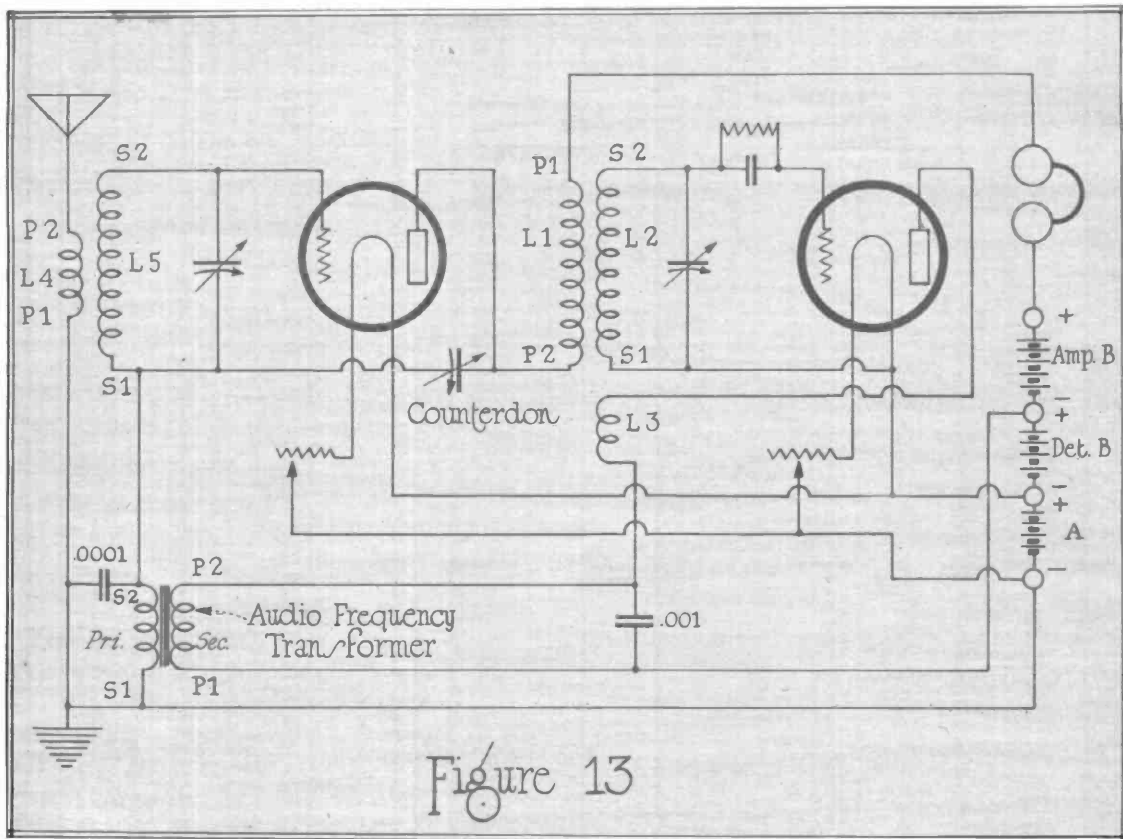
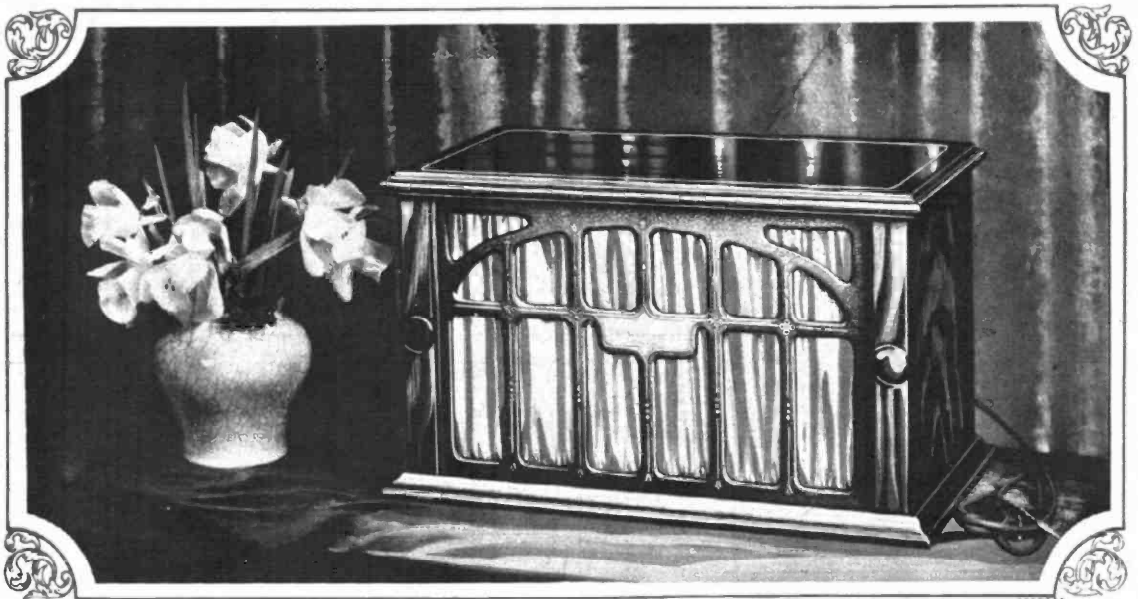


Figure 13



## And Now— The Superspeaker Console

In performance, it's a Superspeaker—enough said.

In Appearance, it's the finest piece of Radio cabinet work you have ever seen.

Just what you'd expect from two years' experiment and development by an organization with a record of leadership in the field of loudspeakers.

See it! Listen to it! Enjoy its ability to improve the appearance and performance of your set.

Of finest American Walnut or the new Claremount Mahogany—Top inlaid with Arlington Ivory—Leather composition grill, richly draped with silk—Volume controlled by ebony knob—Superspeaker-Vemco Reproducing unit—Superspeaker material concealed horn with full floating mounting. Overall size 10 1/4 x 17 1/2 inches, 10 inches high. Ask any Jewett dealer. Price \$40.00; west of the Rockies, \$42.50.

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With parquetry top. Puts  
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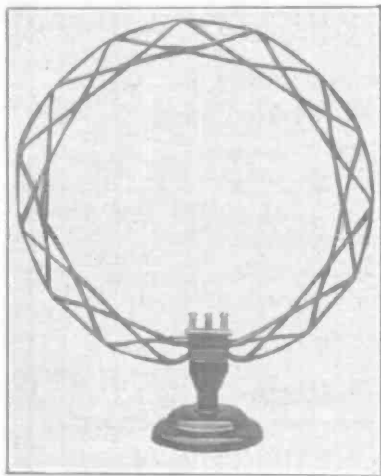
*The Jewett Micro-Dial—*  
Makes tuning 50 times  
as accurate. Fits any  
set. Needs only a screw-  
driver to install. Price  
\$3.50.

*The Jewett Vemco Unit—*  
Makes a loudspeaker out  
of your phonograph. The  
Reproducer used in the Su-  
perspeaker. Price \$12.00.  
West of the Rockies, \$12.50.

*The Jewett Superspeaker Highway—*  
Houses Radio set and all bat-  
teries. Superspeaker built in.  
Takes Radio into the realm of  
fine furniture. Price \$150.00.  
West of the Rockies, \$140.00.

# Jewett Quality Products

# Notes from the Lab at Station 3 XP



The Carter Loop Aerial

**"FLUXITE"**—Monarch Products Company, Red Bank, N. J.

Fluxite is, as the name signifies, a flux for soldering purposes. It has been used at Station 3-XP in soldering the wires of a number of sets that have appeared in this magazine. After standing around for a couple of months the joints show no signs of corrosion, and the sets in operation have none of the noises sometimes present in sets in which poor flux has been used. On account of it being a liquid the flux reaches into screw threads and is particularly helpful in soldering wire to screws.

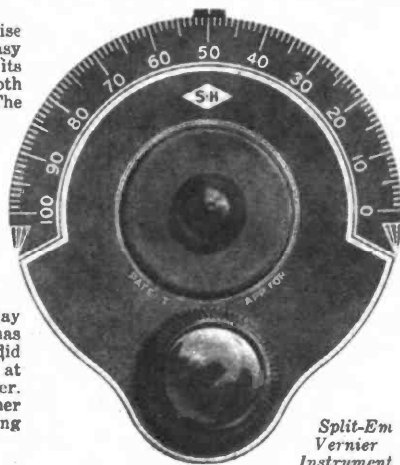
**ULTRA-VERNIER TUNING CONTROL**—Phenix Radio Corporation, 114 East 25th street, New York City.

The ultra-vernier comes in two finishes

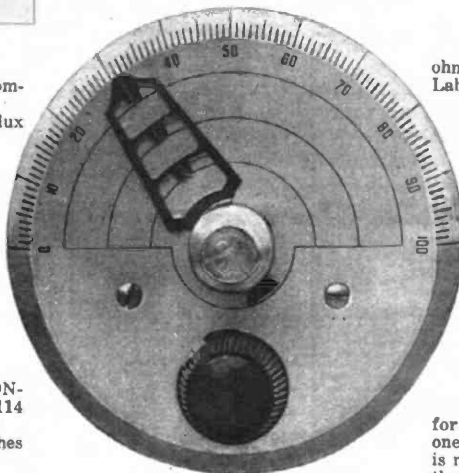
—silvered and gold with either clockwise or counter clockwise readings. It is easy to mount on the panel as the dial is its own template. Tuning is easy and smooth on account of the gear arrangement. The main feature is the ability to log stations on the face of the dial. There are four circles provided with a notch on the dial indicator for each circle. This feature makes it possible to indicate stations that come very near together.

