Zenith—
the exclusive choice
of MacMillan for his
North Polar
Expedition

Zenith Supremacy
will be Maintained

This message brings to radio enthu-
thusiasts the announcement of an
advance in Zenith prices on all
models. The new prices are shown
in the panel at the right.

Radio sets—like motor cars and
pianos—gravitate to their correct
price level. There is more to a radio
receiving set than merely a beauti-
ful cabinet backed by extravagant
claims. It must meet exacting re-
quirements. The novelty has worn
off. The public is becoming edu-
cated. It knows what to expect and
can now distinguish merit in radio.

An imposing name and an intensive
advertising campaign—when they
back a radio product which does not
deliver equally impressive results—
soon lose their fictitious values.

By that same token, performance
which is literally outstanding fixes
for the makers of that product a
standard of supremacy which, in
duty to the public, they are obligated
to maintain.

Throughout the radio world the
name ZENITH has come to be the
very symbol of results—in quality of
tone, in simplicity, in selectivity, in
volume without distortion, and in
long-distance reception. The artistry
of design for which it stands is too
well known for comment.

The fact that ZENITH has ad-
vanced its prices is of more than
passing moment. For it registers the
determination on the part of the
builders of ZENITH to maintain
the acknowledged supremacy of
ZENITH receiving sets—both in
beauty and performance.

All present models are guaranteed
against price reduction.

Dealers and Jobbers: Write or wire for our exclusive territorial franchise.

Zenith Radio Corporation
332 S. Michigan Ave.

Chicago, Ill.

* Tested and Approved by RADIO AGE *

---

The complete Zenith line ranges in
price from $100 to $475.

With either Zenith 3R or 4R, sat-
isfactory reception over distances of
2,000 to 3,000 miles is readily accom-
plished, using any ordinary loud
speaker. Models 3R and 4R licensed un-
der Armstrong U. S. Pat. No. 1,113,149.
They are NON-RADIATING.

Zenith 4R . . $100
Zenith 3R . . $175

The new Super-Zenith is a six-tube set
with a new, unique, and really different
patented circuit, controlled exclusively
by the Zenith Radio Corporation. It is
NOT regenerative.

SUPER-ZENITH VII—Six tubes—2
stages tuned frequency amplification—
detector and 3 stages audio frequency
amplification. Installed in a beautifully
finished cabinet of solid mahogany—
44½ inches long, 16½ inches wide, 10½
inches high. Compartments at either
end for dry batteries. Price (ex-
clusive of tubes and batteries) $240

SUPER-ZENITH VIII—Same as VII ex-
cept—console type. Price (ex-
clusive of tubes and batteries) $260

SUPER-ZENITH IX—Console model
with additional compartments contain-
ing built-in Zenith loud speaker and gen-
erous storage battery space. Price (ex-
clusive of tubes and bat-
teries) . . . . . . . . . . . $355

SUPER-ZENITH X—Contains built-in,
patented, Super-Zenith Duo-Loud Speak-
ers (harmonically synchronized twin
speakers and horns), designed to repro-
duce both high and low pitch tones
otherwise impossible with single-unit
speakers. Price (exclusive of tubes and
batteries) . . . . . . . . . . . $475

All Prices P. O. B. Factory.
Who Else Wants to Earn $50 to $200 a Week in RADIO?

Do short hours, big money and easy work appeal to you?

The Institute furnishes free of charge all instruments necessary for practical instruction at home—you "learn by doing." That is one reason why National Radio Institute graduates get ahead so quickly, and obtain the Government License easily.

Send for "Rich Rewards in Radio" and Special Short-Time Offer

This interesting book will tell you the full story about the wonderful opportunities in Radio. You will see for yourself just how much you can expect to earn in this great profession. It will tell you of the adventure and big money that awaits the ambitious man in this fascinating field.

The National Radio Institute Course is acknowledged by Radio executives to be the best obtainable at any price. The whole success of the Institute is based on its advanced methods. This is the absolutely complete course now being offered which will qualify you for a government first-class commercial license and really get you one of the bigger paying jobs in Radio.

FREE Instruments for practical training at home

This is the world-famous Natarometer—one of the three Instruments given for scientific and practical home training in mastering the code.

These parts with instructions are given for experience and practical training in making and operating regenerative receiving apparatus.

These parts with complete instructions are given for practice in building a receiving set of the more simple kind.

* Tested and Approved by RADIO AGE *
The Magazine of the Hour

CONTENTS

Cover Design by Fred I. Good

Radio Editorials.................................................. 4
Where the Hows Come from................................... 7
By Frank D. Pearne
A "Quiet" Regenerator........................................... 9
By Arthur B. McCullah
How to Make a Vacuum Tube Tester.......................... 11
By H. Frank Hopkins
A Power Supply Receiver....................................... 13
By Brainard Foote
All Ready for a Radio House-Cleaning?...................... 15
By Paul Green
An Improved Reinartz Receiver................................ 17
By Ray G. Piery
A Unique Super-Heterodyne Receiver.......................... 19
By Joseph Calcaterra
The Physical Significance of Tuning.......................... 22
By Dr. Frederick W. Grover
"What the Broadcasters are Doing": RADIO AGE
Studio-Land Feature Section................................... 23
RADIO AGE BLUEPRINT SECTION.............................. 31
A Six-Tube Portable Receiver
By John B. Rathbun
RADIO AGE Institute Monthly Tests......................... 39
The World's Smallest Studio on the Air...................... 40
Pickups and Hookups by Our Readers......................... 41

Radio Age is published monthly by RADIO AGE, Inc.
Member: Audit Bureau of Circulations.

Address all communications to RADIO AGE, INC.
Executive, Editorial and Advertising Offices
500 N. Dearborn Street, Chicago, Ill.
Publication Office, Mount Morris, Ill.

FREDERICK A. SMITH, Editor
RUSSELL H. HOPKINS, Associate Editor
FRANK D. PEARNE, Technical Editor
M. B. SMITH, Business Manager

Advertising Director
HARRY A. ACKERBURG

Eastern Representative
DAVIDSON & HEVEY, 17 West 42nd St., New York City

Final Advertising forms close on the 20th of the 2nd month
preceding date of issue
Issued monthly. Subscription price $2.50 a year.
Entered as second-class matter at post office at Mount Morris, Illinois, under the
Act of March 3, 1879.

The Magazine of the Hour

A Chat With the Editor

RADIO Corporation of America, it appears, is not at all in a
hurry to submit proof that this magazine is not entitled to the use of
the name which we have been using for more than three years. Radio Cor-
poration, with great show of moral indignation, went into the United
States Patent Office at Washington last Fall and made formal protest
against the registration of the title "Radio Age," which name we had
sought to have officially enrolled as our trade mark. Radio Corporation
claimed that the use of the name "Radio Age" was causing damage to
"Wireless Age," the organ of the Corporation, owned and controlled by
the Corporation.

Radio Corporation was to have submitted proof to substantiate its
objections to the use of our name. The Patent Office said this proof must be
submitted on or before March 21. Instead of offering proof, Radio Cor-
poration asked for a continuance. Our counsel consented once more.
The case will not come up until late in April, when there likely will be
another request for delay.

Meanwhile RADIO AGE moves on smoothly. It broke all its own records
for circulation and advertising in the March, 1925, issue. We continue to
receive many letters from fans wishing us success in our defense against the
$33,000,000 band of Broadway radio patriots.

Radio Corporation is fortunate in obtaining delays. The Corporation
was to have appeared before the Federal Trade Commission on March 18 to
answer the charge that it is involved in a trust conspiracy. Radio Corporation
wanted delay. Although the charges were filed a year ago, Radio Corporation
obtained more time to present its defense.

Changes have been made recently in the personnel of the Federal Trade
Commission. We venture to suggest the hope that the Commission still
will be courageous, fair, persistent, and diligent in pushing this radio
trust inquiry. Why should it not?

If there is a radio monopoly—bust it now!

Frederick Smith
Editor of RADIO AGE
Recommend good batteries

In an effort to reduce the first cost of a radio set, a newcomer in radio often buys inferior batteries. You know such "saving" is really wasteful. Tell your friends who are about to buy receivers that the best batteries obtainable will prove to be the most economical. Tell them to buy Eveready Radio Batteries—they last longer and, because they are greatly superior, they give complete satisfaction.

There is an Eveready Radio Battery for every radio use.

Manufactured and guaranteed by
NATIONAL CARBON COMPANY, Inc.
New York
San Francisco
Canadian National Carbon Co., Limited, Toronto, Ontario

EVEREADY
Radio Batteries
—they last longer

* Tested and Approved by RADIO AGE *
HEBER MacDONALD, writer of publicity for the Grebe radio people down at Richmond Hill, N. Y., has written a classic commentary on the radio trust. It is so good we are printing it in full. Know ye all men that we agree with every statement in the editorial. RADIO AGE has had some direct experience with the Radio Corporation of America and the radio public now knows pretty definitely what we think of the patriots who have just been favored with another delay in their hearing before the Federal Trade Commission on the charge of being involved in a conspiracy to gobble up the radio industry.

Mr. MacDonald’s editorial follows:

RADIO fans—come out of the past—it’s haunted. At least it looks that way, especially since history repeats itself. You may have noticed the Selden patent crowd passed into the cold and unrelenting grasp of a receiver the other day. If you have any recollection of the early days of the automobile business, you must recall Selden and his patent. It was a wonderful patent. It worked day and night. No time off for good behavior. No one could make any money with it and Selden said no one would be allowed to make any money without it. And in those olden, golden days, Selden was all-powerful. He even admitted it on high days and holidays.

About the country like a roaring lion went Selden seeking whom he might devour. Courage sprang from his clenched fist. He shook his patent at every auto-maker and collected much largess. They were taxed to live. And this tax was a heavy drain on the then infant motor-car industry. But once on a day a young manufacturer in Detroit, H. Ford, by name, told the Selden gang where they could go and he strongly advised them to take their leech-like patent with them.

Such a patent octopus is considerably like an over-inflated balloon; along comes some one armed with the spear of common sense and the balloon is bust. 'Most any man with back-bone has a good chance to deflate an octopus. An octopus is always an evil. Thrice armed is he whose cause is just. The octopus trembles at the very mention of justice.

And what has all this dissertation to do with radio? Nothing much except that there is another patent octopus trying to suck the life-blood out of the independent radio manufacturers who have not bowed the knee to Baal. The independent radio manufacturers believe they have the right to live without paying tribute to the radio trust. This right to live is denied to the independent radio manufacturers by the minions of the fat and over-fed radio trust. A brilliant array of expensive legal talent do the daily bidding of the Four Horsemen of Destruction.

But the little band of independents know not fear. They have forgotten the Trust and its threats. The Trust belongs to the stolid past. The Independents look to the plastic future. In the words of the Apostle Paul they seem to speak as one man: “This one thing I do, forgetting those things which are behind and reaching forward unto those things which are before; I press toward the mark.” This valiant little group of independents have a fixed image in mind from which all this extraneous and non-essential patent hokum has been extracted or subtracted.

Meanwhile, in the ranks of the Four Horsemen there is much gnashing of teeth. This great radio Goliath of Greed may have its day of reckoning put off again and again—as instanced by the recent delay on March 18—but the end is not afar off. The Trust-buster is just around the corner. Some one had better summon a Daniel, for there surely is a hand-writing on the wall: “MENE, MENE, TEKEL, UPHAR SIN.” The free translation seems to be “Thy kingdom is numbered. Thou art weighed in the balances and found wanting. Thy kingdom is divided and given to the Medes and Persians.”

Uncle Trusty, they have your number. The bearers are at the door.

The use of radio broadcasting stations as advertising machines is the greatest peril the new art is facing today. The eager listener who hopes to hear good music and who instead gets a dissertation on Jones’ pills or Brown’s sausage is not going to remain a devotee of the dials. In promoting advertising as a means of financing stations, the broadcasters who have succumbed to the commercial influence are building up a monster who, like Frankenstein, will slay its creator.

Chicago has three advertising broadcasting stations and is about to acquire more. New York has a big advertising station in WEAF, and the saddest part of that story is that the ballyhoo was organized by the American Telephone and Telegraph Company. The Pacific coast has its advertising problem. "Radio," the San Francisco monthly, says in its April issue: "Radio is too fine a thing, it has too great possibilities in the advancement of human welfare, to be prostituted to such base ends. If this practice continues to increase, and, if the warnings are not heeded, the public will realize that it is being imposed upon and turn to other forms of entertainment."

The writer was discussing the advertising peril with a conspicuous leader of radio activity and thought recently, and suggested the desirability of vigorous agitation against such misuse of the air. The radio man said there was no question about the danger of advertising propaganda to the radio industry and the radio art if such Advertising Was Continued. But, he said, the disease would cure itself.

He confidently expressed the opinion that the public would solve this problem, as it has solved other radio problems. The public would calmly tune out the advertisers until the "broadcasters-for-business-only" found that he had no audience and then he would have to quit for want of contracts. A consummation devoutly to be wished, and may it come speedily.
Radio at its Finest — Now Within Your Reach

Semi-Finished — Factory-Mounted

You buy this set with the All-American parts properly mounted on the panel and baseboard. Without knowledge of blueprints, circuits or names of radio parts, you can wire up an All-Amax Senior in one delightful evening and know that it is right. It was inevitable that sooner or later this reliable—and still economical—method of getting a high-grade radio set should be discovered. All-American manufacturing ingenuity has found the solution and offers this completely mounted, highly efficient three-tube set at no more than you would pay for a kit of parts. Price, $42.

Ten cents will bring you the new Radio Key Book, and upon request we will include, free, a complete wiring blueprint of either All-Amax Senior or All-Amax Junior.

All-American Radio Corp.
E. N. Rauland, President
2680 Coyne Street, Chicago

All-Amax Junior

The same unique manufacturing methods that created All-Amax Senior have brought forth All-Amax Junior—a one-tube set that brings in the local stations on the loud speaker, or tunes them out and gets real distance. All parts are mounted on panel and baseboard, and clear photographic wiring directions are included. Price $22.

WIN

* AN ALL-Amax RECEIVER

At your favorite Radio Store

Ask them about the great All-American Slogan Contest

You can win a set by submitting a SLOGAN

Everybody can enter. It costs nothing

All-American

* Tested and Approved by RADIO AGE *
Mr. Manufacturer

Would you write 100 letters to 100 people to reach just two men?

Then, before you invest your advertising dollars—THINK!

An analysis shows that publications of general circulation, newspapers and magazines, devote less than 2% of their reading columns to Radio—proving that in the opinion of their own Editors less than 2% of their readers are interested in Radio. In fact, many general publications carry no Radio editorial matter. Therefore—98% of your investment is lost!

On the contrary, the Radio magazine offers 100% Radio editorial—attracts 100% potential buyers.

Spend your advertising appropriation in Radio Magazines. Be sure of the greatest possible return on your advertising dollar.

Radio Magazine Publishers’ Association, Inc.

RADIO AGE is a member of the Radio Magazine Publishers Association, Inc.
Self-Oscillations in R.F. Circuits—
Where The HOWLS Come from

By FRANK D. PEARNE

Control of Feedback is Vital for Clarity

I t is a well known fact that in order to get good long distance reception, radio frequency amplification must be used. This type of amplification strengthens the incoming signal, amplifying it to such a value that it becomes strong enough to make enough impression on the detector to make audible those signals which otherwise could not be heard with the ordinary receiving sets.