**BRACH CRYSTAL INSULATOR**—L. S. Brach Manufacturing Company, Newark, N. J.

This insulator is of glass. It lay around the benches of the laboratory, has been used on a transmitting aerial, and is at present in use on a short-wave transmitter. It has been exposed to all kinds of weather and is still bright and clean and giving good service.



Split-Em Vernier Instrument Control



Ultra-Vernier Tuning Control

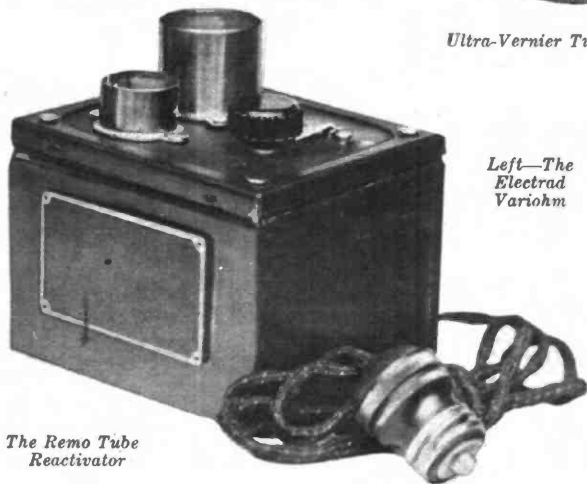
**ERLA PRECISION RHEOSTAT**—25 ohms, Serial No. 6496—Electrical Research Laboratories, Chicago, Ill.

The Erla rheostat is of the single-hole mounting type. Tested on a Leeds Northrop Calibrated resistance box, it showed 24.69 ohms, which is much closer to rating than many rheostats on the market, and is accurate enough for any set. When placed in series with a battery and a voltmeter placed across the terminal of the rheostat, the voltmeter showed a smooth, even change as the contact arm passed over the winding. This is desirable for present-day sets.

**ELECTRAD VARIOHM**—Electrical Research Laboratories, Chicago, Ill.

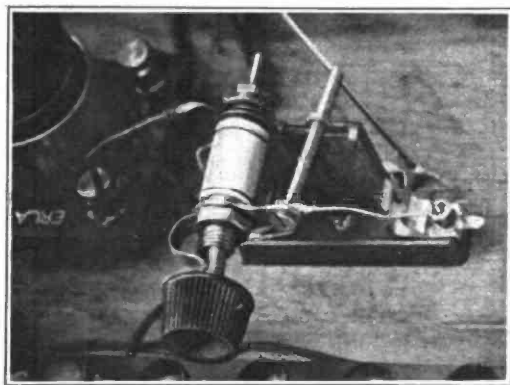
The Variohm is a high-resistance unit for use as a grid leak. It has a range from one quarter to ten megohms. Provision is made for mounting directly on it one of the postage-stamp condensers. It can be panel mounted. The variohm was given a try-out in a short-wave receiving set and nearly doubled the volume. Two of our readers have also

(Continued on Page 24)



The Remo Tube Reactivator

Left—The Electrad Variohm



## Have You Heard Those Texas Stations?

(Continued From Page 13)

are covered with ruby velour and the ceiling is of cloth of gold. Every window may be closed against outside sounds, and yet the perfect system of ventilation provides a constant supply of fresh air at a fixed and comfortable temperature no matter what the outside weather may be.

Still, enthusiastic as Mr. Chinaki is over the new station, it is doubtful if he can possibly have the same affection for it as he has for the one which he and Mr. Austin built between them when radio was so new a thing that it had not yet created a supply of materials and equipment and mechanical knowledge to fill its own demand and they had to learn as they built.

These two young men have been

rolling stones have come back to their own home town and are the mechanical geniuses of WEAY.

If Houston will heed them it will possess one of the best and most originally conducted stations in the country.

WEAY is owned by a man whose business is to sell entertainment at his theatre box office, and it seems strange at first glance that he should go to both pains and expense to give the public free entertainment by radio.

The obvious answer is that it is a matter of good advertising but as plain fact the direct effect on the box office is not great. Yet the good will engendered by this policy has enlisted the public support which has



J. G. Cummings, "Silent Joe," announcer of Station WOAI, San Antonio

chums ever since they discovered a mutual interest in ships—back in the days when they were going to the old Fannin street school in Houston and got caught drawing pictures of battleships instead of learning their lessons.

Their experiences have been almost identical ever since. Both delved into mechanics. Both got Commercial Operator's license at the early age of 16. Both tried to join the navy and both failed because of their extreme youth. Both later made the acquaintance of ships and the sea from the decks of merchantmen, though this time not together.

Once, when Mr. Austin was ashore in New Orleans, he fell victim to the temptation to have his arm tattooed and, walking down the street immediately afterward, he met his chum Mr. Chinaki, who had just come ashore after a voyage.

Austin displayed his tattoo, whereupon Chinaki decided that he must have his arm decorated with the same design, and so they went and had it done right then and there.

Now, the wanderlust satisfied, the

built the new theatre. And whenever there is a convention in town numbers of people find time to hunt up the Iris Theatre and express appreciation for the programs they have heard through its broadcasting department.

The Houston Press broadcasts five programs three nights a week through this station and its city editor acts as announcer for them. The orchestras of the Bender and Rice hotels are also heard regularly, while at 11 P. M. every Friday, the Night Hawks have their turn and feature Max Fink's Iris Theatre orchestra.

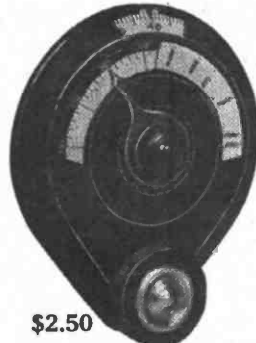
This program is always made up entirely of request numbers, and there is no indication that they will ever get caught up and ahead of the requests which come from parts of the compass in a continuous stream.

Webb C. Artz, of San Antonio, one of WPAI's first announcers, is now with WEAY and gaining new popularity every day.

Some noteworthy talent is heard over this station through the efforts of Mrs. John Wesley Graham, who arranges many programs and acts as

## A New B-T Product

### The "Better Tuning" Control



\$2.50

Exclusive features protected by patents applied for

sign and careful construction parts bearing the B-T name.

Hairline Control, Easy Action, Simple Mounting.

No side strain or pull on shaft to wear out bearings or destroy alignment of your condenser or coil.

Reads 0 to 100 or 100 to 0, —settling the argument as to "clockwise" or "anti-clockwise" instruments.

Registers dial numbers, wave lengths, or call letters.

Improves the tuning as well as appearance of any set.

The new Tuning Control is distinctively a B-T product. It is of the same sensible design that has characterized radio

## Coming:

### THE NEW B-T SOCKET

The New B-T Socket will appeal to the radio builder who demands the utmost in mechanical and electrical efficiency. Exclusive Features reduce socket capacity to minimum. The most positive contact arrangement yet devised. Send in your name for circulars on all new B-T developments.

## BREMER-TULLY MFG. CO.

532 S. Canal St.

Chicago, Ill.



THE QUADRAFORMER KIT contains the three essential transformers necessary to build the SUPER-FIVE, with complete instructions for assembly. The method of description simply takes all the difficulties right out of set construction. Price \$15, prepaid.

The QUADRAFORMER system makes a trouble-proof set, far more sensitive and far more selective, of greater volume and more natural tone than any radio receiver that you have ever heard.

All so-called "neutralizing" devices are done away with. They are not needed. Internal set noises are eliminated instead of being imperfectly suppressed. The QUADRAFORMER system will reward you with a remarkable difference in real music—rich, sweet tones and great volume (without distortion) when desired.

Write today for the QUADRAFORMER BOOK. It will start you on the way toward a new radio experience. Profusely illustrated with photographs and drawings. It takes you step by step through the making of the SUPER-FIVE, an exceptional 3-tube receiver developed by the engineers of the Gearhart-Schlueter Radio Corporation.

Enclose 3c to cover cost of handling and mailing and you'll have it by return mail.

Order your factory-made and matched QUADRAFORMER KIT today. Send no money—you can pay the postman

GEARHART-SCHLUETER RADIO CORP., Fresno, Calif.



# The Wonder of Radio!

**2-Tube Crosley 51**  
Same as wonderful Crosley 50 with additional tube amplifier. Local and nearby stations on loud-speaker always and distance up to 1500 miles under average conditions. Much greater range with head phones.

**Special Sleeping Front**

**2-Tube Crosley 51**  
Same as Model 51 with cabinet holding all dry A and B batteries. \$23.50.

**3-Tube Crosley 51 Portable**  
The Crosley 51 in a black leatherette case, with nicol trimmings. Space for batteries. \$23.50.

**Crosley Musicone**

A marvelous new development of loud-speaking principle. Diffusion of sound creates perfect reproduction of all tones. \$17.50.

**3-Tube Crosley 52**

A larger set for those who want greater reception range on the loud-speaker. Operates on three tubes, using wet or dry batteries. Constant loud-speaker range, 1500 miles or more.

**Special Sleeping Front**

**3-Tube Crosley 52**  
Cabinet contains dry A and B batteries. Same efficient detection and reception as regular 52. \$35.

**3-Tube Crosley 52 Portable**

Same as other 52 models, but in a black leatherette case. Easily carried. All batteries inside. \$35.

Prices quoted above do not include accessories. Add 10 per cent west of Rocky Mountains

This is the latest refinement of the marvelous set that enabled Leonard Weeks, of Belmont, N. D., to catch the message of MacMillan's North Pole expedition when sets sitting ten times as much failed.

In this set Crosley has developed the famous Armstrong regenerative circuit. This circuit does with one tube what it takes three tubes to do in others.

This set will bring in stations from all over the country. It is simple and easy to operate. With accessories the total cost should be under \$25.00. Crosley keeps the cost down with his "radio for the millions" ideas in production.