No jacks are included in the different stages of radio amplification for the reason that they pass through all of these stages at a frequency which is much too high to be heard by the human ear. They are not made audible until they pass through the detector, where they are brought down to audible frequency. Therefore, jacks are of no consequence at any point preceding the detector. After reaching this point, however, the signals may be passed through various stages of audio frequency amplification for the purpose of increasing the volume of the rectified signal, and jacks may be inserted between any of these stages, making it possible to vary the volume as desired. Most long distance receivers operate on the basis of both radio and audio frequency amplification, and no matter what type of radio frequency amplification is used, there will always be a great tendency towards self oscillations in these circuits.

Cause of Howls and Squeals

When self oscillation occurs, howls and squeals of all kinds are produced in the phones and if these oscillations cannot be controlled, the benefits derived from radio frequency amplification are of no value whatever, and the set might better be used without it. Fortunately, however, there are several ways of eliminating the self oscillations, and if this is properly done, the receiver may be made extremely sensitive and practically noiseless so far as these oscillations are concerned. In order that one may fully understand just what causes this trouble, it will be necessary to explain briefly the principle of regeneration. The well known regenerative set makes use of what is known as a feedback, in which part of the amplified energy is fed back from the plate circuit to the grid of the tube. In this case, either a tuned plate circuit or an inductive coupling of the plate and grid circuit is used. Here we have a signal impressed upon the grid and amplified by the relay action of the tube in the plate circuit. When a change takes place in this plate circuit, part of the energy is re-impressed upon the grid circuit by inductive coupling, which again affects the grid, making a still greater change in the current flowing in the plate circuit. This change or increase reacts upon the grid again, making still more changes in the plate circuit, which effect keeps building up the change upon the grid until it reaches a point where it becomes stabilized and no further increase takes place. Aside from building up the signal on the grid, it has the effect of prolonging the signal to a certain extent, the result being a considerable amplification of the signal by this regenerative method.

This is known as a feedback, and because it may be controlled, it becomes a useful and valuable adjunct to the receiver. Thus we have a case where controllable oscillation is a benefit, but those self oscillations which are set up in many sources of feedback which are not under control are the cause of the many howls and squeals so often encountered in radio frequency amplification.

Where several stages of radio frequency amplification are used, some of the energy of the plate circuit may be fed back to the grid circuit to the same tube, or to preceding tubes by induction or capacity in the circuits themselves.

Coupling Causes Trouble

Feedbacks of this kind are undesirable, and unless some method of controlling them is used, self oscillation of the tubes will cause an aggravating howl in the phones or loud speaker. Now this action is caused by an unintended coupling somewhere between the grid and plate circuits of the tubes. Perhaps in the wiring of the set the wire connected to the plate of one tube may be too close to the wire connected to the grid of that, or some other tube, or perhaps these two wires may parallel each other for some distance, in which case one will be affected by the other and self oscillations will be set up.

This, however, will not always occur, for the reason that if the feedback occurs in one direction, it may tend to oppose or neutralize the grid effect, having a tendency to dampen out the grid effect instead of building it up. Where many stages of radio frequency amplification are used, coupling between the plate and grid circuits may occur in many ways. There will always be a capacity coupling between the plate and grid of any tube, because these two
elements act just as though they were the plates of a condenser. This capacity coupling is always present and cannot be avoided, and the only way to overcome it is by neutralizing its effect in a manner similar to that of the neutraloyne circuit in which neutralizing condensers are used.

The coupling may be caused by magnetic action between transformers which are too close together, and again it may be caused by resistance coupling where the internal resistance of the plate batteries is high. Now the energy which is fed back in any of these cases may be either positive or negative, and if it happens to be positive in its direction, or if a positive feedback is strong enough to overcome any negative feedback which may be taking place, continuous oscillations will be set up and howling will usually result.

One method devised to overcome a positive coupling between two circuits is to provide a separate source of negative feedback to overcome or neutralize the effect of any positive feedback which may be taking place between two circuits. In this method a small, three-plate variable condenser is so arranged that one movable plate may be moved in front of one or the other of the stationary plates which are insulated from each other, or it may be moved partly in front of one and partly in front of the other. The movable plate is connected to the grid of the first amplifying tube and the stationary plates are connected to the plates of the second and third tubes, respectively. This arrangement is used in resistance coupled amplifiers, as in this type, and each succeeding stage is reversed in phase. By changing the position of the movable plate of the condenser, one point of adjustment may be found where the feedback effect will be absolutely neutralized. Other positions of the movable plate may be found where the feedback may be either made negative or positive as desired, which makes it possible to control the feedback at will. In the same way, this method may be applied to transformer amplification, providing the secondary connections of the transformers are reversed in relation to the primary connections and a small variable condenser connected between the plate circuits of two tubes.

The Potentiometer Method

Another arrangement, and the one which seems to be most popular among the manufacturers of radio frequency sets, is the potentiometer method. In most cases the grid return circuits of all the tubes are connected to the negative side of the filament battery. This tends to prevent oscillations taking place in the tubes, but is not adjustable. By connecting a high resistance potentiometer across the terminals of the filament battery and connecting the grid return circuits to the movable arm of the potentiometer, the grid bias may be varied from a negative to a positive value, making it possible to obtain any adjustment between the extreme negative and positive which may be desired. By this arrangement, the grids may be made either negative or positive with respect to the negative end of the tube filaments. If it is found that the tubes oscillate when the potentiometer is set at the negative side, the oscillations may be dampened by moving the arm towards the positive end.

Making the grids of the tubes positive with respect to the filaments will naturally reduce the impedances of the grid filament circuits, and if this is carried too far, the grid filament circuit begins to be conductive, and some of the plate current will be wasted; but if the grid circuit is carefully balanced against the feed-back, then the self oscillations of the tubes may be easily controlled. The one bail feature of the potentiometer method is the fact that controlling the oscillations in this manner is absolute, but it increases the resistance of the circuits and naturally the amplification is reduced. It will be noted for example, in the use of a superheterodyne circuit, that at certain adjustments of the potentiometer the set will oscillate in a disagreeable manner, but the volume of the signal is wonderful. However, in order to clear up the reception and make it quiet, the position of the arm on the potentiometer must be changed, and as the oscillations begin to disappear, the volume drops off to a considerable extent due to the increased resistance. If some method could be devised by which the oscillations could be damped out and the volume still retained, then great amplification might be had, with the use of less tubes than are now necessary. More stages of radio frequency amplification are required, of course, to make up for the loss occasioned by getting rid of the self oscillations in the tubes. There is a limit to the number of tubes which may be used, for the reason that tube noises are always present and with each successive stage of amplification these noises are amplified as well as the signal.

Audio Frequency Amplification

Audio frequency amplification, as before mentioned, is used to increase the volume of the signals after they have passed through the detector.

(The Magazine of the Hour)
Consider your Neighbors with This

"QUIET" REGENERATOR

BY ARTHUR B. McCULLAH

A Step Toward a Non-Radiating Set

The purpose of this article is not to introduce a new circuit into the radio folds for no good reason, but to introduce an old circuit with some of its disadvantages overcome.

The regenerative set can truly be called the "Old Reliable." However, conditions have grown up around it that have made it a burden to the community at large. Our last trans-Atlantic test proved that the radiating receivers were doomed. Not only is the regenerative set a menace to society, but the many varieties of radio frequency amplifiers that go into the state of oscillation cause more trouble than a great many regenerative sets.

Some have prophesied that in a short space of time the owners of regenerative sets will learn how to manipulate them in such a manner as not to cause any undue hardship to their neighbors. Time has not borne out this prophecy, and some method must be presented to the fans so they can build sets that will not radiate and at the same time be electrically efficient, as well as easy to tune. The users of most regenerative sets know that by making their sets oscillate they will cause interference, but they continue to use such a practice because it is easy to find stations by the beat note that is produced in their sets, as well as in every other set in the neighborhood.

Some Criticism Undeserved

As said, before, the regenerative set comes in for a lot of criticism that it is not entitled to. The super-heterodyne causes a great amount of trouble that the much abused regenerative set is accused of. The radio frequency amplifiers in many sets radiate more energy than regenerative detectors, because of the high plate voltage as compared to the plate voltage of a detector tube. This, of course, makes for a more powerful oscillator. A general rule may be stated that any set that goes into the state of oscillation will radiate energy unless some method is used to prevent the energy from leaving the set; i.e., in the super-heterodyne receiver the second harmonic system of wave-changing or the Pressley system of preventing radiation to a negligible quantity.

Circuit Analysis

In the set to be described, the antenna coil has (53) turns of Number twenty-four double-covered green silk wire. There is a tap taken out in the exact electrical center which is at the (26½) turn. This is the antenna tap. The purpose of such close coupling is to prevent the first radio frequency amplifier from oscillating. There is a second method that is not always needed, but it is put in for the few that might find it necessary.

It will be noticed that there is a .0005 variable condenser tuning the antenna coil and a .00035 condenser tuning the detector circuit. The reason for this is that in designing a set, practically every builder will have an antenna of a different capacity, which would change the wavelength of the secondary of the first radio frequency transformer to a great extent if the tuning condenser were a .00035 condenser; hence the .0005 variable.

The second radio frequency transformer consists of two coils, a (24) turn primary and a secondary of (95) turns and the same size wire with which the antenna coil is wound. There is also a tap taken out at the center of this winding. Regeneration is obtained with a small variable condenser. It is sometimes known as the Rice Circuit. The primary coil is wound on a smaller bakelite tubing so it will make a snug fit when it has a winding on it. In the circuit diagram it will be noticed that there is a small fixed condenser in series with the regenerative condenser. This is because of the fact that the so-called regenerative condenser has too high a zero capacity to prevent the detector tube from oscillating at the lower end of the scale.

The Choke Coil

As this circuit is what is called a parallel plate supply, some method must be used to keep the radio frequency energy out of the plate supply. This can easily be done by inserting a small honeycomb coil in series with the plate lead of the detector. A coil of one hundred turns or more will do the trick. It might be added that this choke may be made by winding one hundred turns of the same size wire with which the other coils are wound, or if some smaller wire is handy, use it because it will make a more compact coil. The form for winding such a coil can be had from an old spool.

The usual precautions should be taken in selecting the audio transformers. We need not go into the details about them, as they have been discussed at length in these pages before. If the builder wants to go to considerable work, he may use filament control jacks and put a jack in the plate circuit of each tube with the exception of the radio frequency amplifier.
The much important "C" battery is left out of many sets. This is not the case here, however, for it is particularly advantageous when using 199 tubes as we do in this set.

Only one rheostat is used, as 199 tubes work best at three volts. It does not take four rheostats to adjust the tubes to three volts, as the tubes have the same characteristic.

List of Materials
1. 7 x 14 inch panel.
2. 7 x 13 inch panel.
3. Variable condenser.
4. .0035 variable condenser.
5. Low ratio audio frequency transformers.
6. 199 tube sockets.
7. Grid leak and condenser.
8. Rheostat.
9. Spring jack.
10. Spring jack.
11. On-off switch.
12. Chelton variable condenser.
13. .0001 fixed condenser.
15. Bakelite tubing 1 inch long, 1 3/4 inch in diameter.
17. Binding posts.

1. 1/4 lb. No. 24 D. C. G. S.
2. Neutralizing condenser.

Construction

IT IS an old Chinese proverb that "One Picture is Worth 10,000 Words." The picture will tell in the best way how to lay out the set.

The antenna coil should be wound on the center of the bakellite. The most accurate way to do this is to drill a small hole in the tube, equidistant from both ends of the tube and wind on two coils, using this as the starting point for both windings; that is, 26 1/2 turns on both sides of the center. If the same type of condenser is used, the coil will be mounted on the back of the condenser. This first coil should be at right angles to the baseboard.

The second radio frequency transformer is mounted on the back of the condenser in the same manner as the first, except that it is parallel to the baseboard. In other words, it is at right angles to the other coil. The primary coil is wound on the small coil that is one inch long, and it has twenty turns of wire on it. The secondary coil, as said before, has a tap and may be wound the same as the primary coil, only it has 53 turns, or 26 1/2 each side of the center tap.

The Magazine of the Hour

While the choke coil is very easy to build, to make the entire job one of simple assembly, it would be easy to purchase one 100-turns honey-comb coil. For those who want to build their own choke coil, a very nice job can be made of an ordinary thread spool. Wind on one-hundred turns of No. 24 wire in most any fashion. The ends of the wire can be brought out to two screws at one end of the spool.

No trouble should be experienced in constructing this set, as there are no "trick" parts, nor are there any moving coils that would cause the builder with a limited number of tools any difficulty.

Oscillation On First Tube

SOME trouble has been experienced with this circuit on some antennas, due to the first tube oscillating. The first tube on some occasions broke into oscillation in sympathy with the detector tube when it oscillates or is about to oscillate.

The only remedy for such a trouble is to neutralize the radio frequency tube. Neutralization is very easy in this circuit, as there is only one tube to neutralize. The first thing to do is to disconnect the antenna from the set. Set the first dial at about thirty on the dial, and then turn the second dial until the click is heard in the headphones, which indicates the first tube is oscillating.

This, of course, is done with the regenerative condenser set at zero. Now, by adjusting the neutralizing condenser, the first tube can be made to stop oscillating. A test to see whether the first tube is oscillating or not is to turn the regenerative condenser a slight amount and then turn the second dial back and forth over the point where the tube oscillated before.

Note by Technical Editor—Builders of this circuit should remember that any improperly neutralized circuits, regardless of the means adopted for neutralization, can send a weak current into the antenna circuit and at close range prove bothersome to a neighbor. Be sure the r.f. tubes are completely neutralized before going ahead.
How to Make a Vacuum Tube Tester

By H. FRANK HOPKINS

A GREAT many radio fans of today are constantly asking how they can improve on their equipment and how they can reach out and bring in the distant stations strong enough to work the loud speaker and yet maintain maximum tone quality. Knowing that to add amplifying units tends to distort the signal and produce excessive local noises, therefore other means to attain efficiency with the present equipment are constantly in demand.

Efficiency with matched parts is a big step toward getting the utmost out of a set. A way to match and measure the various parts of a receiving set was described by the writer in the February RADIO AGE, when a slide wire bridge was outlined. From the number of inquiries and reports of results obtained with that instrument, it is evident that the set-builder of the present is more interested in the art and theory of radio than in just putting a bunch of parts together to build a receiver and listen to a few programs.

He is an experimenter, gaining knowledge in addition to amusement. Often times he contributes valuable information to the radio science. It is to this type of radio fan that we look to for the future development of radio, for he accomplishes as much as the professional radio engineer.

A Little Study Necessary

It is not necessary that one have an advanced education in electricity or radio engineering to apply science in his experiments, or to know why he gets certain results. With a little study and a few instruments, he has a great field open to him, and the writer is sure that when he meets problems beyond his capacity, which will be few, he need only seek the counsel of authors of technical radio articles, and they will be only too pleased to help him out.

The most vital parts of a receiving set are the vacuum tubes. They are the heart of the system. When they cease to function efficiently, all of our other efforts are in vain, our matched parts cannot produce that which is not applied to them and they can only pass and produce results equal in quality as that applied to them. If the vacuum tube fails to deliver, the output will suffer in both quality and volume. If the tubes do not match up; that is, if they do not have characteristics similar to one another, they cannot be expected to pull together and produce satisfactory results.

The tube problem becomes more complicated day by day as new tubes are put on the market. Not that these new tubes are inferior, for their quality is every bit as good as can be obtained, but their characteristics are not the same. One brand may not have as great an impedance as another; maximum amplification may be obtained on one make of tube at a different plate voltage or grid bias than on another. Such tubes cannot be expected to "co-operate" when the same plate voltage and grid bias are applied to them. Therefore, some method of matching tubes or determining just where their critical point lies is obviously necessary.