Recent letters from enthused owners of the Crosley one-tube 50 report good reception at these distances:

- Mrs. J. E. Martin at East Palestine, O. hears KGO at Oakland, Calif.
- O. W. Bryant at Sunnot, Tenn. gets WLW at Cincinnati, KDKA at Pittsburgh and Hollywood, Calif.
- L. R. Pratt, Hammond, Ind. hears 9NO, New Castle, England.
- Eugene Herrhaus at Brookfield, Mo., hears Montreal and Winnipeg, Canada.
- Paul J. Hall at Osceola, Neb. hears 2LO at London, England.

Crosley manufactures receiving sets which are licensed under Armstrong U. S. Patent No. 1,111,111, and priced from \$11.00 to \$45, without accessories.

Crosley owns and operates Station WLV, Cincinnati, the first remotely controlled super-power broadcasting station.

**The Crosley Radio Corporation**  
Pascal Crosley, Jr., President  
780 Sassafras Street, Cincinnati

accompanist for her own pupils. Notable among these artists is Rudolph Coles, a young tenor, of whom Houston expects great achievements before very long.

Another great favorite much liked by WEAY fans is Miss Ruth Patterson, the soprano whose happy and buoyant personality is expressed through her voice.

These singers are known for the high quality of their selections and the sincere artistry of their performances.

That so much of the better class of musical entertainment offered to radio listeners comes to them as a gift from the artists themselves cannot be too often said. To be sure they sing or they play for advertisement, for practice, for their own pleasure and to gratify the pride of parents, teachers and personal friends, but yet the radio audience which is

the same ownership, became early broadcasters.

WFAA was built by its present supervisor, L. B. Hanson, who also built the famous 30-watt municipal there was little interference. WRR is still operating strictly as a municipal station.

WFAA began in June, 1920, with a composite 150-watt set and was re-stationed, WRR, back in 1920, when placed the following September by a full-fledged 500-watt station. WFAA has 307 feet of antenna height above the street with 362 feet lying between the towers. Charles F. Baker is chief operator with Victor D. Wilson station engineer, assisting in announcing as well.

There are four announcers at WFAA—three from the operating staff and the fourth is The Radian himself—the radio editor of both papers, Adams Calhoun, who refuses



"The Red-Head Girl" of Station WFAA, who is the society editor of the Journal

outside all of these categories is nevertheless tremendously in their debt.

It has done nothing to pay for the time, money and effort—perhaps the discouraged tears which have been spent on the perfecting of the art which gives them pleasure. It need not make any return, not even the easy one of a few careless hand-claps, but if it were better realized how much it pleases and helps an artist to receive applause cards saying that they have been heard, more people would take the time to make this gracious return.

Criticism is always entirely welcome, if given in a kindly spirit, and is often of more real benefit than the highest praise.

So, get busy, listeners, and limber up your pens. There are two halves to radio and you are the other half.

to have his picture taken. I suggested that I might run another face for his in my article, but this met with such suspicious approval that I hesitated.

"I believe that the minute listeners see the picture of their announcer," Calhoun advises, "the interest is gone. They think they want to know but if we keep them guessing they will continue to want it. WFAA announcers are not identities. WSB may have its Lambdin Kay, or Fort Worth may enjoy the camouflage of the Hired Hand, but WFAA does not even give the announcer's initials. We are one, doing the same thing, whenever our turn comes. We stand behind the station. WFAA is the thing to our listeners and not who is at the microphone."

(N. B.—We are glad that the Radian has few followers in his cut. It would be pretty hard on the feature writer and what would the radio magazines do anyway with nothing but technical articles?)

**BEAUTIFUL DALLAS AND WFAA**

By VERA BRADY SHIPMAN

IF YOU are going south into Texas, you will doubtless be urged to visit Dallas. It is a city of enthusiasm, skyscrapers and traditional southern hospitality. Thirty miles east of Fort Worth (its rival) Dallas greets you with hustle which spells business prosperity.

Of course such a city has a radio station. The newspapers, the Morning News and Evening Journal, under

If you tune in on WFAA you may hear a Hawaiian string guitar and singers whom the announcer calls "The Sweethearts of the Air." They are the MacDowell sisters, Grace and Edith, affectionately named by an admiring radio fan. These singers often receive as high as a hundred responses to a single musical program so popular is their style of work. The pretty phrase "healing music over the radio" is applied to

TRADE MARK

## KARDON

READY-WIRED UNITS for all of the famous circuits

Detector unit     Detector and one step     Detector and two steps

Five tubes for any hook-up

**KARDON PRODUCTS CO.**  
481 Greenwich St., New York City  
Philadelphia 68, Pa.     Chicago 24, Ill.

### Well Suited for Reflex

RUBICON transformers are giving remarkable satisfaction in all circuits where tubes do double duty. Type C and D, 3½ and 5 to 1 ratios, work well in reflex stages, either with tuned coupling or with our Type R sized R. F. transformer; also for straight audio. Now over, for the latter we particularly recommend Duplex Push-Pull for its pure, full tones.

*Sound for true fidelity*

"The Inside Story" tells just what transformer to use for any specific purpose.

**The RUBICON CO.**  
29 N. 6th St.     Philadelphia

Audio Type C and D.....\$4.00  
Radio Type R.....\$4.50  
Duplex, per pair.....\$12.00

them for their many shut-in, crippled, aged and prison-folk listeners, who write that they are healed as well as cheered. Gifts come of every description—a Navajo scarf and hand-bag from a Guatemala fan who enjoyed "On the Beach at Walkiti." Candy, cake, fine needlework, rare pottery, oil paintings are sent in. One farmer asked to send them a Poland China pig.

Another star broadcaster at WFAA is Mary Carter Tooney, who in between her 5:30 daily children's story hour, is society editor of the Evening News.

A Tennessee listener to her writes, "As you talk to listeners, during your evening hour, won't you see if you can find my buddy? His name is Bevee and he lived in Dallas."

With a twinkle in her eye Mary told me, "Billy Bevee is my next door neighbor. He and I have been friends since childhood." The girl on Broadway might have added in the language of today, "He's my awesie," but Mary Tooney talks as carefully as she talks to the children over the radio. But we feel, after our visit to Dallas, that Billy Bevee is lucky to find his buddy and have a friend like Mary as well!

"A storyteller gets funny letters as well as the announcer," Mary added.

"One school teacher wrote to get the book of the 'Land of ODD' after I had read a story of OZ land. My listeners are all ages. One Confederate veteran, aged 85, in the Austin soldiers' home called me 'his girl' until he recently married a war widow almost 70, from the soldiers' widows' home. They visit every week and I wonder if he dares to speak to her of me (again the twinkle in her bright eyes)! A miner, who signed himself 'subscriber,' offered me a silver mine. But the children's letters are the best of all. They love the oldest stories best. The 'Old Woman and the Vinegar Bottle' is one most often requested."

Here had to admit ignorance. I thought I knew the old legends, but Mary obligingly told me the story at her desk, and if that's the way children hear it, I, too, would request it again!

"I don't like 'Puss in Boots' or 'Red Riding Hood,' and the children seem to feel my dislikes for both are rarely asked for. I often tell stories of American history from a book by the daughter of the president of this paper, Lucy Donahedi Barber. We have a club in the Sunday paper. I am Cinderella and the children are the Little Knights and Ladies."

Mary Toomy tells her stories as the mothers tell them at home and the children happily respond to her efforts.

I almost forgot to tell you about the red-head girl, who is society editor of the Journal, and sings jazz songs to her own accompaniment on the Wednesday noon programs and as her radio name implies...her songs "go over big" in the song writers vernacular.

WFAA broadcasts the Hotel Adolphus orchestra on the late Saturday night programs, and has about fifteen remote control lines to various halls and theatres, including the Palace Theatre, with Dwight Brown at the organ every Tuesday evening at eleven.

**WHERE THE COWBELLS RING**

By E. D. CAHN

EVERY radio-broadcasting station has a personality of its own and WBAP, Fort Worth, Tex., not only has personality, but add to that plenty of genuine originality besides.

The identity of its famous hired hand is strictly guarded and his *nom de radio* is copyrighted. He is the original hired hand of broadcasting and his dry wit and spontaneous

humor have delighted an audience as huge as it is approving.

The hired man never prepares any of his material in advance, never says anything rehearsed or premeditated. His tongue was blessed by some wag-gish good fairy who never warns him, but makes up for that by never deserting him.

WBAP means the Star-Telegram newspaper to most people, but the hired man says it means wine, beer and pretzels to some folks he knows. And in this connection it may be remarked that he has so high a regard for abstract truth that he has founded and is the president of the Radio Truth Society, which boasts between one hundred and fifty and two hundred thousand members, the chief object of which is to "protect" the truth and save it from abuse.

Whoever manages to tell the most awful whopper during a certain period is solemnly awarded a Truth Certificate. The Truth Society meets Wednesdays and Fridays on the 9:30 program, and is a feature hilariously indorsed by the public in general.

There are four announcers at WBAP so that the hired hand is not overworked. C. B. Locke is one of these and is well liked on account of the pleasing quality of his resonant voice.

Mr. Locke was born in Kentucky, but has lived so long in Texas that he is almost a native. One of his distinguishing traits is his desire to boost for his associates rather than for himself. He has the good newspaperman's loyalty and admiration for his paper and extends those feelings to his fellow workers as well. His understanding of the fine points of the hired hand's work is thorough and he thinks that one of the country's best humorists works through the WBAP microphone, dressed in a replica of the absurd regalia which the cartoonist of the Star-Telegram gave him in a series of cartoons—belled oversize, belled calico shirt sleeves, huge visored cap and a cowbell in his hand.

Just as Memphis uses a steamboat whistle as its identifying sound, this station always goes on the air, and signs off, to the sound of a cowbell. This is because for years and years Fort Worth was known as "cow town" and has always been a cattle market.