Pulls Others Down

Vacuum tubes wear out, too. The same as everything else, and as it passes its efficient stage, it pulls all of the others down with it by making it necessary to increase the filament voltage to obtain a satisfactory output. The others consequently age very rapidly, making it necessary to replace all of them in a short time instead of replacing just one of them when it passes its useful period. This was described in the article entitled "Regulating Filament Energy" in the April RADIO AGE.

One such case would cost the fan...

**WIRING TABLE**

<table>
<thead>
<tr>
<th>Run-One Lead from</th>
<th>TO:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binding Post B90</td>
<td>Switch point No. 4</td>
</tr>
<tr>
<td>Binding Post B 67/8</td>
<td>Switch point No. 3</td>
</tr>
<tr>
<td>Binding Post B45</td>
<td>Switch point No. 2</td>
</tr>
<tr>
<td>Binding Post B22/2</td>
<td>Switch point No. 1</td>
</tr>
<tr>
<td>Binding Post B</td>
<td>Binding Post A+</td>
</tr>
<tr>
<td>Binding Post B-</td>
<td>Terminal 100 on PF</td>
</tr>
<tr>
<td>Binding Post D-</td>
<td>Switch point on T</td>
</tr>
<tr>
<td>Binding Post A+</td>
<td>Terminal F on T</td>
</tr>
<tr>
<td>Binding Post A-</td>
<td>Terminal No. 10 on PF</td>
</tr>
<tr>
<td>Binding Post C+</td>
<td>Terminal No. 1 on GP</td>
</tr>
<tr>
<td>Binding Post C-</td>
<td>Terminal No. 0 on BS</td>
</tr>
<tr>
<td>Binding Post G</td>
<td>Terminal No. 2 on GP</td>
</tr>
<tr>
<td>Terminal No. 0 on BS</td>
<td>Terminal + on GM</td>
</tr>
<tr>
<td>Terminal No. 2 on GP</td>
<td>Terminal + on T</td>
</tr>
<tr>
<td>Terminal No. 2 on T</td>
<td>Terminal No. 2 on GS</td>
</tr>
<tr>
<td>Terminal No. 2 on BR</td>
<td>Terminal + on MA</td>
</tr>
<tr>
<td>Terminal No. 3 on BR</td>
<td>Terminal No. 4 on TS</td>
</tr>
<tr>
<td>Terminal + on GM</td>
<td>Terminal No. 0 on GS</td>
</tr>
<tr>
<td>Terminal No. 2 on MA</td>
<td>Terminal F on T</td>
</tr>
<tr>
<td>Terminal No. 1 on MA</td>
<td>Terminal No. 3 on TS</td>
</tr>
<tr>
<td>Terminal No. 19 on PF</td>
<td>Terminal No. 10 on PF</td>
</tr>
</tbody>
</table>

**Proper Knowledge of Tubes' Capacity and Worth Will Save Fan Much Trouble in Operation of His Set; Many Ways of Operating Tester Shown**

---

Fig. 1. A front view of the vacuum tube tester, which can be made by any fan. Each part is so placed to give maximum efficiency, and no parts are used that will not be necessary. The tester is compact as well as attractive, and may be constructed for portable or stationary use.
almost as much, if not more, than a good tube tester. This would not be so inconvenient if it would only happen once, but it continues to happen, while the investment in a tube-tester is like insurance on your tubes, in addition to the benefits you will reap in acquiring more knowledge about your equipment. In this way you will be able to weed out the weak, inefficient tubes and match the good ones for efficient operation.

The tube tester to be described is not expensive. Its total cost is not much more than six dollars more than the cost of the meters, and these instruments may be purchased from any reliable dealer at about seven dollars each.

The meters used in the set to be described were the best that could be obtained for this purpose, and they are standard equipment. In listing the bill of materials for this set, all of the parts are given a designating letter or sign, which is used throughout the article to enable the prospective builder to understand the place of the parts in the circuit and to simplify the wiring.

A case or cabinet 8 1/2 inches by 11 inches and 5 inches deep will be required if this is to be a portable set, or just a panel 10 inches by 15 inches by 3-16 inches thick with the necessary mounting brackets if it is to be used as a permanent fixture. The panel for the case will be 8 1/2 inches by 11 inches by 1-8 inches or 3-16 inches in thickness. It will be drilled to mount the equipment as shown in the photograph accompanying this article. No dimensions are given for drilling the panel, as there is a large selection of equipment, all different in shape, and all can be used with equal success. Accordingly, the size of the holes may vary, but the layout of the panel is not altered, nor is it difficult.

The Parts of the Instrument

1 Two scale voltmeter. (0 to 10 and 0 to 100 scale.) PF for plate and filament voltage.
2 Votmeeeter (10-0-10 scale) GM for measuring grid bias voltage.
3 Milliammeter (0 to 30 scale) MA for measuring plate current.
4 Jack switch, GS, for grid voltmeter.
5 Two way transfer switch, TS, for PF meter.
6 30-ohm vernier rheostat, R, for filament control.
7 3000-ohm graphite resistance, BR, for "B" or plate battery control.
8 400 ohm potentiometer, GP, for grid bias control.
9 201 type socket, T, with metal shell.
10 Adapter for 199 tubes (If required.)
11 Adapter for WD type tubes (If required.)
2 Induction switch levers and knobs, BS, and PS.
6 Switch points, BS 1, 2, 3, and 4.
10 Binding posts, B90, B67 1-2, B45, B22 1-2. B-, A+, A-, C+, C-+, and C-
Miscellaneous mounting screws, terminals, wire, and solder.

Wiring the Set

When all of the instruments have been secured and the panel laid out and drilled with the instruments mounted on it, the next step will be to wire it up. The method to do this is with Number 14 B and S gauge rubber-covered stranded wire, each wire having a terminal soldered to each end. These terminals will be securely bolted to the posts on the instruments. Care should be taken to see that the soldering is secure and makes a good connection, and that the lugs and terminals are clean and have (Turn to page 56)

![Fig. 3. A typical plate characteristic curve for the 199 type (3 volt) tube.](image)

![Fig. 4. Typical grid characteristics for 199 type (3 volt) tubes at 45-80 and 90 volts "B" battery.](image)
THE application of alternating current for supplying energy for both filament and plate circuits of a receiving set is distinctly new and rather "treacy." It is comparatively easy to devise a rectifying system for furnishing satisfactory plate voltage to replace the dry cell type of "B" batteries, but the addition of the house lighting system for lighting the tubes as well is a more complicated matter.

However, the incomparable convenience of a never-failing power supply appeals to everyone. Dead batteries usually show up just when you've invited the next-door neighbors in for a special program of Metropolitan singers, or during the Sunday evening concert. And "B" batteries must be frequently replaced as they become exhausted.

Inasmuch as the alternating current can easily be changed to direct current of any desired voltage for the "B" circuit, the "B" voltage supply is composed of direct current, as usual, with a battery. But for the filament, on the other hand, rectification of sufficient current for tube illumination would entail a large amount of rectifier and filter apparatus that would make the storage battery and charger the more logical and convenient filament power supply system, to say nothing of the cost of such equipment.

However, by correctly arranging the "grid return" leads, the hum ordinarily caused by 60 cycle lines is balanced out to such an extent that it is scarcely noticeable. There are, however, some limitations upon the types of circuit which may be successfully used with the A. C. supply system, and moreover, upon the extent of the set's receiving range. These requirements tend to restrict the use of the system to listeners who care more about the reception of programs from the nearer stations and who are more interested in perfection of musical reproduction than they are in the search after far-away broadcasts.

A tube detector, unless it be supplied with filament current by a storage battery or separate dry cell, is ruled out from the start. This means that a crystal detector is essential. From the standpoint of extreme sensitivity, this is certainly a handicap, but for clarity of reception no one can question the crystal's superiority over the tube for detection purposes. And with the plentiful supply of new crystal detector stands comprising either zincite and bornite or zincite and tellurium, a detector that is rugged and long-lasting may be easily obtained. The dual mineral type of detector is ideal for such a receiving set, inasmuch as its adjustment is made in a second and that adjustment is held for long periods of time—often several weeks on end.

The amplifying tubes can, with perfect success, be lighted on A. C., so that the set may employ tubes for amplifying purposes in practically any combination, provided the detector be a crystal. To gain the best results, the circuit should not be reflexed, since there are certain uncertainties about reflex sets that often cause trouble when run on alternating current. The most satisfactory all-around circuit is a combination of one step of radio frequency, a crystal detector and two steps of audio frequency, with no provision for headphones.

For Loud Speaker Only

In other words, the completed set is one intended solely for loud speaker reproduction. It is a simple set to operate, with two tuning controls and one sensitivity control. There is also the crystal detector adjustment knob which must be touched occasionally. Stations within fifty miles are considered "locals" when received on a fair outside.
antenna, and those within twenty-five miles are "locals" when a small indoor aerial is used. The selectivity is very satisfactory, so that some distant stations may be heard while locals are on the air, and quite a lot of pleasing DX work can be accomplished when locals do not interfere seriously. This means that while the set is chiefly meant for local reception with perfect clarity and plenty of "pep," DX stations are also within reach, though not to the same extent as with a receiver expressly intended for DX work like the super-heterodyne and various other "dynes."

One illustration shows the baseboard of a power supply receiver built for use with a cabinet. Another view shows how the completed set appears and gives some idea of its attractiveness and simple control. The circuit selected is presented as a result of a great deal of experimenting in search of a circuit with plenty of sensitiveness and adaptable to all sorts of aerials, from a long high wire over 150 feet from end to end down to a mere capacity plate on which the house telephone is placed. The sloping type of cabinet is chosen for reasons of tuning convenience and better illumination of the dials, and for the better appearance as well.

To house the necessary apparatus, the baseboard measures 20 inches long by 12 inches deep. On it are the tuning apparatus, except condensers and detector, the audio amplifier, the "B" voltage rectifier and the filament current supply system. Thus, the only external connections or parts needed are 1, The aerial; 2, The ground; 3, The loud speaker; 4, A cord and plug to the base receptacle or other lighting socket.

To avoid ugly wires in front, the speaker leads are inserted through the rear and at the left end of the board, the flexible cord is placed at the rear center, while the aerial and ground wires emerge at the rear right. A push switch is inserted in the flexible cord at about a twelve-inch distance from the cabinet, for turning the power on and off.

The Parts Necessary

So long as high grade apparatus is selected, there are no special requirements as to the parts selected, with the exception of the A. F. transformers. Three of these are used in the "B" rectifying system and they must be rigidly assembled, with clamps or machine screws tightly holding the laminations of the core at several points. If you can wiggle the core pieces with your finger, they cannot be used for the "B" part of the set, though they may be used for the audio amplifier well enough.

(Turn to page 48)
Now's the Time for a Radio House-Cleaning

By PAUL GREEN

An All-Around Overhauling Needed If Your Set is to Work Efficiently This Summer

FOR FIVE months or more, radio reception has been good. Aside from charging the "A" battery, most of us have given our sets little or no attention since last Fall. Now, however, we hear on every hand complaints of reception failing off. By this time next month a large majority of radio listeners will have pessimistically accepted the situation as unalterable and let it go at that.

In spite of this, broadcasting stations have been for many months planning wonderful programs and greater power for the coming Summer. If reception continues to grow poorer as the season advances, will all this planning accomplish anything? Isn't it just so much wasted effort? you ask. Well, perhaps we have formed hasty conclusions as to the effect of warmer weather on reception. Let us see.

Do you recall, last Fall, when you put the old set in trim for the Winter, how among the things you did, perhaps you purchased a new set of "B" batteries and a tube or two and just for luck re-soldered some of the joints. You knew that others were getting results; therefore, your failure to do so argued the need of attention to your set. Well, anyway, you got the set to "working"—and it has continued to do so for several months. Well, here we are "at the end of our radio season," and what do you propose doing? Desert your old stand-by? And just when it needs your attention, too.

Weather Gets the Blame

THE average set has seen a total of not less than six hundred hours' service since last it received any real attention. During that time batteries, contacts, joints and tubes have undergone changes. Even if Winter were to continue, these parts would need attention. But, in common with many other fans, you probably have overlooked examining your set, charging the weather with the "falling off" instead.

Certainly, with all these wonderful radio programs ahead of us, it is very worth while to do what we can to assist our sets to give us their best. Following are some of the complaints to which a set may be subject at this time of year, with hints for remedying the complaints.

An aerial which, perhaps, gave very good service all Winter long may now hang too close to trees and shrubbery. As the foliage comes out, the absorption problem grows more serious and the aerial must be given more clearance. An examination will usually show that it can be rehung more advantageously. While doing so, see that the insulators are clean and free from carbon deposit. If they are of a porous design, change them for the glazed type. The lead-in should hang free and clear of other objects. It must be well insulated where it enters the building. Be sure that the joint between the lead-in and aerial is a good one.

There are a number of changes that may have taken place in the set since last Fall. Unless the joints were soldered with rosin core solder or carefully wiped after soldering, many of them will be found corroded or coated with a copper salt. Flux often spreads to the panel and forms a partial short circuit, the effect of which becomes more and more apparent as warmer and damper weather approaches. Clean such parts with benzine and alcohol. Unless the rotors of your condensers are provided with flexible "pig tails," it is well to clean the points of contact with fine emery cloth. Dust between the plates with a pipe cleaner to remove dust particles and lint. If left in, they tend to collect moisture and cause leakage between plates. This cuts down volume and makes the set noisy.

Look for Broken Joints

WITH a pair of phones on your ears and the set in operation, go over it for broken joints. Tap each joint separately with a lead pencil. With the head-set still on, test each movable part. If sudden clicks are heard, it is a sure indication of broken joints or loose con-
tacts. In case of loose joints, re-soldering will correct the trouble. Tightening nuts will usually correct the other.

Those of us who are using storage "A" batteries know that they must be recharged at intervals. We have come to recognize the symptoms which say—"low battery," and so little need be said on this score. But it is usually a fact that "B" batteries are allowed to get low before new ones are purchased. They should be tested frequently and as soon as the voltage has dropped ten or twelve per cent, thrown away. Under such conditions it will usually be found that the amperage has dropped to a very low figure. For this reason, it is not safe to allow the "B" battery to fall off much more, especially if yours is a set having more than two tubes.

Like the storage battery, the tube becomes run down and after a Winter's use it is in no condition to detect properly and amplify the weaker signals of summer-time. The tubes are responsible for much of the falling off that we have attributed to the weather.

The effective life of a tube is not determined by the length of time it can be used without burning out. Long before this occurs, most tubes cease to be efficient. To offset this gradual falling off, the filament is burned brighter. This still further hastens the tube's demise. Is it at all strange, then, that as Spring passes and Summer comes we find our sets almost useless so far as coping with the more difficult broadcast conditions is concerned?

So much for cause and effect—we have remedied the other troubles, now what can we do for the tubes?

When it was said that the tube, like the battery, runs low, the analogy should have been carried one step farther and the statement made that the tube, like the battery, can be recharged.

Practically everyone of us has noted the instructions which come with tubes, for rejuvenating them. A few of us have tried these instructions, but so far as the writer's experience goes, no one ever "brought his tubes back" by such a procedure. This is accounted for by the fact that very few fans have the proper instruments for regulating or measuring the applied filament current.

A Step Forward

Within a short time instruments will be made available to all fans for rejuvenating their tubes. Tests with this equipment reveal some very interesting facts. Tubes which have long since passed their period of usefulness can be brought back to apparently full normal. This also applies to tubes which have been paralyzed by excess filament voltage.

Frequently brand new tubes will show a marked improvement after treatment. In a number of tests, rejuvenation has made the tube noticeably superior to new tubes. Paralyzing a tube and bringing it back to life has been repeated as high as thirty or forty times without noticeably ill effects of any kind.

Heretofore, our tubes, like dry batteries, were discarded when their effective life had passed. Now that we can recharge them just like storage batteries. Let's make this a real radio Spring and Summer and enjoy the wonderful programs planned for us.

And while you're cleaning up and tightening up your set, you might cast an eye around the room in which it is located and tidy that up a bit. Nothing so iske a well-meaning housewife as to find hubby's or son's radio apparatus strung all over the bedroom, dining room, kitchen, or wherever the set happens to be located.

So for the good of all dispositions concerned, clean out all unnecessary parts and stow them away for future use. And while you're doing that, see that your aerial lead-in from the set to the window, and the ground connection are in good shape, for these vital factors of a set's operation, when not inspected from time to time, may develop faults that do serious damage to the receiver.

(Note: Mr. Green will be glad to supply detailed information regarding the tube rejuvenator to all readers of RADIO AGE who will address him care of this magazine.)
A PRACTICAL SUPER-HET

A UNIQUE 8-TUBE OUTFIT ON AN 18-INCH PANEL

By Joseph Calcaterra

The instruments have been very carefully designed to permit mounting in a small space, without interfering electrically with each other, and the creditable performance in this respect is, therefore, not to be considered surprising. It must not be forgotten, either, that even in super-heterodynes, short wires are better than long ones, and close mounting permits short wires. Add to this technical advantage the great usefulness of an 18-inch set as compared with a 40-inch one for traveling purposes in the Summer time, and the set here described needs no further recommendation.

Tone is Paramount

It should be remarked, however, that tone quality has been considered paramount throughout this design, while the selectivity noted is fully up to the best super-heterodyne practice, it is believed that the tone quality obtainable, even with distant stations, is a distinct advance. Two features contribute largely to this—the use of broadtuned transformers in the intermediate stages, eliminating the necessity of delicate "matching," and the use of laboratory-grade audio transformers. In spite of this use of some rather high-priced parts, the entire set can be built at an expenditure for parts (not including tubes, batteries, etc.) of not to exceed $75.00.

Simplicity of control is another point which has been carefully worked out in this design. Besides the two familiar major controls, there are only three minor ones. Yet the sensitiveness is not perceptibly less than that of any of the
Rear view, layout of panel

Top view, layout of sub-panel

Bottom view, layout of sub-panel

Building post panel layout—view from front of set, inverted
well-known, complicated supertes; a loop antenna not more than 18 inches in diameter will bring in distant stations.

The two photographs show the appearance respectively of the top and bottom of the set, and drawings are given which show the layouts respectively of the back of the panel, top and bottom of sub-panel, and binding-post panel.

(See note at end of article.)

Parts Shown by Numbers

A wiring diagram is also given, on which the parts are identified by the same numbers used in the drawings. This circuit does not differ very much from the standard circuit; it has a special method of loop connection by which a certain amount of regenerative is introduced, under control of a small variable condenser (No. 6 in drawing). This sharpens the tuning to a marked degree.

All of the parts used in a super-heterodyne must, of course, be high-grade in order to get the results one expects from the circuit. It is not necessary to use the laboratory-grade audio transformers shown in the pictures, but since these are larger than standard transformers, the latter can be mounted in the same space with no difficulty whatever.

The holes in the sub-panel, through which wires are passed when making connections between terminals located above the sub-panel and others below the sub-panel, have been made conspicuous by being blackened. These holes are marked by lower case or "small" letters to distinguish them from terminal markings. These holes are not all shown in exactly the best position in the drawings here given, as a few have been shifted slightly to bring them into view.

It will be noticed in the photographs that there are very few wires visible from the top of the set, and this feature adds greatly to its appearance. The effect is obtained chiefly through the device of reversing some of the binding post screws on the sockets. All of these posts which are shown on the sub-panel by slotted screw heads instead of by knurled nuts are thus reversed, and the wires are attached below the sub-panel. In some cases other connections are made also on top of the sub-panel, a soldering lug being here inserted under the screw head for that purpose. The reversed terminal screws going through the sub-panel are sufficient to fasten the socket to the panel without using additional screws for the purpose.

After all of the parts and binding posts are connected to the three panels, and the binding-post panel is attached by metal brackets to the sub-panel, the greater part of the wiring can be completed to best advantage before attaching the front panel. It is best to begin with all of the wires which can be connected on top of the sub-panel assembly.

Next the wiring on the underside of the sub-panel should be completed, and then the wires which run through the sub-panel, between terminals located on opposite sides of it. The front panel is then attached and the remaining wires connected.

At one end of the sub-panel are the eight battery terminals. The A battery may be either six dry cells connected three in series, or preferably a four-volt storage battery. Binding post 40 should be connected to the 45-volt B battery terminal for the first and second detector tubes, and binding post 41 to the 90-volt end of the B battery for the amplifier tubes. Binding post 34 carries a 4.7-volt negative C battery voltage to the grids of the two audio tubes, while post 35 carries a 3-volt grid bias to the intermediate frequency tubes.

At the other end of the binding post panel are the three posts for loop connections. Post 32 should connect to a tap on the loop such that one-fourth of the total turns on the loop are included between posts 31 and 32.

To operate the set, turn on the battery switch and turn the rheostats about three-fourths of the way on. Set the small condenser, No. 6, at its minimum capacity and begin tuning with the two large variable condensers. When the set is working, gradually increase the capacity of condenser No. 6 to sharpen up the tuning, but not enough to throw the detector into oscillation. Rheostat 3 should be turned on as far as possible without causing loss of clearness of tone, and rheostat 4 should be turned down as low as possible without losing volume.

(See note below.)

A bottom view of the super-heterodyne receiver, showing the wiring arrangement before the parts are installed. After studying this diagram and the others in this article, the fan should have no trouble in placing the parts. Every part is clearly marked by a number in the diagrams on the opposite page.
The Physical Significance of Tuning

By Dr. Frederick W. Grover

Who is a prominent Member of the Department of Electrical Engineering of Union College, Schenectady, N. Y., and recognized authority on the subject of radio waves

Every radio fan knows what is meant by tuning-in. You turn a dial on the receiving set until the sound is loudest. Without tuning, only the local stations come in, and it is impossible to separate one station from another. We tune our sets as a matter of course and naturally give little thought to the actual significance of what may be regarded as perhaps the most basic of radio adjustments.

I am asking your consideration of certain analogies which may be pointed out between the actions in a radio circuit and those in the more familiar cases of sounding or vibrating bodies. Analogies are helpful in that they illustrate unfamiliar things by pointing their likeness to things better known. However, when we liken an electric oscillation of current to the vibration of a sounding body, or an electromotive force to a mechanical force, it must be remembered that they are not identical things. We must use our imaginations subject to common sense, and make some allowance for points of difference.

Pitch Decides Wavelength

A string instrument is tuned by carefully tightening a string until, when it is sounded, it gives off the desired pitch. The pitch of the sound is, however, the same whether it is struck, plucked or bowed. We say that the string vibrates in its natural period. The same is true of any sounding body. Sound waves go off from it through the air and the pitch of the sound determines the wavelength; that is, the distance by which one pulse travels ahead of the next. Likewise a radio circuit may be set into oscillation by various means, but gives off electrical waves whose wavelength bears no relation to the method by which the oscillation is produced. The transmitting circuit has a natural period just as in the case of the string. Whereas the pitch of the sound given by the string (so many vibrations per second) depends upon its length and tension, so the pitch of the electrical wave (so many kilocycles per second) depends upon the amount of inductance in its coil and the capacity of its condenser.

The analogy between a sounding body and an oscillating electrical circuit, used for broadcasting, may be extended to the case of a receiving circuit also. If you sing a single note forcibly into the top of a piano, you will observe that one of the strings faintly sings the same note after you. Investigation shows that the single string involved, if struck in the usual way, gives out this note and no other. Of the multitude of strings in the piano, all are practically unaffected, except the single string whose natural period of vibration agrees with the period of the sound vibrations sung. Shout another musical note, and another string responds, while the previous one joins the throng of silent strings. Evidently the sound waves of your voice have beat upon all of the strings of the piano, but are powerless to produce a noticeable vibration except in the case of the string which is tuned to the incoming sound waves.

How It’s Done

Likewise, the electrical waves passing out from a broadcasting station produce no appreciable oscillations in a receiving circuit, unless its natural period of oscillation is the same as that of the incoming electrical waves. When we tune a circuit to the electrical waves, it is just the same as though in the piano experiment we had worked upon a single string by tightening it or loosening it, until it responded with greatest loudness to the note sung against it.

To get a clear idea of the actions involved in the vibrations of a sounding body, let us consider the simple case of a thin strip of steel, a foot long, clamped at one end in a vise. If the free end is pulled aside, we feel an elastic force resisting us, and this gets greater farther we pull it from the original position. If now we let the spring go, the elastic force causes it to return toward the undisturbed position, and we observe that it will vibrate for a short time, sending out pulses into the air. If we try a much shorter and stiffer spring, suitable for a harmonica, the vibrations are more rapid and we hear a musical sound.

An explanation of the vibrations of the spring is briefly as follows:—The spring is bent aside at the start, and when released, the elastic force causes it to move. As it returns, the elastic force diminishes, and by the time the spring has reached the original undisturbed position, it has become zero. However, the spring keeps on moving because of its momentum, and as it passes the undisturbed position it begins to bend the spring in a direction opposite to the first, thus setting up an elastic force which works against the motion of the spring, slowing it down more and more until it comes to rest. The spring then moves back, and the sequence of events is repeated. If there were no friction, the spring would make equal excursions on both sides of the undisturbed position, and once started, the vibrations would never cease. Of course, this is never the case; the vibrations die down gradually and the spring comes to rest, since with each excursion the effect of friction is to reduce the distance traveled from the central position.

The original work done on the spring in bending it aside is the sole source of energy the spring possesses, and when this has been dissipated in overcoming the

(Turn to page 52)
REMINISCENT OF THE FAR EAST—

were the intimate, quaint talks broadcast recently from KNX, Hollywood, Calif., by Anna May Wong, diminutive Chinese movie actress who has made such a "hit" with the cinema fans throughout the country. Despite the fact she's a native Chinese, Miss Wong talks like a typical New Yorker. However, she is able to convey real Oriental atmosphere by lapsing into Chinese dialect and crooning the weird songs of her native land.
WEBW Quartet Gains Host of Friends

THE four imposing young men who are shown in the photograph on this page compose the famous Fairbanks, Morse & Co. Quartet at Beloit, Wisconsin, who broadcast almost every Tuesday evening from WEBW, in conjunction with the Fairbanks-Morse Concert Band. The quartet recently sang a noon hour concert from WMAQ, Chicago, which many readers may remember having enjoyed.

Three Lees and a Dave make up this musical four. They are: Dave McCullough, Leland Forman, LeGrande Warriner and LeGrande Brannen.

The first of the Lees is Leland Forman, who sings second tenor and who directs the quartet. The other two Lees are LeGrande Warriner and LeGrande Brannen, singing baritone and bass parts. Dave McCullough, the Scotchman who sings like an Irish tenor, is the fourth member and ably handles the top tenor notes.

“Our Dave,” as his colleagues and thousands of listeners all over the country are calling him, sings more popular numbers than the other members of the quartet, who confine themselves almost entirely to classical compositions. Dave is one of the most popular entertainers in southern Wisconsin.

Flappers who have been charmed by his sweet voice over the air will not doubt be disappointed and stop sending the station mass notes when they learn that McCullough is a happily married man. He admits it himself.

Brannen Popular Reader

LeGrande Brannen, the splendid bass singer, is also an accomplished musical reader. When the quartet recently entertained from Chicago, he gave a reading called, “The Game of Life.”

WJZ Requests Second “Best Announcer” Rating

BECAUSE of the large amount of public interest in the findings of the Radio Voice Technique Committee at its recent meeting, Station WJZ has requested that the committee hold another meeting for the purpose of comparing the announcers of all stations in and near New York City. The committee recently listened to wax records of a representative number of announcers and voted Herbert B. Glover, of WJZ, as the best of those announcers.

Great public interest has been shown in regard to that decision, and station WJZ feels that the term “announcer” should be applied only to the winner of research in which every announcer has been examined. Charles B. Popeneoe, manager of Stations WJZ and WJY, has forwarded the following letter to the committee:

“I am naturally most pleased that an announcer of Station WJZ should have received the highest rating at the recent meeting of the committee. The fact that the winning percentage was only 66 out of a possible 100 shows, however, that there is still much room for improvement in the announcing profession.

Not a Competition

In view of the unexpectedly large amount of public interest in this question of who is the best announcer, I should like to suggest that the Radio Voice Technique Committee conduct another and more comprehensive rating of the announcers of stations in and near New York City. I realize that the committee, at its recent meeting, had no thought of identifying the holder of the highest percentage of the “Best Announcer” and that the findings were of a purely scientific nature.”
Here is a Station That Realizes
That Many Listeners-in Are Women

Radio for Milady
at WNAC

The First Aerial Millinery Show from
This Popular Boston Station Results in
A Flood of Letters from Devotees of Style

By OLIVER JENKINS

WOMAN has been long accorded the privilege of changing her mind at a moment's notice. There are some people of the opposite sex who have little patience with this whimsical trait of womankind, asserting that it is merely a convenient refuge.

It goes deeper than that, however. A woman's life from beginning to end has a great deal to do with the word, “adaptability.” She must be ready to adapt herself to all sorts of changes, even to that of changing her name. It is natural, therefore, that she yields easily to the tyranny of that most fickle of gods—the God of Style.

Perhaps you are wondering what all this has to do with radio. Well, Station WNAC, at Boston, claims that it has a lot to do with it. And Station WNAC ought to know something about it, for this station was the pioneer among the radio stations in the Hub of the universe.

Long ago this popular Boston station decided that the woman radio-fan was not being catered to as was fitting, and plans were made for doing something along this line. Miss Jean Sargent, whose voice is familiar to every New England listener-in, probably about a year ago hit upon a novel idea. She went to John Shepard, Jr., owner of the station, and outlined the scheme sketchily.

"Today," she said, "radio stations seem to have the belief that they must present programs which will please every variety of listener-in. All the way from jazz to grand opera must be traveled on each day's program. This cannot last. Sooner or later stations are going to realize that specialization will do the trick much better."

Women Have Radio Needs

She knew that there were many women becoming interested in radio. Furthermore, she knew that graphic descriptions of boxing bouts, business talks and stock reports contained little interest for the women members of most families. Something ought to be done about this.

"Why not a special period devoted to women each day?" she demanded.

"And what could you put into that period?" was the question asked her.

"Oh, all sorts of things. Cooking classes, style talks, advice on interior decorating, gardening—the subjects would be endless."

So the idea was tried out one morning over the radio. The result was surprising. Letters poured in from all over New England, filled with praise and demanding more such periods. It was too popular to remain cramped in an hour's period, however, and soon several hours a day were given over to the women fans. Even so, the station was handicapped in being able to cover only comparatively small territory with its 100 watts; imagine the joy and excitement, then, when news was received last December that WNAC was going up to 500 watts.

The improvement in the station's power now makes it possible for it to thoroughly blanket the New England states.

Programs for women have been constantly on the increase. Each week saw a more elaborate progress in this direction. It was the day of March 4 that the crowning triumph thus far was reached. WNAC, on that day and evening, broadcast for the first time in radio history, a real, honest-to-goodness millinery show. The latest millinery for the coming Spring and Summer season was talked over at length, and vivid descriptions were given. All of the finest millinery artists of America and Europe were represented at this greatest of millinery shows.