Many cowbells were sent in by admirers and among them was one from a lady whose mother came to Texas behind a team of oxen in 1866. It is a huge one and still bears its original old strap wound around and round with a piece of ancient figured cloth.

However, the hired hand was not to be beguiled by strange bells and he stuck to the one he had begun with. The fans were just as loyal as he was. Just let him ring any other bell, even once, and the radio family would be sure to notice the difference and demand to know "how come?"

The result was that the bell got to be so famous that it must have tempted somebody beyond power to resist. Anyways, it disappeared—vanished—simply and suddenly wasn't there!

Search availed nothing and at last it was sorrowfully announced that it was gone, that news of it would be more than welcome, and that any one detaining it had better examine his conscience at once.

Then the telephone calls, letters and telegrams began to pour in. The hired hand's pet bell had been seen hiding out in a pasture in Arkansas. It was in a boat in the Buffalo Bayou. It had been seen passing over a well-known Louisiana city in the company of a demented balloonist. Divers criminals were suspected and some openly accused. Many a heifer wore a conscious and embarrassed look as she roamed the range, which was



"A" is a stray field or wave traveling toward the coil. Due to the exciting all induced currents oppose each other on an opposite side. Above no pick-up.

The wave front here moves at right angles to the coil plane. Again induced currents are set up in opposite side of the coil, preventing interference.

**New kind of coil**

Instantly brings four amazing improvements to your present set—greater distance, more volume, increased selectivity, finer tone quality. Send for remarkable new book, *Better Radio Reception*.

SCIENCE has discovered a new inductance principle that is bringing astounding results. Now you can apply it to your present set through new type coils known as Erla "Balloon" Circloids.

Thousands of tests and experiments were necessary before the circloid was finally perfected. Leading radio engineers worked night and day in order to develop a coil that would correct the four vital weaknesses of present sets. At last they were successful.

When circloids are used, results you think impossible are obtained with surprising ease. Note especially the four that follow:

1. **Greater distance.** Circloids have no measurable external field to affect adjacent coils or wiring circuits. This makes possible higher amplification in each stage with increased sensitivity and greater range.
2. **More volume.** Higher r. f. amplification enables circloids to bring in distant stations scarcely audible in ordinary sets with volume enough on the loud speaker to fill an auditorium.
3. **Increased selectivity.** Circloids have absolutely no pick-up qualities of their own. Only signals flowing in the antenna circuit are built up. (See diagram above.) This explains total absence of static.

**Disadvantages**—Exclusive franchises are available in high-class divisions in territories "all open. Write or wire immediately.

4. **Finer tone quality.** The self-enclosed field positively prevents stray feed-backs between coils. Hence no buzzing or distortion. Tones are crystal clear.

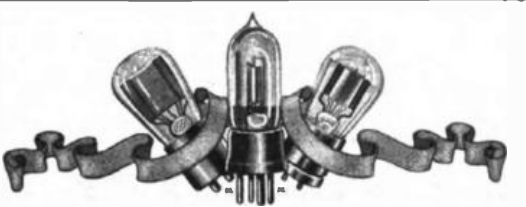
Write for new book, *"Better Radio Reception"*

You will be amazed at the difference circloids will make in your present receiver. Get a set and test them out today. Go to your Erla dealer, or write direct.

Also send for remarkable new book just published. It explains the Circloid principle with diagrams and drawings and tells you many things you ought to know about reception. Send 10c to cover postage and cost of mailing.

ELECTRICAL RESEARCH LABORATORIES  
2522 Cottage Grove Ave., Chicago, U.S.A.  
\* Trade Mark Registered

<p>ELECTRICAL RESEARCH LABORATORIES 2522 Cottage Grove Ave., Chicago, U. S. A.</p>		
<p>[ ] Send me free information on the Circloid. I enclose 10c for postage [ ] for book, "Better Radio Reception."</p>		
<p>Name .....</p>		<p>This sign identifies authorized Erla distributors. All are equipped to give complete radio service.</p>
<p>Address .....</p>		
<p>City .....</p>		



**Mail this Coupon for Illustrated Book**

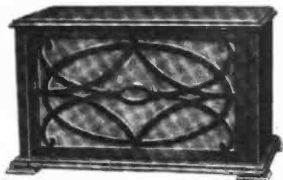
Kenneth Harkness Radio Corporation, 727-739 Frelinghuysen Avenue, Newark, N. J. MEM 1-65

Please send me a copy of your illustrated booklet describing the commercial model of the new, simplified 3-tube Harkness Counter-Box receiver with detailed building instructions and step-by-step wiring diagrams. I enclose 25 cents to cover cost of handling and mailing.

Name .....

Address .....

## Getting Concerts WHOLE



Cabinet Model "C," \$30

It soon dawns on the owner of a Bristol Speaker that he is listening in on *entire* concerts.

That roving disposition to tune in every station on the map is due, much more than is generally supposed, to a yearning for really sweet music.

One reason radio music does not always sound sweet is that certain of the tones are out of tune.

Coming through a Bristol Speaker, *all* the tones are evenly in tune. The result is an arresting sweetness that "invites" you to stay through a concert to the end.

## BRISTOL AUDIOPHONE Loud Speaker

For \$25 and \$30 you can get a Bristol Speaker; and there are others as low as \$12.50. Ask your dealer to send one out. Write us for Folder No. 3022-Q, telling why the Bristol is such a delight to the ear.

THE BRISTOL COMPANY WATERBURY, CONN.



## For Good Summer Radio Reception use JEFFERSON TUBE REJUVENATOR *keeps tubes like NEW!*

**D**ON'T blame the weather for all summer radio troubles. . . . How are the tubes? All tubes, remember, grow weak with use—especially in summer when operated at higher voltage. Bring them back to full efficiency with the Jefferson Tube Rejuvenator! Takes only 10 minutes; attach to a convenient electric light socket. Used once a month, it doubles and triples the life of tubes! Quickly pays for itself in saving of tubes and batteries. It's wasteful to be without one: It's economy to own one. Takes large or small tubes—201-A, 301-A, UV-199, C-299. Fully guaranteed. At leading stores selling radio supplies. If your dealer can't supply you, send \$7.50 to

JEFFERSON ELECTRIC MFG. CO.  
501 So. Green St., Chicago, Ill.

Makers of Jefferson Radios, Bell Ringers and Taps Transmitters; Jefferson Spark Coils for Automobile, Stationary and Marine Engines; Jefferson Oil Burner Ignition Coils and Transformers.



**\$7.50**  
\$10 in Canada

doubtless due to so much scrutiny from determined searchers.

Bells began to come in to the Star-Telegram office by messenger, post and express. Big ones, little ones, tinny ones, deep-chested ones, others as new as paint and as shamelessly fake as a henna transformation, yet not one of all that conglomerate herd of bells could produce the exact tinkle of the hired hand's pet bell.

His grief was pitiful to see. He wore a crape band on his hat and donned a black shirt. He went off his feed for days and he heaved such terrific sighs that they blew all the papers off the desks.

But finally he made up his mind that the bell was gone beyond hope of recall, and that life would have to go on somehow without it. He assembled all the aspiring bells and gave each one a number—and there were so many of them by that time that they almost crowded the microphone out of the window—and then he announced that they were all to be rung according to number and that the public might vote to decide which one of them should succeed the boss bell.

Accordingly this was done and then, lo and behold, the Fort Worth Chamber of Commerce received a mysterious parcel from over a thousand miles away and upon opening it found that some miscreant souvenir hunter had suffered a change of heart, had taken pity upon the grief and consternation of the hired hand and had sent back his bell—the original, the one and only, the Boss Bell.

Immediately the glad tidings were flung upon the air and the bell was rung to prove them. It went back on the job and has been there ever since.

WBAP has no regular musical features except Johnny Jackson's Texas Hotel Orchestra, playing every Wednesday afternoon, and Eddie Kerner's Radio Orchestra in Mineral Wells, by remote control, from 11 P. M. every Sunday to 1 A. M. Monday. The Star-Telegram is so careful that nothing of a partisan or commercial nature shall go out through its station that it insists upon a pre-hearing of every talk before it is broadcast.

It has been on the air ever since September of 1921, and was one of the first of the 1000-watt stations after it outgrew its original 5-watt beginnings. Though none of its talent is paid, it is booked far in advance by artists eager to be heard by its public.

One of its original ideas was to broadcast a Negro Holy Roller meeting. This received an immediate and tremendous response, a great deal of which came from Canada, where the Negro population is virtually nonexistent. These responses were turned over to the minister and he answered some of them on the spur of the moment and in the heat of exaltation right into the waiting microphone.

Applause mail, by the way, is always given to those furnishing the programs, and is valued by the paper as well as the artists. As has been said, WBAP has personality, and it is a most pleasant one to encounter because it springs from an intelligent ideal of public service and works hand in hand with a fine spirit of camaraderie for everybody's benefit.

### Notes From the Laboratory at Station 3XP

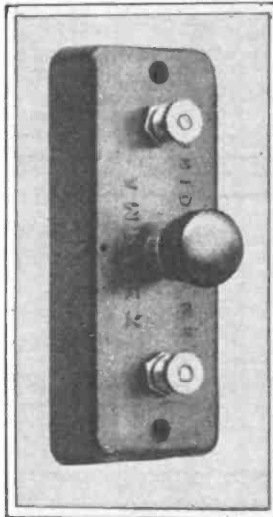
(Continued From Page 20)  
written enthusiastically of this instrument.

**SPLIT-EM VERNIER INSTRUMENT CONTROL**—American Instrument Works, 613 Fulton Building, Pittsburgh, Pa.

The Split-Em Vernier is one of the geared dial of the rack and pinion type, with a four-to-one ratio. The dial is substantially made and finished

in black with a brush-brass finish. The tuning knob is of generous proportions. If you are troubled with any difficulty in obtaining fine tuning adjustments this dial may be of assistance to you.