All the Styles by Radio

The place was at the famous Copley-Plaza hotel, and in the spacious salon during the afternoon and evening, more than two thousand of the best-known hat designers looked over the models, discussed unusual creations and (Continued on Page 55)

Here is one of those latest broad-brimmed hats which Miss Jean Sargent described from the style show microphone for the New England flappers.
How Station WCCO
Super-for the NORTH
AS TOLD BY

Not satisfied with the physical properties of WLAG and to contribute $50,000 a year towards the support of the Twin City Station WCCO—a broadcasting station with a purpose—that's the Gold Medal Station, Saint Paul-Minneapolis. Its purpose is to serve the Northwest, and twelve hours a day, seven days a week, they work at it enthusiastically.

Incidentally, you have probably noted their earnest endeavors in the last week or two, even if you are not a resident of the Northwest, for on March 4 WCCO blossomed out with its new 5,000-Watt transmitting equipment, and also on that evening inaugurated its new Minneapolis studios on top of the Nicollet Hotel.

The new transmitter is one of the super broadcasting units, and the Minneapolis studios are said to be the equal both in equipment and elegance of anything in the country.

New St. Paul Studios

NOT satisfied with this, the management of WCCO announced that they would immediately begin building studios in Saint Paul. These will probably have the most unique location of any studios in the world, for they will be in Saint Paul's handsome new Union Depot used by nine railroads.

The Gold Medal Station is also unique in the manner in which it is supported. The physical properties, including the transmitting station located on the east bank of the Mississippi, 18 miles northwest of Saint Paul and Minneapolis, the new studios on top of the Nicollet Hotel, and the new studios, construction of which has just begun in Saint Paul, are all the property of the Washburn Crosby Company, who also operate the station jointly with the Saint Paul Association and the Minneapolis Civic & Commerce Association. A brief history of how the station came into existence is as follows:

One morning late in July, 1924, the Northwest awoke to discover that it was to be without broadcasting service. This condition was brought about by closing of the Twin City Station WLAG, operated by the Cutting & Washington Radio Corporation, and the closing of the Dayton Company's Station, WBAH.

Everywhere discussion was rife in the solution of the problem should be. This condition continued until August 5, when Washburn Crosby Company submitted a proposal to the Minneapolis Civic & Commerce Association and the Saint Paul Association. This proposal was as follows:

A Co-operative Plan

WASHBURN CROSBY COMPANY offered to buy the physical properties of WLAG and to contribute $50,000 a year towards the support of the Twin City Station WCCO for a three-year period, providing the business men of Saint Paul and Minneapolis together would contribute a like amount for the same period. The station was to be known as the Gold Medal Station, and was to be credited both to Saint Paul and Minneapolis.

Washburn Crosby Company also offered, if their proposition was accepted, to immediately place an order for a new 5,000 watt broadcasting equipment to take the place of the old equipment.

The proposition was accepted, and on September 12 the station became a reality. Carrying out the original agreement, Washburn Crosby Company placed an order for one of the new 5,000 watt broadcast sets, which was designed especially for that territory.

On March 4 the new broadcasting equipment of WCCO was formally introduced to the public when it broadcast the inaugural ceremonies from Washington by remote control.

Wednesday evening, March 4, WCCO opened its new Minneapolis studios on top of the Nicollet Hotel with what was unquestionably one of the finest programs ever broadcast by a radio station. The program opened at 8:00 p.m., with a short talk by Governor Theodore Christiansen of Minnesota, in which he outlined the value of radio to the public. The staff of the station was then intro-
Is Keeping Up-to-Date

Power Growing WEST

E. H. GAMMONS

duced over the air. At 8:30 began a musical program which continued for five hours. Included on this were the leading artists, orchestras, glee clubs, and quartets of the Northwest, the band of the famous Third Infantry, oldest regiment in the United States Army, now stationed at Fort Snelling.

Invitations were sent to approximately 5,000 residents of the Twin Cities to attend the opening and view the broadcasts. The result was a tremendous crowd, which jammed the hotel, elevators, hallways, and the studios themselves all evening, and gave ample evidence of the interest which Minneapolis and Saint Paul have in radio.

Towers 18 Miles Away

THE transmitting equipment of Station WCCO is located 18 miles northwest of the Twin Cities on the east bank of the Mississippi. There are the two 200-foot aerial towers and the power house. Programs are received over specially built telephone wires from studios in Minneapolis and Saint Paul.

The new studios on top of the Nicollet Hotel are housed in a structure built especially for them. There is a small studio for individuals and a large studio for groups. Between them are the announcer’s and operators’ rooms. Glass panels in the walls of the studios make possible a view of the broadcasting by persons in the reception room and in the promenade along one side of the large studio. These studios are literally “hung in the air,” the ceilings being suspended, the floors built upon cork, and the walls deadened by heavy drapes which are adjustable. They are luxuriously furnished and have been pronounced by those who have seen practically all of the broadcasting studios as being surpassed by none.

With “Service to the Northwest” as its slogan, the Gold Medal Station is now ready to provide the Northwest with programs to equal any.

New Director for WCCO

HENRY A. BELLOWS, well known magazine editor and musical critic of the Northwest, will become associated with WCCO soon as director, according to an announcement made by the management.

Mr. Bellows in the position of director will have complete charge of the arrangements for and all the broadcasts from the station.

He is nationally known as a writer, editor and an authority on music. For thirteen years he has been associated with the “Northwestern Miller” Minneapolis, as managing editor, associate editor and director. Prior to that he was editor of “The Bellman.”
The West Proclaims a Champion

"Uncle John" Daggett of KHJ, Los Angeles, is Contest Winner for March

"For East is East and West is West. And Ne'er the twain shall meet."
—With apologies to radio.

Radio, the great annihilator of distance, has reached out its mighty arm and placed its finger on a spot amid the orange blossoms and has sought out the Master of Ceremonies of the broadcasting station known as KHJ, at Los Angeles. And, meeting on common ground, the East has turned West to proclaim a new champion in the person of our beloved "Uncle John" S. Daggett, the winner of RADIO AGE's popularity contest for the month of March.

A newspaper man for many years, Uncle John has long since learned what constitutes the fundamental elements of human interest. And by carrying his unassumed geniality from the editorial offices to the broadcasting studio of the Los Angeles Times, he was at once accepted as one of the foremost announcers of this century. For he is anything but supercilious.

Step into the studio of KHJ and you will there find a tall man with sparkling, kindly eyes, rempled gray hair and a winning smile. Look into his heart and you will discover a fatherly personality that radiates through the microphone, bringing cheer to the sickroom, the children, the housewife and the business man alike. Just such a man is Uncle John.

A Suitable Inspiration

Surrounded as he is by singing canaries, the studio forms a fitting setting from which to gather inspiration in entertaining the little folks. In this he instantly gained popular favor, particularly in introducing Queen Titania, the golden haired tot of the "movies," and the Sandman, O. G. Pirie, her father. This trio has done much to entertain and at the same time teach the kiddies the proper way of living.

For John Daggett believes that the voice of radio should do more than merely entertain. Versatile as he is dynamic, he feels that the public is betrayed if a performer is not inspiring to better things of life and likewise educational. The entertainment must be wholesome, and above all it should appeal to the masses. Religion is given its place in the schedule of KHJ, and here, too, Uncle John has shown his keen understanding by offering the microphone to all sects and denominations.

In observing the spirit of close harmony ever prevailing between the director and his many artists, one at once understands why Uncle John has little difficulty in securing real talent for the delight of his many listeners. Despite his portrayal of diligence itself, he always has time for a pleasant sally or kind remark for all who come in contact with him. The studio houses one large "happy family."

And the radio artists are not the only ones present. John Daggett extends the hand of cordiality to all visitors to the capacity of his studio. Those of his vast audience who desire a "close-up" of what happens behind the scenes are assured a genuine treat of true western hospitality.

KHJ, the visitor is told, means Kindness, Happiness and Joy, and if you have not already been convinced, just give your dial a twirl some night to the 405 meter wave and stand by to be washed overboard by the joyful, "KHJ, Los Angeles, California."

The Winner for March

John S. Daggett, Announcer, KHJ, Los Angeles

Winners of Preceding Months

July: Bill Hay, KFXX, Los Angeles
August: Harry Snodgrass, KDKA, Pittsburgh
September: H. W. Aslin, KDRA, Pittsburgh
October: Bert Davis, WOJ, Chicago
November: Jack Nelson, WJJD, Chicago
December: Harry M. Snodgrass, Entertainer

January: Jack Nelson, Announcer, WJJD, Chicago
February: Bert Davis, Entertainer, WOJ, Chicago
March: John S. Daggett, Announcer, KHJ, Los Angeles
April: Lincoln Entertainer, WOJ, Chicago

Standing to March 15

Name and Classification

Where Heard

Karl Benanetz, Organist... WIP, Philadelphia
Bill Hay, Announcer, KFXX, Hastings
H. W. Aslin, Announcer, KDRA, Pittsburgh
Coco-Sanders' Nighthawks, Orchestra, KYW, Chicago
Harry M. Snodgrass, Entertainer
Jefferson City
Jack Nelson, Announcer, WJJD, Mooseheart
Bert Davis, Entertainer, WOJ, Chicago
John S. Daggett, Announcer, KHJ, Los Angeles
Arion Trio, Entertainer, WOJ, Chicago
Ford & Glenn, Entertainers, WLS, Chicago
Duncan Satters, Entertainers, KYW, Chicago
Lembohs, Entertainers, WSB, Atlanta
J. Remington Welisch, Organist, KYW, Chicago
Ford Smith, Announcer, WOJ, Chicago
R. L. Tyxion, Announcer, WWJ, Detroit
Hedg Hand, Announcer, WBAP, Fort Worth
Ben Kaney, Announcer, KYW, Chicago
Nick B. Harris, Entertainer, KFJ, Los Angeles
Jerry Sullivan, Announcer-Entertainer, WOJ, Chicago
Edward H. Smith, Director Player

WGY, Schenectady
Charles E. Ehrstein, Announcer... WTAG, Elgin
Dumas Placket, Entertainer... WNO, Chicago
Wendell Hall, Entertainer... WDAY, Kalamazoo City
Howard Mithold, Announcer... KGO, Oakland
Scottish Rite Orchestra... KGO, Oakland
Banks Kennedy, Entertainer... WEBB, Chicago
Harris, Announcer... KDKA, Pittsburgh
Robert Boniel, Announcer... WEBB, Chicago
Arion Trio, Instrumental... KGO, Oakland

Deadline is Near

The contest is rapidly drawing to a close. At midnight, June 15, RADIO AGE will accept the last of the ballots cast for the many favorites in the Popularity Contest.

During the period from February 16 to March 15, John Daggett by virtue of having garnered the greatest number of votes during the thirty days, advanced his position from twelfth to third place. It will also be noted that H. W. Aslin, Harry Snodgrass, Jack Nelson, Fred Smith and "Sen" Kaney have all strengthened their positions in "Standing to March 15."

Charles Ehrstein, Lee Sims and Arion Trio are newcomers to the list.

Up to now, the candidates at the head of the list have been fairly consistent in their leadership, but in spite of the short time that the contest has yet to run, victory is by no means assured to any one of them. Many a race is won or lost by clever jockeying near the finish.

So now for the smashing drive! Your opportunities to say it with ballots for your favorite are limited. Clip the coupon and send it in now while the contest is fresh in your mind.
Common Sense Replaces Nursery Rhyme Methods

THE BEDTIME STORY is coming into its own. Not so very long ago the "queer" ladies and gentlemen who furnished the entertainment for the kiddies by radio had quite a hard time getting the radio public to take them seriously. In fact, they had a hard time taking themselves seriously, and as a result the great American sport of radio bedtime story-telling failed to rise above the level of crude humor for several months after the popular advent of the broadcasting art.

The originators of the bedtime story idea thought that to amuse the kiddies they had to adhere strictly to nursery rhyme psychology. They never thought for a moment that maybe their child listeners could rise above the moron plane and enjoy some real common-sense Children's Hours.

The entrance of a new form of Bedtime Story material occurred almost simultaneously in Boston and Chicago. The owners of Station WEEI in Boston decided to form a "Big Brother" Club along the lines of the well-known organization of that name, and to appeal to boys and girls of all ages by the radio. No silly Bedtime Stories, mind you; no childish prattle on how this little brown bear came home with his folks and found his meal absorbed by an unknown mouth. The Big Brothers of radio set out to do some real work among the children, and to substitute this brotherhood movement for the meaningless kindergarten material that persisted in remaining part and parcel of every radio station.

7000 Child-Members

WEEI'S idea was an immediate success. In a little over a year membership in the Big Brother Club has jumped to 7000 child members, ranging from 1 to 14 years. "Bob" Emery and Dorothy Blackwell are the guiding lights of this juvenile institution, and it is through their efforts that the Big Brother Club is today one of the strongest children's organizations in the country.

While all this was going on in the East, Walter Wilson, the original bedtime story man known as "Uncle Bob" from KYW, Chicago, was changing his mode of "approach" also.

Uncle Bob had been with radio from the start, and he had tried every known means of gaining the favor of the kiddies. Of course, his nursery rhyme method was successful, for he had the knack of conveying his personality from the studio to the children listening in, but like the few keen-minded radiologists of two years ago, Wilson realized the children must have something better or they would soon outgrow his daily Bedtime Story Hour.

So Uncle Bob formulated a standard Children's Hour program that not only interested all children—everywhere—but their parents as well! His method today consists largely of singing and playing the piano, intermingling modernized children's songs with the well known popular melodies. And this new method has been so successful that KYW's bedtime story listeners have doubled during the past year.

A New Kind of Bedtime Story

By RUSSELL H. HOPKINS

"Uncle Bob" Wilson believes in personal contact, and his immense popularity can be largely attributed to his making periodic "personal" appearances in towns where his Bedtime Hours are most popular. Both Wilson and KYW realize that this is an invaluable aid in holding the station's young friends.

Children Help, Too

FORD RUSH and Glenn Rowell, the Bedtime Story Boys of WLS, Chicago, get closest to the children's hearts by introducing the policy of having children do broadcasting during "Lullaby Hour" from WLS. On certain days of the week Ford and Glenn invite ambitious Lullaby Listeners to participate in their intimate talks with the radio listeners, and as a result, thousands of children who are WLS "fans" are competing among themselves to be chosen to help "Big Ford and Little Glenn." The popularity of their Lullaby Club has resulted in a tide of correspondence that nearly equals that received from all other programs combined.

And Ford and Glenn abandoned story-telling long ago. Instead, they talk to each other in a personal way and talk to the kiddies as if they were in the same room.

Truly, this is an era of new things in radio and especially in the gentle art of winning juvenile listeners and holding them as they grow older.

(Copyright, 1925, By Radio Age, Inc.)
Some Radio Programs and Personalities

Behind the Scenes at KFI

Where Broadcasting Is an "Art"

By MARGOT LYON
Program Director, KFI,
Los Angeles, Cal.

The phonograph and the camera introduced the surprising fact to many people that other people did not see and hear them as they saw and heard themselves. The latest development of science in disillusioning some and enchanting others is the radio. As has been often said of other things, you never can tell who’s who over the radio until you have heard them over the radio.

Many of KFI’s artists have sung but rarely elsewhere, some of them coming to KFI with friends just to see what went on behind the scenes, and, singing just once at the request of some of the regular artists, have made such a success that they have come again and again.

It is peculiar to witness the reaction of those who hear singers in the studio and then walk out to the loud speaker and hear the same voice as it comes off the air. A tenor whose voice in the studio seems to lack resonance and purity will broadcast with the utmost clarity and sweetness, his broadcast voice leaving nothing to be desired, whereas a trained voice, that from the concert stage has delighted thousands, will not "radiate" well at all.

It’s Not a “Cinch”

Due to the difficulty in judging a good radio voice and to other reasons not so easy to illustrate, the position of a program director is no sinecure. However, the vast KFI audience seems to be pleased with the station’s efforts, to judge by the many letters they send.

The demand of radio broadcasting has developed a supply of radio entertainers. The field of broadcast entertainment is being widened by the sincere efforts of the studio managers and the artists.

As in the early days of vaudeville, the first effort toward entertainment has been the attempt to present novelties and unusual stunts. However, more and more over the radio, as over the footlights, the combined effort of artist and station has developed a sincere and worth-while form of entertainment eminently fitted for the needs of radio.

The audience, listening with headphones or with loud speaker, are blind as far as the studio and what is broadcast from the studio are concerned. Every program must be planned from the start as though it were being played before a theater with the lights off. Although this may seem self-evident it is not generally considered. Every trick of the human voice, every intonation, inflection and articulation must be polished to the last point before the audience can attain the maximum enjoyment from the program.

By letters and by broadcast requests for information, KFI has made up charts of the type of program most enjoyed by the public and finds that almost every kind of program has its adherents. For the humorous monologue to the classic string quartette come letters from isolated farms and from yachts and country estates. Strange to say, the letter in favor of the string quartette is more than likely to come from the tired wife of the farmer, who washes dishes or irons her clothes a thousand miles away from KFI, while listening to Mozart or Haydn.

Letters come in from the blind whose only comfort is the radio and from the deaf who perhaps have never heard a sound from the great silent world until with ear-phones they have picked up a program from KFI.

Phone Lines Always Busy

One of the most interesting things to be met with in the broadcasting station is the number of telephone calls that come in during the various programs, ranging from requests for various numbers to inquiries as to the proper feeding of a baby and what are the ten points of a prize winning Airedale.

Somewhat peculiar are the requests for songs. A singer may just have finished “Pace pace mio dio” when an ingratiating voice will ask, over the phone of course, if the lady who just sang could please render “Charley, My Boy.”

Sometimes there is a great deal of pathos in the requests. One particular night a frantic mother called asking if we could not in some way help her to locate her little boy who had strayed away. It had to be explained to her that the laws of broadcasting did not permit such announcements to be made. Other times an old time number will be asked for, to please some one who is ill or shut in. Then the artists will scurry about and among themselves refresh their memories and the most daring of them will attempt to "fake" a piano accompaniment.

It is not possible to grant all the requests asked for during the actual broadcasting hour, and it is the habit of KFI at certain times to ask those who wish to hear their favorites sing certain numbers to be sure to write in their requests so that the artists may plan on pleasing their friends. When the fact is known that as many as thirty requests have been phoned in during one hour for one artist, such as Starr

(Continued on page 54)
A Compact Traveling Set

The 6-Tube "Portatron"

By JOHN B. RATHBUN

Controls are Simple and Operation Quiet

and this system must therefore be discarded right at this point, both for the reason that it takes up much room, and also for the reason that a separate dial control will be required for each radio stage (and for the tuner unit in addition) which will bring the total number of controls up to three or more. This is out of the question in a portable outfit; hence we must look farther for a means of radio frequency stage coupling. We should have only a single selective control for the tuner unit, and no variable controls after the first stage that are represented by dials or knobs on the front of the panel.

Resistance Coupling

Resistance coupling for the radio frequency and audio frequency coupling requires no separate interstage controls, but unfortunately, resistance coupling in the radio frequency stages is only efficient on long wavelengths, say on wavelengths above 1,000 meters. This resistance coupling method will be fine for the audio stages, and is just what will be used for the output, but we will have to guess again in regard to the coupling on the R.F. end of the hookup. The untuned or fixed radio frequency transformer at once suggests itself, but for this time it must be rejected because of the space occupied and for the reason that such transformers are likely to "back-couple" between stages if crowded together as closely as we intend to crowd the stages of this outfit.

There is only one other coupling possible on the R.F. end, and that is by means of inductances of the "choke coil" order, which are connected into circuit just like the resistance units of a resistance coupled stages. One end of the choke coil is connected to the plate of the tube, while the other end goes to the (+B). The connection between the first tube plate and the grid of the following tube is made through a fixed condenser just as in the case of the resistance coupling scheme. The choke coils must have a very much higher inductance than commonly used with radio frequency tuning units. They should consist of several thousand turns of very fine wire. The secondary coil of an audio frequency transformer will be just about right for this purpose when the standard 100 Milli-Henry chokes cannot be obtained. The inductive value must be sufficient to choke back the high frequency plate current so that it will not short circuit back through the "B" battery connections, and at the same time the coil resistance should not be sufficient to interfere with the supply.
Schematic diagram of six-tube portable set with combined impedance and resistance couplings.

Six tube portable set single control system with two stages radio and three stages of audio amplifier.

Detail of coupler primary 12-15 turns. Secondary 50-60 turns. 5-5 turns.

Detail of grid coupling coil, 100 ohm wire 14 turns. 100 ohm wire 24 turns.
of continuous "B" battery current to the plate of the tube. The choke coil permits the "B" battery current to pass to the plate, but chokes back the R. F. current.

Radio Frequency Amplification

The application of the choke system to the first three tubes will be seen in Fig. 1 and Fig. 2, where Fig. 1 is a schematic diagram using symbols, and Fig. 2 is a picture wiring diagram. The first will be of direct service to the rear-encased builder in "doping out" the circuit, while the latter will show the novice how the wiring connections are actually made to the parts. Fig. 3 is a front elevation of the panel and cabinet, while Fig. 4 is a rear elevation showing the parts assembled at the rear of the panel. Fig. 3A is a sectional view as seen from one side of the assemblage.

Taking Figs. 1-2, we see that an aperiodic type coupler is used at (L1-L2) which is tuned by vernier variable condensers (K1-K2) across the secondary coil (L2) of the coupler. This can be a home-made coupler such as has been described many times in these columns; it can be a standard neutrodyne transformer with standard adjustable aperiodic tuner. In any event, the primary coil, (L1) is untuned. When the usual flat top aerial is used, the aerial lead-in wire is connected to (AXT) and the ground wire at (GN), a system which gives the aerial a high-voltage piezoelectric strength. By connecting the ends of a loop aerial at (X1) and (GN), and then opening the grid switch (T), we can operate on the loop aerial. The tap switch (T1) cuts out the secondary coil (L2) which is necessary on loop reception.

Coil (L3) suppresses oscillations. When operating on the flat top aerial, or a type similar to the usual outdoor aerial, the coupling between the primary (L1) and the secondary (L2) must be very "tight," and cannot tolerate any considerable space between the two coils. For this reason, it is best to adopt a ready-made coupler in which the coupling gap can be easily adjusted until the proper degree is found by experiment. We have only one control, and to obtain the proper selectivity in local jams we must have the proper "looseness" between the coils. The home-made coil generally contains from 12 to 15 turns of No. 26 D. S. C. wire on the primary (L1), and from 55 to 60 turns on the secondary coil (L2), using the same size wire. The distance between the two coils, or the coupling, may be from 3/8 to 1/2 inch or even greater.

By a 4.5 volt three cell "C" battery at (C), we usually get greater sensitivity and signal strength, and the battery also reduces the tendency towards free oscillations in the circuit. However, the "C" battery can be omitted in many cases without serious loss. The switch (T) can be the usual form of tap switch with a definite contact point, and one dead contact.

The first radio frequency tube (T1), which follows the tuning inductance, is provided with the choke coil (CC) connected to the plate at one end and to the (+B) line at the other, so that from 90 to 135 volts of "B" battery will be maintained on the plate. The plate of tube (T1) is coupled to the grid of the second R. F. tube (T2) through the fixed coupling condenser (K1) ofordinarily of 0.00025 mf. capacity. This condenser prevents the application of the plate voltage to the grid of (T2) and thus prevents the high "B" voltage from paralyzing this tube. The choke coil (CC) can be the secondary winding of an audio transformer, and as will be seen, prevents the R. F. plate output from short-circuiting the "B" battery.

YOU PORTABLE FANS!

If you want a smaller and more compact portable receiver than is described in the RADIO AGE Blueprint section this month, you'll find another in the JUNE ISSUE, out May 15. It will be

A 3-TUBE PORTABLE REFLX

"THE BABY OF THEM ALL."

Just the thing to put in your suitcase for that vacation trip.

By John B. Rathbun

IN JUNE RADIO AGE

The Magazine of the Hour

All of the audio tubes "taper" toward the rear; that is, the last tube has a higher leak resistance than that of the first audio amplifying tube. (GL2) = 1.0 megohm, (GL3) = 5.00 megohm, and (GL4) = 25.00 megohm. This arrangement gives a stronger bias to the grids on the tubes which are most heavily loaded, and therefore results in a better distribution of amplification through the tubes. The output tube (T6) leads to the output jack (J1). A full 90 volts must be maintained on the plates of all amplifier tubes, and where possible, this should be increased to 112.5 volts as the choke and resistance coupling demands a higher voltage than the straight transformer coupling ordinarily used. Two vertical type 45 volt blocks will take up the minimum amount of space in the cabinet when the batteries are carried in the cabinet, but a third small 22.5 volt block will greatly improve the performance by raising the voltage to 112.5 volts. The great trouble with a portable set is to get the batteries into place without monopolizing all of the cabinet space. When the set is built for ordinary stationary service, we can use three 45 volt blocks of "B" battery, giving 135 volts, and will thus obtain the maximum output of the tubes. The small size "B" batteries must be used for the portable set. For "A" batteries are to be No. 6 cells and are connected up in series to give a total of 4.5 volts across the rheostat. When possible, these should be square batteries so that the maximum amount of battery material can be put into a minimum of space. The demand
of the six tubes is slightly greater than that ordinarily recommended for continuous service (0.36 ampere), but with the voltage being 3.5 volts it should last for a long time before replacement becomes necessary.

**Reason for Six Tubes**

With transformer coupling on both radio frequency and audio frequency stages, a five-tube set is commonly built; with two radio stages, detector, and two audio stages. With choke coils in the radio stages and resistance coupling in the audio stages, the amplifying power of the tubes is somewhat reduced so that the tubes can be made small enough to give the same results. However, this is more than compensated for by the simplicity of the controls and the clear toned, noiseless operation of the set. It has a far better tone than with the usual arrangements and can be handled by the novice in radio.

Fig. 3, showing the front elevation of the panel and cabinet, gives a good idea of the general arrangement of the receiver when designed as a portable set. The cabinet is really divided into two parts, (1) the upper portion covered by the panel being for the radio circuit proper while (2) the lower compartment houses the "A" and "B" batteries. As this is a special arrangement, the cabinet and panel will have to be made specially for the job and it is not likely that a ready-made cabinet or panel can be found which will exactly fit the conditions.

In the front view of Fig. 3 we see that the panel contains all of the controls, and also the three binding posts for the aerial (ANT-X-GND). The dial of the tuning condenser is at (C1), and for accuracy this should be a four-inch dial with some sort of vernier arrangement, as the tuning is exceedingly sharp. The vacuum tube socket nearest the front face of the detector tube is at the right of the condenser dial. The battery switch for turning the "A" battery current on and off is at "SW" and the output jack is (J1). In the upper right hand corner of the panel is the grid and filament (PT) for the detector tube.

From the finished surfaces on which it may lie, as well as to prevent or help to prevent, the ringing microphonic noises experienced with "199" tubes.

**Shell for Tubes**

The side sectional view of Fig. 3A shows that the shell (F) is used for carrying the first three tubes, and that this shell is attached to the panel (E) by means of brass angle brackets (L). The shell (F) carries the first two tubes (T1-T2) of the radio frequency circuit and also the detector tube (T3). Below the upper end of the shell is placed the bracket on which the three audio tubes (T4-T5-T6). As the resistance units and other parts of the circuit are carried on the underside of the shelves with the sockets on top, we must be sure to leave room to accommodate them on their sockets, plus the thickness or height of the resistance units and the condensers, plus clearance.

The material used for the cabinet can be 3-16 inch or 3-8 inch thick, but if care is taken, just as good results on the put together with matched corners, will be perfectly safe when built of 3-16 inch stock. The bakelite panels should not be less than 3-16 inch thick and this also covers the shelves which should be of the same material and at least 2-16 inch thick. But the bakelite or formica. The shelves carry the wiring and many of the current carrying parts so that their insulating value should be fully equal to that of the panels.

We cannot further into the details of this cabinet's construction will be clearly seen by those who are competent to undertake work of this sort, and if one is not sure of being able to build this cabinet, the drawings are amply dimensioned for a practical cabinet-maker. For this reason, I do not suggest anyone who has not had a cabinet making course, and can now give the hint that you also give him the panels and shelves so that he can get a good fit between the edges of the panel and the rabbet of the cabinet.

**Arrangement of Apparatus**

Fig. 4 shows the arrangement of the apparatus as seen from the rear of the panel. The six tube sockets (U) are placed in groups of three on the two shelves (F) and (H), and the outlines of the tubes are indicated by thin dot and dash lines so that the allowance for shelf clearance can be easily seen. The tubes are numbered so that their relation to the circuit drawings of Figs. 1 and 1 can be easily followed, and the sockets can be located in the same way. Fig. 3A and Fig. 4 are used in combination, thus obtaining the side and rear elevations of the assembly.

It will be seen that the shelves are cut off at the right in Fig. 4 to accommodate the variable tuning condenser (C1) and the variable inductance (L1-2). On the lower side of the shelves will be seen the coupling resistances, grid condenser, grid leaks and the wiring. In making allowance for the space between shelves, measure the height of the tube plus the height of the socket (U) give a little clearance so that the tubes can be taken out of the sockets and replaced without tearing the set to pieces. In other words, the true height of the socket assembly is the sum of the tube height, plus the socket height, plus a little clearance between the lower end of the tube and the top of the socket.

The arrangement of the battery compartment in general with the batteries in place is marked. Stronger springs made from flat spring brass bars bear on one side of the batteries and hold them in place against jolts and jars when the set is being carried. Connections between the apparatus and batteries are made by means of terminals for flexible wire which can be obtained from any electrical store. This is very flexible and well insulated, and makes an ideal connection. The ends of the fixture wire should be provided with "spade" type tips soldered to the connecting posts, and then make a permanent contact with the connections which is easily attached and which does not loosen under ordinary conditions. Do not attempt placing the strands of wire directly under the binding screws. For this reason, the contacts are made in an eye to which they are almost certain to get undone.
Economy of Arrangement Is Vital
(Continued from page 33)

Alternative Arrangement

As will be seen, the part of the assembly taken up by the receiver proper is very small, the panel measuring 10 inches deep, but for some purposes the total height with the batteries included may be too great to be practicable. In such a case, the battery compartment can be made separate, terminating the receiver portion at the board shown running over the tops of the batteries. This, however, makes it necessary to reconnect the batteries every time that the receiver is set up and as a result it is a decided nuisance.

As laid out in the drawings, there is ample room for a fifth "B" battery if it is desired to operate with a plate voltage of 112½ volts, or a sixth "B" battery if we wish to operate at 135 volts. Further, there is room for one spare "A" battery if it is desired to carry this arrangement along on a trip. The voltmeter (VM) is a very desirable instrument, particularly when drying "A" batteries, as it indicates the voltage due to weakening batteries. Unless we have some means of testing the voltage occasionally, we are likely to believe that the set is out of order when the voltage drops, and waste much time chasing for trouble in the wiring when the difficulty actually exists in the cells. Just because automatic filament controls are installed for the regulation of the filament current is no reason why the voltmeter should be omitted.