**AMPLEX GRID-DENSER**—Amplex Instrument Laboratories, 57 Dey street, New York City.  
The Grid-Denser was tested at



The Amplex Grid-Denser

1463 kilocycles and gave a maximum capacity of .00047 mfd. It is sturdily built and provides a means of adapting the grid condenser to the tube it is to be used with.

**REMO TUBE REACTIVATOR**—The Reno Corporation, Meriden, Conn.

A tube may be reactivated and while it will not give the same length of service that it did originally, there is still a considerable amount of serv-



The Brach Crystal Insulator

ice in it. This type of apparatus was described in the April issue. It is now appearing on the market in



commercial form, one of which is the Remo. If any one uses a number of tubes a machine of this type would prove a good investment.

**CARBORUNDUM CRYSTAL DETECTOR**—Carborundum Company, Niagara Falls, N. Y.

A fixed crystal detector of very rigid construction, yet sensitive enough to have the maker caution you to be careful in handling it. The makers have sufficient confidence in their product to run a service department to help purchasers to get the results they feel are in the crystal. The action of the crystal is decidedly directional and care should be taken to read thoroughly the instruction sheet before attempting to install it.



The Carborundum Crystal Detector

**THE CARTER LOOP AERIAL**—Carter Radio Company, 209 South State street, Chicago, Ill.

The Carter loop is nicely designed to meet the need for a small loop that is not ungainly in appearance. It is only one foot, ten inches high. A compound pentagon winding is used. The base is removable, and the loop can be car-



The Erla Precision Rheostat

ried in a space eighteen by eighteen by two inches. Clear reception was obtained on all the sets on which it was tried.

**Why Not Have a "Superhet Converter?"**

(Continued From Page 18)

tion in at 550 meters and left that way, then wouldn't it be fine if you went to your little two-tube set, which would only have two dials to manipulate, and turned them so that you heterodyned an incoming signal to produce a frequency of 550 meters at which your already tuned neutrodyne is set? Seems reasonable to suppose that we need never change the neutrodyne away from the point at which experience tells us it works best. We'll discuss that point later. But we can throw away our third arm which has now become useless because we can tune in all stations with only the two dials of the little two-tube set, secure the heterodyne effect with its marked advantages of

selectivity, and all at a cost so small as to be almost negligible.

Like all pretty pictures, however, this one has faults of its own. A discussion of them will show that the idea which I believe I have now "staked out" might not be so bad after all. A superheterodyne for everybody might not be impossible, if to secure it one had only to build a little two-tube affair without disturbing in any way his present set. All letters on the subject will be gratefully received and answered! Meanwhile, our next article is being prepared with a view to seeing just how far this idea might be carried.

**"The Curb Is the Limit" Club**

(Continued From Page 7)

speaking to some one in a crowd. I tell you it's great to have the kids know you and want you to know it."

"Mothers and club women say they know I have no children of my own because if I had, my love wouldn't be so broad for all children. I don't know about that part of it, but I do know that I couldn't possibly love the kids any more than I do or any less than I do, if I had a dozen little Uncle Bobs of my own.

"I usually have a march in my KYW story time and have the whole family parade—Dad in the lead, mother, grandpa and grandma and brother and sister. Once I had mother lead out. The next day I had a letter from a boy who asked me not to put mama at the head any more for she marched too slowly.

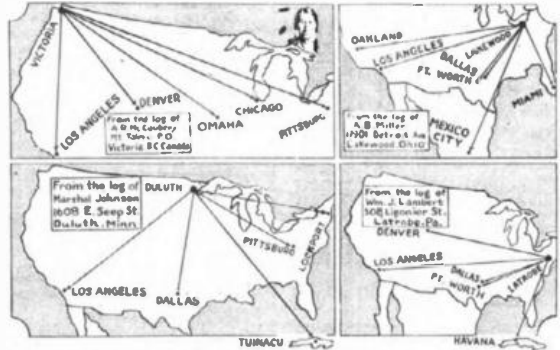
"Perhaps you wonder why I sing the popular songs, but I just feel that I am singing them the songs of the street which they know. Every bedtime hour you tune in on, sing a go-to-bed lullaby or a child's song and the children who listen to Uncle Bob each night are the boys and girls who are accustomed to hearing picture-show songs. They sing with me and as I repeat the choruses and say, 'Now all join in,' I can feel that every boy and girl on Halstead street is singing, too."

It's these children of congested districts to whom Uncle Bob's word is law. Uncle Bob tells them to remember to wear their rubbers and asks them to say a little prayer for the little girl who is sick over on Ashland avenue.

When Uncle Bob visited Holland, Mich., on March 20, the local Elks Club began a campaign for "The Curb Is the Limit" and sent out 3000 certificates, with Uncle Bob's picture in the corner, of membership into the order. A Lansing, Mich., little boy wrote Uncle Bob that he was sorry he couldn't see him at the show but he was saving for six weeks to give sixty cents to a little boy who had been run over by an automobile and the Lansing State Journal had created a fund for the boy. When Uncle Bob spoke over WREO, the Lansing radio station, he received over a hundred letters about the "Curb Is the Limit" plan.

On March 31, at Ann Arbor, Mich., the Chamber of Commerce adopted the plan of issuing certificates and buttons for this pledge. At Madison, Wis., the women's clubs sponsored the movement. Some of these pledges which are mailed in are signed by thirty, forty or fifty children.

A Racine, Wis., child told of a teacher's placing a child life line, with eight or ten children as if crossing, other children walking fast represent Uncle Bob and little Miss Edith Rathke, an 8-year-old "Curb Is the Limit" pledge signer, who signed up eighteen children in her block on



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South Sangamon street, with a joint pledge, the first to come to Uncle Bob last November in his new venture to save the children from the streets resented moving vehicles and others grouping to count ten before crossing.

At Saginaw, Mich., the children stood in line from 11 to 2:30, and when all the seats were filled, Uncle Bob went out and told them to wait and he would put on another show so they all could surely get in. A crowd of happy children waited without a noticeable restlessness with



Uncle Bob coming out occasionally to cheer them along.

"Folks, I have the finest job in the world," said Uncle Bob at a stage personal appearance at the Jeffery Theatre in Chicago recently, before a crowded audience of children and their parents. "I wouldn't change places with anybody on earth. Why I wouldn't change jobs with President Coolidge or Babe Ruth." And Uncle Bob, with his broad smile, means it, too!

**Counterflex Circuits For Experiments**

(Continued From Page 18)

of the Fig. 11 circuit, due to the same cause as the first, is the interfering hum induced by A. C. lighting lines and similar interference induced by generators, arc lamps and electrical devices. These effects, of course, are present in many receivers, but they are particularly noticeable in the circuit of Fig. 11 as the antenna is connected directly to the grid of the A. F. amplifying tube.

These two defects are so serious that many may wonder why I show the circuit at all. There are some localities, however, in which it can be used. Moreover, the second defect can be very easily remedied, as will be explained presently.

The serious defects mentioned above can be materially remedied by adopting the system of Fig. 12. This requires the addition of a tapped inductance coil and switch. Instead of connecting the antenna directly to the grid of the audio-frequency amplifying tube a .00025 mfd. condenser is connected between the antenna and the grid and the tapped inductance L4 is shunted across the antenna and

ground. Otherwise the circuit is the same as Fig. 11. It is, however, a much more desirable arrangement. Induction hum and interference of that nature is completely eliminated. The interference caused by local signals is reduced, although it is by no means eliminated. The antenna being partially tuned, signals are amplified by the A. F. amplifying tube so that the system is slightly more sensitive than the standard arrangement. L4 can be wound with about 50 turns of No. 22 on a three-inch form, the coil being tapped every fifth turn. L1, L2 and L3 are the standard "3-circuit tuner" of Fig. 10. The coupling between L1 and L2 should be loose. If possible, different values should be tried for L1. The ordinary tuner has a 10-turn primary coil L1. To improve audibility this can be increased. If it is increased too much, however, or if the coupling between L1 and L2 is too close, the A. F. amplifying tube may oscillate when the detector tube oscillates, which must be avoided.

Now, while the circuit of Fig. 12 is much more practical than that of Fig. 11 and can possibly be used with success in many localities, it is still unsuitable for use in districts surrounded by broadcasting stations. Strong signals are detected by the A. F. amplifying tube, even though this interference can be partially reduced by detuning the antenna with the inductance switch.

In Fig. 13, however, I show a non-radiating Counterflex circuit with regenerative detector which possesses none of the defects of the others. This circuit, of course, is not as simple as those of Figs. 11 and 12, but the additional apparatus required is well worth its cost. No extra tubes are needed. The circuit is more selective than that of Fig. 10 and is much more sensitive. In other words, it possesses all the advantages of the ordinary regenerative receiver, together with the additional advantages of higher audibility and selectivity, yet it does not radiate, and cannot cause interference to others.

A set using this circuit is not difficult to construct, and successful operation can easily be obtained if some care is taken in the choice of parts and inductance values. L1, L2 and L3 form the three-circuit tuner. A standard tuner can be used, but much better audibility will be secured if L1 has a larger inductance value than the usual tuner provides. It should be possible to vary the coupling between L1 and L2 so that the best degree of coupling can be determined. Basket-wound coils can be used throughout to good advantage.

Some tuners of this type, now on the market, are admirably suited to this circuit. In these tuners, the separation between L1 and L2 can be varied to determine the best value of coupling. With .00025 mfd. variable condensers across L2 and L5 and using basket-wound coils wound with No. 20 double cotton-covered wire the following values are suitable for use in this circuit:

- L1—30 turns.
- L2—80 turns.
- L4—10 turns.
- L5—80 turns.