Voltmeters must be connected properly according to polarity, and you must be guided by the markings on the instrument itself. If polarity is wrong, then the needle indicator will be thrown against the wrong end of the scale. The size of the voltmeter should be so chosen that the full voltage will bring the needle near or slightly beyond the center of the graduated scale where the divisions are the largest, and the battery voltage should not allow the needle to the far end of the scale.

Suppressing Oscillations

Free oscillations in the radio frequency stages, or reed type of receiver, and我们 must devise some system for stopping these oscillations if we expect to get the full output of the set. In fact, most of the trouble experienced with sets having radio frequency stages can be traced to improper or imperfect methods of damping down the oscillations. There are a number of methods of stopping oscillations, among which are the potentiometer, neutralizing condensers, bias batteries, etc., but in this receiver we have simplified the problem by the use of a parallel reactance coil (L3) on the diagrams.

Coil (L3) consists of four or five turns of wire wound on the end of the tuning coil. One end of this coil is connected to the plate of the first radio tube as shown, while the other end is left open or is unconnected. As one end is opened, only capacitive current will flow from the plate into the coil, and the magnetic coupling is therefore very feeble, as it should be. Some little experimenting will be required in adjusting this coil before it just stops the oscillations. It may be that the plate connection must be connected to the other end of (L3), or that the whole coil must be wound on the other end of the tube. Varying the number of turns, or the distance of (L3) from (L2) may be required. Just because you have not hit the proper combination on the first trial is no proof that it will not work. The losses are at a minimum with this arrangement, and there are no separate controls as when a potentiometer is used. In addition to the compensating coil (L3), the "C" battery will be an aid in keeping down oscillations and increasing the sensitivity of the first two tubes.

End Your Radio Troubles for 30c in Stamps

We have laid aside a limited number of back issues RADIO AGE for your use. Select the ones you want and enclose 30c in stamps for each desired. All issues are included in the store of radio knowledge by laying in an ample stock of copies NOW!

January, 1924

- Tuning Out Interference- Wave Trade- Eliminator
- Filters
- A Fancy Supercollider
- Push-Pull Amplifier
- Balancing Circuit

March, 1924

- A Push-Pull Super-Collider
- A simple low loss tuned
- A Tuned Radio Frequency Amplifier
- Simple's Reflect Set

April, 1924

- An Efficient Supercollider (full illustrated)
- Anti-Body Capacitor Resistor
- Antenna Amplifier
- Index and First two Installations of Radio Age Data Sheets

May 1924

- Construction of a Simple Portable Set
- Third Installation of Radio Age Data Sheets

July, 1924

- Important Factors in Constructing a Supercollider
- A Ware Radio Set
- An Improved Audio Filter for Baby Heterodyne
- Radio Age Data Sheets

July, 1924

- A Portable Tuned Instrument Reflex
- Operation of Baby and Grid Blue.
- A Three-Tube Wizard Circuit.
- Data Sheets.

August, 1924

- Changing Into Radio Without a Diaphragm.
- The Simplest 3-Element Tube.
- Filtered Heterodyne Audio Mains.
- An Audio Amplifier Without an "A" Battery.
- Data Sheets.

September, 1924

- How to ImproveReceiver Performance.
- One Tuning Control for For's Breadth Selectivity.
- Four Postr, and Rheostats of A New Baby Heterodyne, and an Apartrine Variometer Set.
- Index and Last two Installations of Radio Age Data Sheets.

November, 1924

- A Home Made Super-Reflex.
- An Improved Audio Filter for Baby Heterodyne.
- An Improved Single Receiver.
- Simple Reflect Set.
- Audio Filter for Baby Heterodyne.
- Radio Age Data Sheets.

December, 1924

- Blueprints of a 4-Tube Super-Heterodyne.
- A Air Line Receiver (full illustrated).
- A Transtroliner TX. Receiver.
- How to Make a Reliable Battery Charger and a Loud Speaker at a Small Cost.

January, 1925

- A Reflected Neutrodyne.
- A Six Tube Super-Heterodyne.
- An Efficient Portable Set.
- Finished Plate Resonator.
- Making a Meter-Finder. 2. February, 1925

- A Sure Shot Super-Heterodyne.
- A Four Circuit Reflect, and a Single Receiver.
- Small Coils of a Reflect.

March, 1925

- A Simple Reflect Set.
- A Four Circuit Reflect.
- How to Wind Low Coil Coils.
- Simple Reflects and Reflectors.
- Blue Prints of a Two-Tube Ultra Audion and a Regenerative Receiver.

April, 1925

- Blueprints of a Two-Tube Portable Set.
- "W" Volutes from the A. C. Socket.
- A Simple Reflect Set.
- Blueprints of a Five-Tube Radio Frequency Receiver.

December, 1924

- Blueprints of a 4-Tube Super-Heterodyne.
- A Air Line Receiver (full illustrated).
- A Transtroliner TX. Receiver.
- How to Make a Reliable Battery Charger and a Loud Speaker at a Small Cost.

January, 1925

- A Reflected Neutrodyne.
- A Six Tube Super-Heterodyne.
- An Efficient Portable Set.
- Finished Plate Resonator.
- Making a Meter-Finder. 2. February, 1925

- A Sure Shot Super-Heterodyne.
- A Four Circuit Reflect, and a Single Receiver.
- Small Coils of a Reflect.

March, 1925

- A Simple Reflect Set.
- A Four Circuit Reflect.
- How to Wind Low Coil Coils.
- Simple Reflects and Reflectors.
- Blue Prints of a Two-Tube Ultra Audion and a Regenerative Receiver.

April, 1925

- Blueprints of a Two-Tube Portable Set.
- "W" Volutes from the A. C. Socket.
- A Simple Reflect Set.
- Blueprints of a Five-Tube Radio Frequency Receiver.

RADIO AGE, Inc. 500 N. Dearborn st., Chicago

The Magazine of the Hour
Radio Age Institute
Manufacturers' Testing Service

MEMBERS of the staff of RADIO AGE will be pleased to test devices and materials for radio manufacturers with the object of mining their efficiency and worth. All apparatus which meets with the approval of various tests imposed by members of the technical staff of Radio Age will be awarded endorsement, certificate shown to the right will be furnished free of charge. Materials for testing should be sent to:

RADIO AGE INSTITUTE
504 N. Dearborn Barn, Chicago, Ill.

Test No. 47. THE QUAN CONDENSER. Submitted by the Quan Radio Corporation, of Chicago, Ill. The manufacturers claim this condenser to be the lowest cost commercial condenser made. The radio-frequency measurements of this condenser in our laboratory indicate they are not exaggerating in their claims. This condenser has a resistance as indicated by the standard to which it is compared, for the whole broadcast frequency range and for various values of capacity. The very small reactance attributed to the high insulation resistance and low dielectric losses, due to the use of the pyrex end plate, which is well out of the demagnetizing range, arrived in good condition, and satisfactorily passed the tests and requirements of RADIO AGE Institute.

Test No. 48. THE ULTRA VERNIER Tuning Control. Submitted by the Phoenix Radio Corporation, of New York City. This tuning control was designed by the well-known radio engineers, R. E. La Caugh, and is feared so well enough to give hairline splitting accuracy without marring tuning time. It is tested 30 to 1. The face of the dial removes rattle on the panel. The rotor or moving arm turns without the least twist to the bottom of the dial. The real usefulness of this dial in quick and accurate tuning is the provision made for the fan to spool the dial with pencil or less in the station he desires. These units are very attractive in appearance, practically passed the tests and requirements of RADIO AGE Institute.

Test No. 49. DUPLEX MATCHED CONDENSERS. Submitted by the Duplex Condenser and Radio Corporation, of Flatbush Ave., Brooklyn, N.Y. These condensers come in sets of three, and their advantage lies in simplified looping, for their use affords uniform dial settings for tetrode and all other radio types. Tests proved that Duplex condensers are accurately made and do not change capacity, unless varied by the operator. These plates are die-cast in their shafts, and the plates are forced into connecting slots milled in the end posts. The condenser submitted was a 21 plate. Satisfactorily passed the tests and requirements of the RADIO AGE Institute.

Test No. 50. THE CARBONUDUM DETECTOR. Submitted by the Carbonudum Company, North Falls, N.Y. This detector contains some special carbonudum made for radio purposes. Tests in our laboratory revealed that this detector gives volume equal to any and in many cases more than any other crystal. When tested for selectivity, it is so sharpened that interference was cut to a minimum. While other crystals burned out by the application of repeatedly strong sources, the Carbonudum detector stood up well for the period in which it was used. The detector worked very well in all tests passed in good condition, and satisfactorily passed the tests and requirements of RADIO AGE Institute.

Test No. 51. NA-ALD SOCKETS. Manufactured and submitted by the Allyn Manufacturing Co. of Springfield, Mass. These sockets are made of high grade bakelite by a special process. According to our tests, they were very low. The finish on these sockets is permanent and stood up well over extensive usage. Sockets are guaranteed indefinitely. Satisfactorily passed the tests and requirements of the RADIO AGE Institute.

Test No. 52. ULTRA VERNIER DIAL. Submitted by the Luminous Mfg. Co. of 9 Liberty St., Jamaica, N.Y. These resistance values, when used in place of iron core transformers in audio amplification, were found to negatively eliminate distortions. Besides giving pure tone quality, they are reduced by a factor of 20 in capacity and change of frequency. These dials have been carefully designed to give hairline splitting accuracy without marring tuning time. They were mounted in our tests under ordinary gears and sockets. Satisfactorily passed the tests and requirements of the RADIO AGE Institute.

Test No. 53. CRESCENT LAVITE RESISTANCES. Manufactured and submitted by the Crescent Radio Supply Co., of 9 Liberty St., Jamaica, N.Y. These resistances, when used for the same capacity are better than the iron core transformers, and are used in our test. The results were very low. The finish on these sockets is permanent and stood up well over extensive usage. Sockets are guaranteed indefinitely. Satisfactorily passed the tests and requirements of the RADIO AGE Institute.

Test No. 54. THE HANDY CONDENSER GLIP. Manufactured and submitted by the Ridge Manufacturing Company of 55 N. Rodgers Ave., Chicago, Ill. This clip was designed for the purpose of providing great freedom of access to fixed condensers in radio receivers. This clip, for use with fixed condensers, was tested over a period of thirty days, and it was observed that the insulation strength was considerably augmented. It is used for preventing the change of capacity in the fixed condenser, shorting the circuit or opening the circuit, and otherwise generally protecting the condenser from outside damage. Satisfactorily passed the tests and requirements of RADIO AGE Institute.

Test No. 55. THE GLOBE HEADSET. Manufactured and submitted by the Globe Phone Manufacturing Company of Reading, Pa. The Globe headset was tested both for function, and distance, strength, and in every instance clearly of tone at all. In surprising "sweetness," on high notes was evident. These receivers are constructed with bays embedded in a polished nickel finish, and one winding is shielded. Magnets are of drop form and rust proof, and terminals are corroded. The adjustments on the head is comfortable. Tests revealed remarkable results. Satisfactorily passed the tests and requirements of the RADIO AGE Institute.

Test No. 56. THE TRI-JACK AND B M J'S. Submitted by the Brooklyn Metal Stamping Co. of 218 Atlantic Ave., Brooklyn, N. Y. The Tri-Jack, shown in the illustration, is manufactured to meet capacity effects almost entirely. The single circuit, circuit, and double circuit jack combined and the very latest in radio development. It contains the size of the end jack, and is made up of molded, solid, Bakelite, and the overall dimensions are one inch by one inch. The terminals are clearly marked. The B. M. Jack, submitted with the Tri-Jack for test, was also found efficient for simple open circuit work. It is designed for easy soldering. Lugs are spaced to be always accessible. The lug tips are tough. Satisfactorily passed the tests and requirements of RADIO AGE Institute.

Test No. 57. AMPERITE RECTIFIERS. Submitted by the Radiant Co. 90 Franklin St., New York, N. Y. An automatic rectifier used in place of the customary rectifier, a small tube that contains this resistance element in a metal end which is used as terminals when it is inserted in the base supplied with the instrument. Being automatic in action and needing no adjustment, it will be found very useful for controlling the filament temperature of amplifying tubes. Tested and approved by RADIO AGE Institute.

Test No. 58. THE CUTLER-HAMMER TOGGLE SWITCH. Manufactured by the Cutler-Hammer Manufacturing Company have recently added to the line of radio products a new Toggle Battery Switch. It has large wiper contacts, positive make-and-break mechanism, wide spacing terminals, and attractive appearance. It is destined to embody the best features of its type and also to eliminate every disadvantage. The mechanism is enclosed in a dust proof cover and the metal parts are permanently finished in polished nickel. The switch is easily mounted on any radio panel in a few minutes. It does not require any screws or metal buttons. A lock nut is provided for proper adjustment for panel thickness. When installed, a flip handle is attached, which remains in the "off" position unless the operator pulls out the lever with the finger turns the current on or of. An easy and convenient type of switch to operate. Manufactured by the Cutler-Hammer Manufacturing Co., Milwaukee, Wis. Satisfactorily passed the tests and requirements of RADIO AGE Institute.
World's Smallest Studio Now on the Air

Gay Artists Perform from WJJD's Burlap Studio

Radio listeners cannot enjoy Flo Henry's bewitching gaze, as shown above, but they can hear her equally bewitching voice from WJJD's burlap studio at the Rendezvous.

(Photograph by Connelly, Chicago.)

As a contrast to the many claims of various broadcasting stations through the country of having the largest and most elaborate studios for radio programs, there recently came the announcement from WJJD that the world's smallest and most informal studio was now on the air.

When arrangements for a Chicago studio were made by Jack Nelson, Managing Director and Announcer of the Loyal Order of Moose Station WJJD, and this studio was located in the Palmer House, Chicago, and called the Garod Studio, it was found that awaiting the completion of the new Palmer House, there was no orchestra music in the hotel.

So Jack went scouting around and made arrangements with the Rendezvous Cafe management to broadcast Charley Straight and his Orchestra every night as a part of the Chicago program offered by WJJD at 10:30 p.m.

He then noticed that many of the entertainers there had voices which would broadcast exceptionally well and he "got the itch" to put them on for some "hot" programs.

Their work, however, prevented their journeying down to the elaborate Garod Studio in the Palmer House, so the "back-stage studio" idea was conceived, and programs are now being broadcast every Sunday night beginning at midnight (Central Standard Time).

Dressing Room as Studio

THERE was not room to arrange for a studio which would be open to the guests of the Rendezvous, so a large dressing room back-stage was chosen; and because it would not be open for inspection, burlap was chosen for the material to deaden the room and make it available for broadcasting.

So "Potato Sack Studio" is an appropriate designation, both because of its hangings and size. Here the regular entertainers, (and some of them have been there as long as two years), Lillian Bernard, Flo Henry, Frank Mason, Jack O'Malley, Billy Gerber, Margaret White,—the Red Head Gal with the Uke,—Wanda Goll, Jimmy Travers, etc., "do their stuff" between the dances played by Charley Straight and his Orchestra.

It is quite a trick to keep the "air" program running smoothly, because the entertainers must dress for one of their acts, change makeup, do their bit "on the floor" and then dash into the Potato Sack to do a turn "on the air," rush out, change clothes again for the next show, and repeat three or four times a night. Perhaps that's what makes this program so peppy.

WJJD has received hundreds of letters of applause on this feature. It just happens there are few stations on the air at that time. Miners and other workers of late shifts applaud heartily because it gives them something late Sunday night which was not available before.