The tickler coil, L3, should not be wound with such heavy wire and should preferably be of the "pancake" or similar compact type to avoid capacity between L2 and L3. No. 26 silk-covered wire can be used to wind this coil and it should have just sufficient turns to produce oscillation at the maximum wave-length of the tuning condenser. Furthermore, this

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coil should be at the filament end of L2, as shown in the diagram. The object of these precautions is to eliminate capacity between L2 and L3 so that the adjustment of the tickler coil does not seriously detune the grid circuit. The coupling between L1 and L2 must be determined after the set and L5 must be loose to obtain good selectivity. There should be a separation of an inch or more between the two coils.

Note that a .001 mfd. fixed condenser is connected across the primary of the reflex audio transformer and a .0001 mfd. across the secondary. If the detector tube does not oscillate at the low frequencies (high wave-lengths) a .002 can be used across the primary of the audio transformer.

The Counterdon is the standard 3-plate counteracting condenser. The object of the Counterdon in this circuit should be thoroughly understood. In the standard Counterflex circuit the Counterdon is used to prevent the reflex tube from oscillating. In this circuit, however, the reflex tube will not oscillate of its own accord. The coupling between L1 and L2 must be loose enough to prevent all possibility of the reflex tube breaking into self-oscillation. The object of the Counterdon is to prevent the reflex tube from oscillating when the detector tube is oscillating. If the detector tube did not oscillate at all, close coupling could be used between L1 and L2 and self-oscillation of the reflex tube prevented by means of the Counterdon, as in the standard Counterflex circuit. To use the circuit of Fig. 13 efficiently, however, it must be possible to produce self-oscillation in the detector-tube circuits. These oscillations are so strong that the Counterdon cannot prevent the generation of continuous oscillations in the reflex tube if the coupling between L1 and L2 is too close. The Counterdon, therefore, should be adjusted with the detector tube oscillating and with the circuits tuned to a high frequency, say 250 meters, the desired adjustment being that which prevents the reflex tube from oscillating. If the oscillations in the reflex tube cannot be checked by the Counterdon, loosen the coupling between L1 and L2. The correct degree of coupling can easily be found. When this coupling and the adjustment of the Counterdon are determined they should not again be varied. To avoid the temptation of increasing audibility on weak signals by adjustment of the Counterdon this is constructed and wired, as will be explained. The coupling between L4 capacity should preferably be mounted at the rear of the set. It should be remembered that the primary object of the Counterdon is to prevent the reflex tube from oscillating when the detector tube is oscillating, thereby eliminating all possibility of radiation.

Fig. 14 is the same circuit as Fig. 13 with an added stage of audio-frequency amplification. This 3-tube circuit is one of the very best Counterflex circuits.

(To be continued next month)

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H. M. N.

## A Word of Explanation

(Continued From Page 14)

the other circuits using two stages of radio-frequency amplification ahead of the detector and the audio-frequency stages are very efficient on the upper section of the broadcasting bands of wave lengths from about 400 meters up to the upper limit of 545. It is when we try to receive stations which are broadcasting on 350 meters or below that we run into trouble. Lower than 280 meters, almost all of these sets are likely to become unmanageable and to squeal and howl to such an extent that there is no satisfaction with them.

Bear in mind the fact just stated that the upper section of the broadcasting band is amplified very efficiently and with no trouble in the average five-tube set as it stands today.

Mr. Flewelling's idea, then, is simply to use an extra unit to heterodyne the lower waves and to change them into some wave on this upper section of the broadcasting band where our present receivers operate efficiently.

Theoretically, this is a perfectly simple matter, and the readers of this magazine, in experimenting with it in conjunction with Mr. Flewelling, can do a very real service to radio in general by letting Mr. Flewelling have the results of their experiments so that he can compare them with his own. We want to arrange this heterodyning unit so that the present receiver may be tuned to resonance at its most efficient point and left there permanently, and thereafter the act of the tuning will be done by the two dials of the heterodyning unit. This will not only simplify the tuning by reducing the number of controls from three to two, but it will also mean that our present sets will always be operated at their most efficient point.

Personally, I think the desirable development along this line will be a unit of three tubes—an oscillator, a first detector and then a stage of straight transformer-coupled radio-frequency amplification to feed into the present five-tube set. This will virtually make a superheterodyne out of any of our sets at present in use. Most of our veteran radio fans have on their shelves somewhere, one of the fixed radio-frequency transformers with which we all tried to increase our DX reception before the days of the popularity of tuned radio-frequency. These transformers were very efficient along the same section of the broadcasting wave lengths that I have spoken of from about 400 meters to 550. Consequently, putting one of these transformers in the heterodyne unit would be making it work at its best efficiency point, which would feed directly into the best efficiency point in your present five-tube set.

It seems to me that this "superheterodyne converter" idea is about as valuable a contribution as this magazine can give to the great bulk of radio fans for the coming season. There is no reason at all for junking your present set if this works out satisfactorily. On paper, it looks good. Long experience with radio, however, has taught me to regard all promising paper plans with an air of great suspicion if not of downright distrust. I have drawn so many beautiful looking plans on paper and figured everything out with a pencil to the point where failure could not possibly occur and then, in trying to put it into actual practice, have run up against the conclusion that the more I figure about radio the less I really know. Consequently, I am basing no predictions on paper presentations, but both Mr. Flewelling and I are simply offering this super-

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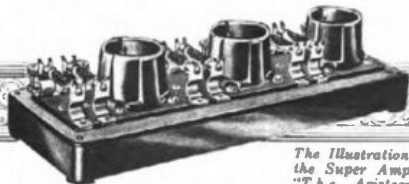
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## Radio as a Public Utility

(Continued From Page 6)

much difference between Class B stations, Class A stations and Class "X" amateur stations as there is between street cars, buses and taxi cabs. Rarely is it satisfactory to have at one time on one street more than one street-car company. Likewise we cannot have at one place more than one Class B station operating at one time on one wave length. But several bus lines can easily converge into a common group of streets, even though the buses be independently owned. These are the Class A stations. They are not so powerful; they are intended to give specialized service to relatively limited districts; they are of small carrying power; and the common use of a given street by several companies produces relatively little confusion to the public.

Taxi cabs are like the "X" stations of radio. They go anywhere, cruising for patrons, or occupying fixed stations, at the preference of the owner. They are, of course, required to keep out of the way of general traffic just as any other automobile, and their owners must be decent, constructive citizens of the community, or they lose their right of doing business. So, too, the experimental radio station with an "X" license. It can operate on any wave length; it cruises over the range from 30 meters to 20,000 meters, assuming the owner's whim and pocketbook permit. But obviously an "X" station must not stall on the tracks of a Class B station, because if it does it accomplishes no good for its patrons in the radio and seriously interferes with moving the carload of radio strap-hangers, anxious to reach their radio destination on time. The good of the greater number in the street car demands that the taxi get off the track; in radio the greater number are served by Class B stations, and the "X" station moves out of the way during broadcasting hours.

The meaning of all this is very clear to the student of public utilities. To any one interested in radio the moral of the comparison should be as readily seen. The public-service period might just as well start at the outset, and there is every reason to believe that the public, the broadcasters and the radio industry, all will be gainers if it does.

Public service corporations usually are given a monopoly for their kind of business within the territory served. This enables the company to do business more cheaply, to give the best service, and safely to make large investments for the continued growth of the community, all of which would be doubtful, if not impossible of realization, if any new-comer who chose might come in and start a competing business of his own. Competition in the public utility business is not desirable. It is time to stop and consider whether competition in the radio broadcasting business is any more profitable to any one. This is a

very large question. It is a question which no one can answer with finality; but it is a question that is of constantly increasing importance and one that must be answered somehow soon.

After many years study of the public utility problems of the country, I, for one, am convinced that we must adopt for radio one of the most basic devices which has been found essential in the public utility business. This device is known as "the certificate of public convenience and necessity." This term means just what it says, a determination and certification, after study, that the public convenience or the public necessity demands the service which a new company proposes to offer. And under the utility laws of most of the forty-eight States, no new public service corporation can come into existence until such proper study has been made and such certificate issued.

Suppose this principle, which has been proven by many years thorough study with respect to railroad, gas, electric, telephone, and water companies were applied to radio. What would be the result? It would simply mean that before a high-power important radio station, such as would be qualified for a Class B wave length, were established at any point the radio inspection service of the Government would determine whether such a station, if founded, could render any real public service. If there already existed several well-established and well-operated Class B stations in the territory and there was no determinable lack of good programs for the listeners which would be reached by a new station there might very well be a question, and there probably would be serious doubt as to the advantage of having any more stations established.

Certainly this policy would avoid the confusion which unavoidably follows having too many class B stations in any one district. I am going to venture the forecast that some such scheme will have to be adopted in order to limit the further granting of high-power station licenses and with the coming of that day we shall be just one step closer in our system of handling radio problems to the system already used for railways and public-utility companies. The law does not yet authorize this step, unfortunately, I believe.

Some who have discussed this question have said that this scheme is not fair, that it would restrict the right of free speech, and that every one should have an equal opportunity to broadcast his ideas, his jazz, or his propaganda. Perhaps that argument is in some measure correct, but the interest of the greater number, that is, the millions of listeners-in, is certainly superior to the right of some new-comer who desires to jass the ether. Unless the new-comer can demonstrate to impartial public officials that he can give something not already available in adequate amount at all reasonable times there is no reason for granting him franchise rights in the air. It would be equally absurd to give him a license as to give a second street railway company the right to lay tracks down the main business streets of a town when the tracks and cars already there are giving adequate public service at as low a price as good management could make possible.

Some public utilities are "common carriers." Thus a railway company must hold itself in readiness to accept as passengers all of those people who pay the fixed fare and abide by the reasonable rules of the company as to tickets and conduct while on the company property. A railroad company

giving freight service or an express company must take packages for any one who wishes to ship. In other words it must not discriminate between its patrons or make rules that unduly favor one class of patrons compared with another. Some people argue that this same idea will eventually apply to radio. Personally, see absolutely no reason to believe that such time ever will or ever should come.

But just for a minute let us suppose that we are operating radio station PDQ as a common carrier. The morning some blue-sky stock promoter comes in and demands a half hour to eulogize his mining share or oil stocks; the maker of "Sur Kill" liver pills waits upon us as demands another half hour; and little later the official propagandist of the Reds of Moscow engages the station for an hour. Thus the most valuable broadcasting hours, from 10 to 10 o'clock, are engaged by the patrons and we, as common-carrier station operators, must take the business. Perhaps we had planned that evening to broadcast a speech by some eminent scientist, by the President of the United States, or concert by world-famous artists. We have no choice; we must cancel a these plans and accept the common-carrier business offered just as long as they pay our prescribed rate per hour. Any such thing is, of course absurd. Public opinion would not for a minute tolerate such require-

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ment by law or any such station-operating practice. The station management must be given the right to determine what it will, and what it will not, broadcast.

Such right of choice is nothing more or less than the well-established right recognized for any editor. He may receive and pay for, or reject and return, any contribution offered. He may solicit articles or may use his scissors and paste pot on clippings from other magazines. He has absolute and final right to determine what shall appear in the columns of his magazine. No other basis could possibly be used to determine what an editor shall and what he shall not print.

And the business manager or owner of the magazine has equal right to determine what shall be advertised in the pages of his magazine. If such magazine owner does not object to fostering fakes he may, if he chooses, allow all sorts of quack doctors, blue-sky stock promoters and other bad-principled advertisers to use his columns. On the other hand, if he be a reputable publisher he reserves and vigorously exercises the right to reject advertising for anything that he believes should not be described in his papers. If he thinks a commodity will not do what the advertiser claims for it he prohibits the publishing of what he considers misleading claims in the advertisement. If he thinks the price asked is too high for the service which the article can possibly render to the user he may even reject the advertising on that score. And whether the advertiser likes it or not he has no appeal from the judgment of the publisher.

Radio stations are really one form of publication. They are magazines which are issued nightly as imprints of the microphone upon the ether. It is a highly perishable periodical, to be sure, for it is useful only to him who uses the electron tube or sensitive crystal to translate the ether impression to sound waves and simultaneously with the translation listens to the "pages" as they issue from the press. But every correct principle of editing and publishing can be observed by the station manager. He will use in his "editorial" columns an expression of opinion just what he chooses to put there. He will issue as news of the day any discussion or repetition of current events that he wants to present to his readers. He will engage at a cost to himself those contributors who he thinks should sing, or speak, or otherwise perform for his subscribers. And for the advertising pages of his station he will take pay only for such material as he wishes to have sent to his patrons. All else goes into the radio editorial waste basket, or is "returned with thanks" if the self-addressed stamped envelope happens to have been enclosed.

The laws governing public utilities and the laws and practices governing the editing and publishing of magazines are well established; but the radio laws is just in the making. We have effectively on the statute books only one single short bit of legislation. This is the act passed a number of years ago, long before broadcasting was even conceived, much less realized, which gives the Secretary of Commerce the right and the responsibility for granting licenses to all who wish to apply for the privilege of operating radio stations. From that very inadequate foundation the structure of radio law needed in this country must be built up.

The American listeners-in are beginning to demand that some restric-

tive laws be established. Fortunately the broadcasters, the makers of radio equipment and supplies, and those interested in radio as an art as well as radio as an industry, are almost unanimous as to the need. Of course, there is nothing like uniform opinion as to just how the development should take place, but this question should solve itself in the next few months (or few years), quite readily since it is agreed by almost every one that some constructive effort must now be made.

Some people have asked who is going to pay the bill incurred by the radio broadcaster. The answer in this is as in every phase of public utility business is "ultimately the public pays the bill." They pay it in one or more of three important ways. They may pay it by direct patronage of the company or activity described, as in the case of newspapers, theatres, and other agencies which sell a service, not a commodity; they may pay it by direct purchase of a commodity marketed by the broadcaster; but most frequently they do pay the bill simply by giving their attention to the program and thereby creating on behalf of the broadcaster a "good will" which results in business later. This good will does not mean more tickets at the movie during the next week, or more sales of candy, batteries or soap powder the next month. It means rather a long-time favorable consideration of the product when the need for the product or its equivalent arises.

And when the public gives its attention to the broadcasting station it gives something of very real value. "But," you say, "this attention does not cost the listener anything." As a matter of fact it does cost and it can be bought only for real money or real effort. When I go home at night prepared to enjoy myself for the evening I have a choice between a magazine, the latest book, the movies around the corner, grand opera, vaudeville, a call upon friends or neighbors, some music on the phonograph and a score of other things, radio being only one of them. Why and when do I choose radio? Only when it offers me some instruction, entertainment or recreation that suits my taste and mood better than the rest. I pay dearly for the privilege of listening to radio because I give up an hour, two hours or more of my recreation time and this recreation time is not sacrificed lightly.

Each radio listener pays for his radio entertainment with attention just as truly as the street-car rider who drops a token or a nickel into the fare box as he boards the car. If he is satisfied with the service rendered for the fare he pays he continues a regular patron; but if not he turns to another buys a fiver when the street car gets so slow that it takes an hour to ride to work when twenty minutes by machine will serve. Thus the public has a right to demand that the service rendered be in accordance with its need and wish. Otherwise it has a right to demand that the agency of service be removed and another sort be franchised in its place.

The broadcaster on his part, once given a right to operate, is entitled to relatively undisturbed use of the ether highways assigned to him. Competition on this particular highway in his own territory is not in the public interest nor fair to him. The relationship between the broadcaster and the public established by the radio broadcast license is, therefore, in its essence contractual.

These are only a few of the funda-



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mental facts recognized, more or less academically, but as yet unrecognized by law. Next October there doubtless will be called by the Department of Commerce the Fourth Annual National Radio Conference. On that occasion there will be discussed the most important problems then affecting radio broadcasting and the radio public. At that time these problems of radio law will doubtless occupy the center of the stage. Only time can tell how the problems will be solved, but it seems safe to guess that the present basic laws affecting our public-service corporations and the publication policy of the country will be used as models for establishing radio legislation.

### Editorially Speaking

(Continued From Page 3)

use our house lighting currents for both filament and plate. I believe very firmly that the day will come when we will be able to do this; whether it is here yet is entirely another matter.

Various "B" battery eliminators were placed upon the market last year and performed very satisfactorily in the great majority of cases. Now comes the announcement of the new McCullough tube, designed to work from our house alternating current supply without filament battery and, at the time that this is being written, Mr. Schicklering announces that he, too, has developed a tube on entirely different principles to do away with the "A" battery and another one to solve the tube difficulties in the "B" battery eliminators which require tubes.

One radio magazine has already published an issue devoted very largely to the McCullough tube and certainly giving the impression that this tube has solved all of the problems of working radio sets perfectly on AC house current. We are quite familiar with the McCullough tubes, and we have been working with them in our laboratory for some time. We refuse, however, to be stamped into an enthusiasm which may later not prove to be justified and which may be the means of leading our readers into an expenditure not warranted by results. Please do not get the impression from this that I am speaking unfavorably of this tube; I mean simply that there has not yet been time for any one to form a really final opinion as to whether it is in reality all that some of its users claim it to be. Just as soon as we are convinced what the possibilities are, we shall tell our readers all about it, whether the results be favorable or otherwise. We do not propose to print a lot of snap judgment, merely to cause an artificial stimulation of tied-up advertising, to help us out in a discouraging period of summer business depression.

Mr. Schicklering's tube will probably be on the market when this appears in print. I have seen it in operation in his factory at Newark, but I never accept as final any demonstration of a manufacturer and do not recommend any article to the readers of this magazine until thorough tests in our own laboratory have made me feel safe in standing behind it in my recommendations.

The final test of a tube's efficiency is a matter of its continued performance over the rated period of its life. It is perfectly easy for almost any tube manufacturer to put out a tube which will apparently perform very well for the first 100 hours or so, but most of the independent tubes begin to depreciate very rapidly after that and few of them will stand up for

even one-half of the life of the average Radiotron or Cunningham tube. I have yet to find any tube on the market the equal of these two. I am speaking now of the standard type of tube burning upon a six-volt storage battery.

All other things being equal, I believe that the average fan will accept a shorter life for the tube lighting on the house-lighting current and will be willing to replace these tubes more frequently simply because of the convenience of this method of burning them, and the fact that they do away with the considerable expense of storage batteries and charger and the annoyance that the attention to storage batteries entails. Even with these advantages, however, the AC tube will have to equal the actual performance of the present tubes in order to gain any widespread popularity.

This means that the new tubes will have to be just as sensitive as the 2V201A or the C501A; they will have to produce just as much amplification per stage and just as good quality, and they must be so absolutely free from the 60-cycle hum of the AC lighting mains that head phone can be satisfactorily used for DX reception.

We are trying out the new tubes at our laboratory with all of these things in view. In testing tubes, we not only use them in the ordinary way in ordinary sets, but we also place a number of them upon what we call "life tests" which means that, we deliberately kill them under constant and periodic observation, meanwhile measuring them to see how their various attributes stand up as they slowly die under the test.

This, of course, takes a considerable period of time. It sometimes happens also that one set of tubes under such a test will produce phenomena that do not give us definite answers to the questions we want to ask and, therefore, it is necessary for us to get another lot of the tubes and start the tests all over again.

Our advice to our readers is not to demand at this time that set manufacturers make provisions in their sets immediately for the use of the AC house-lighting current. Just as soon as these tubes have absolutely proved their efficiency, the manufacturer himself will be the first one to make such alterations as are necessary, and until the better and more reputable manufacturers do make these changes, you can feel fairly safe in assuming that the present standard types of tubes are considered the best for all around radio reception and there is no reason for you to junk your present set nor to delay buying a set if you have none at the present time.

The devices for the elimination of the "B" battery are far in advance of the AC tube situation. In certainly 50 per cent of the radio installation, these "B" battery eliminating devices are giving perfect satisfaction and are thoroughly justifying themselves. I believe that their use will become more and more widespread and that ultimately, although I do not see it immediately in sight, we will use radio sets to take both filament and plate supply from our house-lighting sockets. I even believe that this will all be done through devices installed within the bulb of the tube itself, but this is looking far into the future and my readers must not think that I see anything in sight at the present time to justify any such claims. I am only predicting it upon laboratory experiments which have already proved that such a system is not altogether beyond a reasonable expectation in the course of time.

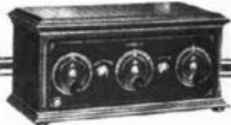
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advise our nontechnical readers not to be at all excited about all of the claims which they will see in newspapers and magazines. We should all keep our feet very firmly upon the ground at the present time and refuse to be stampeded. Radio has always been a very jumpy business and we have been altogether too prone to rush from one craze to another like a lot of panic-stricken sheep. It is time for us to settle down now to a satisfied acceptance of the wonders of radio as we have it and to assume the attitude that the producer of something new and supposed revolutionary must absolutely prove his case to us before we get excited about it.

### What's Wrong With My Reception?

(Continued From Page 9)

average five-tube receiver, it is inadvisable to use more than 135 volts—three 45-volt units. Two 45-volt units are usually sufficient, but there is often enough improvement in volume to warrant an increase to 112½ or 135 volts. Such an increase increases the plate current also, so that the batteries will not last quite so long as with 90 volts. However, for greater volume on the more distant stations, the high voltage is of considerable value.

Unless B batteries can be located near the receiver, there will be a good deal of coupling between tubes through long leads and in the batteries themselves. A most helpful measure is the installation of a one-microfarad by-pass condenser right inside the set, between the positive

B and the negative B binding posts. This permits longer use of B batteries than is otherwise possible because it avoids the undesirable coupling just mentioned. And it goes without saying that run-down B batteries are a great detriment, so far as DX is concerned.

Finally, we come to the installation of the receiver. This takes in both aerial and ground and the location of the receiver with respect to these two parts of the receiving system. I was recently called upon to investigate the radio troubles of a man whose home was situated in a slight hollow between two hillsides. Perhaps a thousand feet away was his nearest neighbor, using a set exactly the same in every way—make and accessories. The neighbor was possibly 100 feet higher than the man in the hollow. Moreover, his aerial was about 50 feet high and 80 feet long, whereas the first man's antenna was only about 30 feet high and 75 feet long. His aerial was just on a line with the power and telephone wires passing his house and not very far from them. The other had his aerial much higher than the power lines.

The remedy was very plain:—a higher antenna. It was corrected. On my next visit I noticed that his call list included San Antonio, Denver, St. Paul and many others that had never been heard previously. And no alteration in the set had been necessary.

Many listeners spend a good deal of money on new sets and parts, when twenty-five dollars for a couple of poles would have solved the problem easily.

Height is far more important than length in the aerial. The length should be kept down, in order that the

"natural period" of the aerial system may be lower than the shortest broadcast wave length received. A long aerial interferes with reception on the short wave lengths. There is always the objectionable appearance of a high aerial, but a shipshape antenna is not a very serious drawback to one's home with radio as universally popular as it has now become.

I might cite a certain instance in Brooklyn, N. Y. A corner house was besieged with electric light wires and telephone wires running on both streets.

The first antenna put up was a wire about 100 feet long, crossing the street under the wires to a tree on the other side. The height wasn't over 20 feet at the outside. A number of receivers were tried, including several tuned K. F. sets of high repute, and results were but fair. Distant stations came in poorly, at best.

Finally, the aerial was improved. A 20-foot iron pipe was erected at each end of the roof, crossing the street under the wires to the roof corners. The poles were painted white and presented a neat appearance. A single wire was tightly stretched between, making a horizontal length of about 50 feet, with a 25-foot lead-in. KHJ came through on a one-tube set the very first evening. Philadelphia stations immediately became "locals," so well did they come in at all times.

The water-piping system is so convenient and efficient a ground connection that little comment is needed. In locations in rural districts where piping is minus, a good ground may be made of a large sheet of galvanized iron, perhaps having 15 or 20 square feet, buried deep enough to make contact with moist earth. The connecting wire should be soldered to the central point of the sheet. Ground wires

should be short and direct and be connected to piping with clamps.

In locating the receiver, care should be taken to provide short antenna and ground wires inside the room. Do not follow the plan of concealing the aerial wire, 15 to 25 feet in length, behind the molding and in back of the woodwork, tacking it down out of sight. This adds unwanted inductance and permits valuable energy to leak off the walls by capacity. If the lead-in enters at a window and there is a radiator for the ground, place the set in a direct line between window and radiator so as to have the wires very short. Don't drape the wires over curtain rods, etc. If they are too long by two or three feet, cut them off to the proper length. And use heavy wire for such connections:—ordinary lamp cord is very satisfactory. The ground wire may be tacked to the floor or baseboard if desired.

The aerial system throughout should have no unwelded joints or include small wire. Resistance must be kept low as well as its capacity. Make the aerial, including lead-in not over 125 feet in length, make it high and free from every other object, use heavy wire, either copper tape or stranded wire, and insulate it carefully.

A good receiving set, supplied with good accessories and connected to a good aerial system, is in a fair way to do something, when operated intelligently. A combination of tiny details, each in itself relatively unimportant, but collectively of unquestioned merit, bring untold improvement. Step back a little way and criticize your own radio installation. Perhaps your balky receiving set isn't at fault at all. It may be that you are trying to make it work under impossible conditions. Better theirs!

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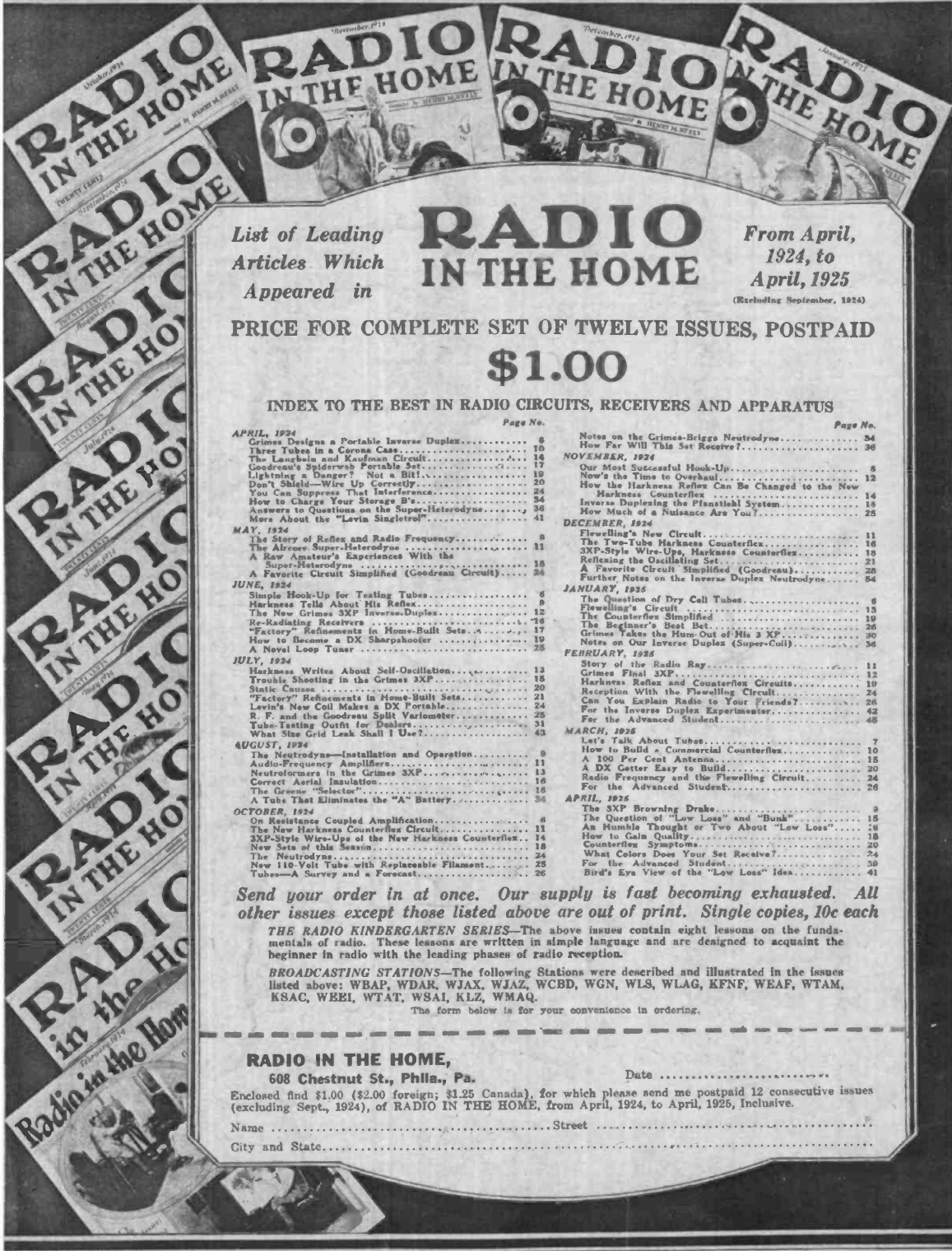
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