Inasmuch as this program is only once a week, it does not work the Rendezvous folks too hard. It certainly couldn't be done every night or they would all be "wrecks," but once a week is a lot of fun and as Jack Nelson announces from the Potato Sack, "These weekly shows will be very informal. We'll let you in on all our secrets, our gayeties, and perhaps even some of our little quareis, so that you will almost smell the grease paint and see all the costumes."

It is that informality that makes them just what they seem: a good time by a handful of stage folk, back stage. They seem to feel that they are not putting a program out, but all the folks listening in are really listening in,—sort of eavesdropping on their little weekly get-together.

Ralph Helps, Too

Incidentally, Ralph Shugart, the engineer of WJJD, deserves a good word for the excellent way in which he handles the Chicago broadcasting. Mooseheart is 37 miles west of its Chicago central (the Garod Studio in the Palmer House), and the Rendezvous Cafe is another four miles North from there, and the lines, amplifiers and microphones are certainly well handled.

While the "Potato Sack Studio" will be used according to the present plans but once a week, that does not mean that WJJD will not broadcast from the Rendezvous only once a week, for every night as a regular feature of the Chicago programs of the Mooseheart Station, Charley Straight and his famous dance orchestra will contribute to the entertainment.

We'll venture to say that if you have a player piano and will walk over to it now, you will find at least five rolls on your shelves bearing the signature of Charley Straight; for there is no one who has played piano records for as long a time as has Charley. Now is marked the inauguration of the broadcasting of the last of the really popular, big and famous dance orchestras of Chicago.
THE MAY issue of RADIO AGE! Gosh! How time does fly. It seems as though it were just yesterday that we picked up the September issue, said good-bye to Old Man Static and prepared for a Winter of ideal reception. Now we must prepare for a Summer of ideal reception. It is possible and it can be done, although it has not been done very successfully in the past.

However, developments in the radio line have been so good in the past Winter, that we no longer fear the Summer static, spelling out our good DX records and pleasant concerts, popular and otherwise, from out-of-town-stations. When we look back and think of the giant strides made by radio in the past ten months, I am sure most of us will realize just why this is going to be a real radio Summer.

Take, for example, the super-heterodyne type of receiver, with its extreme selectivity, portability and last, but not least, the little energy collector or loop antenna, that they use. This will practically eliminate the old "distance eliminator"—static. The reason for this is obvious to all of us. In the past, large flat-topped antennas were used, and would pick up disturbances from all directions. The loop antenna does not do this. Consequently most of the undesirable noises will not get through to the set, to be amplified many times.

One must not necessarily have a super-heterodyne to operate a circuit on a loop. Several sets employing the reflex principal are very bit as efficient, when using a loop antenna, as when they use a large indoor one. Regenerative sets can be made to operate on a loop also. In our blueprint section several months back one of these was shown, and it has given exceptionally fine results. It consisted of a detector tube and the customary two stages of audio frequency amplification. And there are plenty of other circuits that will work just as well.

Another thing that comes with Spring—house-cleaning. Don't you think it might be well for us to house-clean the radio set at this time? Of course, it will be inconvenient to have your home itself turned upside down and the radio set at the same time, but it has to be done, and there is no time like the present. Take a look inside the cabinet, clean out the dust, tighten up on the bolts and nuts, test the soldered connections carefully, and tighten up on the prong connections of the tube sockets. Little things like that all go to make the set work better, and after a hard Winter's service on the part of the radio set, I am sure it will be appreciated by it! It might be well to call your attention to the proper use of your ground connection, which, being usually made in the basement, is never looked at. This might have become corroded to such an extent that you are not operating with a direct ground at all. Yes, I think we had better take a look.

I am going to ask you once more for information on portable receivers. Let us have the benefit of your experience.

I am sure that some of our thousands of readers could give us some very beneficial "tips" on these types of receiving sets. So don't be bashful. Let us have the results of your experiments. Well—I guess that's that, for this time, and trusting that you will continue...
to flood this department with your DX lists and reports, I shall let you go on to the rest of this department.

THE PICK-UPS EDITOR.

We have a circuit this month from Felix Frederiksen, of Delmar, Iowa. It is a variant of the well-known "Ultra-Audion," and Mr. Frederiksen says it is a "bear" for DX work. This circuit is known as the Woods circuit, and possesses several distinct advantages over the ordinary ultra-audion.

It is very sharp in tuning and for that reason is capable of reaching out through heavy interference and doing real DX work. The disadvantage of the ordinary circuit lies in the fact that it is difficult to control the amount of regeneration secured. This is overcome in this circuit by the use of a plate variometer to secure an inductive feedback in addition to the usual connection from the plate of the detector tube to the grid circuit. An additional feature is the use of a vario-coupler for the tuning inductance. By the use of a vario-coupler in place of the tapped coil or the variometer commonly used, exceptional selectivity is secured in place of the usual broad tuning of the single circuit receiver.

Mr. Frederiksen advises us to use only the best parts in the well known "Ultra-Audion." He says: "If poor parts are used, do not blame the circuit if it does not come up to expectations." This advice applies especially to the availability of wooden knobs which should be of the straight line wave-length curve type. A twenty-three plate one, with a vernier dial attachment, is what you will need.

The aerial binding post is wired to the top tap of the vario-coupler and to one of the switch levers. This arrangement shorts out the turns of wire on the top half of the vario-coupler that are not in use and reduces the dead end losses, thus increasing the efficiency of the coupling.

In place of the vario-coupler you can wind a fixed inductance, if you so desire. On a bakelite or cardboard tube three inches in diameter and four inches long, wind twenty-five turns of No. 20 single cotton covered magnet wire on one end of the tube for the primary. Leave a space about one-quarter of an inch, and wind fifty turns in the same direction on the other end of the tube for the secondary, the same size wire being used. This inductance can then be mounted on thin strips of bakelite for supports and a very good substitute is obtained for the vario-coupler. The variometer shown can be eliminated if you desire by winding a rotor on a small wooden form to fit inside one end of the inductance coil just described. It the rotor, should be wound with seventy-five turns of No. 28 single cotton covered wire.

However, we think it would be best to use the vario-coupler and variometer.

The following parts will be necessary for the construction of this circuit:
1. vario-coupler.
2. Switch Levers.
3. Switch points, determined by number of taps on coupler.
4. 23-plate condenser.
5. Fixed grid condenser, 0.0025.
6. Variable Grid Leak.
7. Vario-meter.
8. Double circuit jack.
10. Audio frequency transformer.
12. Twenty ohm rheostat.
13. Bolts, nuts, wire, etc.

Mr. Frederiksen seems very well pleased with this type of set and those of us who are using the old type "singles" might try this improvement and see what's what. We have not quoted Mr. Frederiksen's letter, as it was quite long, he being so enthusiastic about his set. His DX list would "drag" most of us out of our chairs. It certainly is a "whiz."

So for the benefit of all concerned, we are going to pass this circuit along.

Mr. Joseph Larsen, of Boise, Idaho, gives us a suggestion for the mounting of spider-web coils behind the panel, which we think might prove of interest. His letter follows:

The Magazine of the Hour

RADIO AGE.

Chicago, Ill.

Gentlemen:

Many of the readers of the Pick-ups and Hook-ups columns no doubt have refrained from using spider-web coils, a very efficient form of inductance, due to the fact that mounting them in the conventional way on the front of the panel, makes them clumsy and unsightly. This can be overcome, however, in a very simple and efficient manner; efficient because of the possible micrometer adjustment and the absence of body capacity.

The drawing explains the idea so clearly that there is little need for a detailed description.

The wood strips to which the coils are fastened are cut from a cigar box. They are glued to the inductance and to small blocks at the inside of the panel, to which are screwed small brass hinges obtainable from any hardware store.

The brass rods threaded into the knobs and panel may be any convenient size and thread. The ends against the hinges should be filed round.

If, for the sake of appearance of dials, it is desired to separate the control knobs farther than shown in the sketch, this is easily done by gluing a small block of empty thread spool between each wooden arm and the coil.

Rubber bands supply the tension, tending to bring the coils into close inductive relation. By adjusting the bands on different prongs, the tension may be varied.

Honeycomb coils mounted in this manner will appeal to the experimenter using the three coil tickler regenerative circuit. Very efficient oscillator-couplers for the super-heterodyne can also be manufactured in this manner. For the latter I suggest a form having an odd number of spokes, say about seventeen, with a beginning or minimum diameter of one and a half inches. The pick-up, secondary and tickler coils should be wound with twenty-five, thirty-five and fifty turns of wire, respectively.

Yours very truly,

Boise, Idaho.  JOSEPH LARSEN.
It's a good stunt, Dial Twisters, and an easy one, too. Not only does it keep the coils out of sight, but it protects them from dust and dirt, preventing injury to them at the same time.

Thanks, Mr. Larsen, for your idea.

A letter this month (from 91 Hamilton Road, Golden Green, London, England, N. W., as follows):

RADIO AGE,
Gentlemen:

May I, from the other side of the Atlantic, contribute my quota to your very interesting journal? It is always interesting to read of current radio opinions in your paper and it gives much information as to the trend of receiver development.

In the attached list I give a number of stations I have heard on my present receiver, which consists of a detector valve, followed by one stage of audio frequency amplification. Over here, this is practically the standard set. Very few experimenters use radio frequency valves, being of the opinion that it complicates tuning and really only amplifies the "mush" which accompanies the weak signals. The only uncommon thing about this hook-up enclosed lies in the grid return lead.

The set is extremely simple to make and is most surprisingly selective. In fact, the local station ZLO, using a power of one and one-half k. w. and only five miles away, is completely cut out on the two degrees of the condenser. It is well worth a trial by anyone desiring extraordinary selectivity, together with full volume. It is very sensitive to weak signals, as the enclosed list vouches for.

By the way, do you think it will merit a D. S. Badge?

Now, I am going to ask a favor of you, or some of the readers of the Pick-Ups and I-hook-Ups section. Will somebody let me have a circuit or hook-up, as I believe everyone calls them, of a superhet, using up to five valves, with the audio frequency amplification obtained by a reflex circuit, as I should be very grateful if anyone can do this for me, as such circuits are practically impossible to obtain in England.

THOS. RODWAY, Jr.,
British G-2/ADG.

We are printing Tom's letter and the diagram of the circuit that he says most of the English radio fans use. L-1 is the primary and consists of twelve turns of wire wound over L-2, the secondary, which consists of eighty-five turns of fairly heavy wire. L-3 is the tickler and consists of seventy turns.

As can be seen, this circuit is one of our "old-timer" favorites, and gives very good results. Below you will find the DX list, that Tom thinks will get him a D.T. button: 2LO, 6BM, 35C, 5IT, 2EH, 5FY, 2ZY, 5HF, 361K, 51U, 213, "Petit Parisien", Radiola, Eifel Tower, Radio Electrique, Brussels, Radio Iberica, Madrid, Berlin, Frankfurt, Hamburg, ZUP, Paris, SW, KDKA, KJZ, KFZ, KQO, KW, KVI, KOB, WOC, WDM, WIP, KJV, and WJTH.

How many of us would love to have our log read like that? Could something similar be worked out over here? suppose we all have a log similar to this? Thank you for your interest.

In reading Tom's letter I was very surprised to learn that he has listened to the KDKA, KJZ, KFZ, KQO, KOA, and WQAM stations received by him regularly. He also has a crystal set on which he has received KDKA and WGY.

Howard B. Hooping, Muscogee, Ind., is doing some mighty fine DX work on his "Hopwood" set built according to RADIO AGE specifications. Such stations as KFO, KFO, KOA, and WQAM are received by him regularly. He also has a crystal set on which he has received KDKA and WGY.

Arthur J. F. Roth, 634 No. Law St., Allentown, Pa., is having a fine time "pulling in the long ones" on his three-circuit outfit. His DX list runs up into the "house numbers.

We have a letter from one of the fans on the Eastern Coast who is using one of RADIO AGE's latest Reinartz hook-ups, with which he is getting wonderful results. Any of you fellows who are in doubt as to the practicability of the Reinartz circuit might drop him a line and get his opinion.

J. A. Myers, Jr., says: "I have read the article on the two tube "Ultra-Audion" and I would like to say for the benefit of those readers who are interested that I have done quite a bit of experimenting with the Ultra-Audion as described in the March issue of RADIO AGE. I have tried coils of all sizes, shapes and forms and have come to the conclusion that the spider web form of inductance is the most efficient. Any of the readers of this section who want 'dope' on this circuit might get in touch with me."

As J. A. was good enough to offer his services, let's see that some of us mail him a card. He lives at 944 W. Capitol St., Jackson, Miss.

T. F. O'Connell, from "out where the West begins" wants to know if any of us have ever thought of using a breast drill for coil or radio frequency (long wave) transformer winding. This is a good stunt, and quite a few of the "old timers" use it all the time. Nevertheless, we are going to pass it along for the benefit of the newcomers in this radio business. Some breast drills are geared as high as six to one, and you can easily see that your work is reduced fully 75 per cent when you wind by this method.

All you have to do is fasten the form, or core, to the end that takes the drill. The usual method is to insert a reamer a trifle larger in the bit than in the hole. You will have drilled in the core of the transformer, force the core over the bit, fasten the starting end of the coil, and "let her ride." Try it, fans. It works very well.

We have a letter from Robert E. Blose, of Allentown, Pa., who has had a receiving set just three weeks, and has a list of stations heard so long that it reads like a broadcasting station list. To print it would be impossible, so we will have to award him a D.T. button without disclosing his log.

(Turn the page)
Hugh M. Clark writes us to let us know he thinks that RADIO AGE is the best on the market. He has a Clapp-Eastman, three-tube regenerative set, with which he has received WSB, WNYX, KWAG, KPOM, CWL, KOA, KFKR, CFCN, KSD, WFAA, KFRU, KFI and others too numerous to mention. We call this pretty good reception, considering that he is in the most eastern state in the union, and we will award him his DT button. He lives in Auburn, Maine.

Kenneth Wyatt, 51 Cast St., Fitchburg, Mass., writes us as follows:

RADIO AGE,
Chicago, Ill.,
Gentlemen:
Looking over back issues of RADIO AGE, I noticed a record made with a "Cockaday" receiver, of thirteen stations in thirty-nine minutes. Deciding to beat this, I sat down and received twenty-nine stations in thirty minutes. Am I entitled to become a Dial Twister? All stations were heard on my two tube Cockaday.

Yours very truly,
KENNETH WYATT.

What do you think, fellows? Pretty good. Can any one do better? We shall see. Meanwhile this will stand as a record, and Kenneth will be awarded the DT button.

Another Interesting Letter
RADIO AGE,
Chicago, Ill.,
Gentlemen:
Glancing over a copy of RADIO AGE which I purchased yesterday for the first time, I noticed your "Pick-Ups and Hook-Ups" department, which interested me very much, and as I have done some rather good DX work myself, I thought I should like to see if it would merit a DT button. My list is not a very long one, but what I take as the greatest pride is the fact that I can get these stations at will, and hold them as long as I want to listen. The circuit is nothing phenomenal, being quite common. Here is the list: WGR, WBZ, KDKA, WGY, WEA, WNYC, WCAE, WFE, WSAL, WLW, WOC, KYW, KSD, WHAZ, WMAK, WTV, WLS, WAI, CFCA, WEBH, WCB, WJW, WHAS, WEAR and KDKA.

Yours very truly,
ROBERT C. POTTER.

R. R. No. 3,
Beavemills, Ont., Can.
Your list, Bob, as you say, is not very long, but considering the fact that you receive these stations at will, we think it is extremely good. We will award you your DT button. Also, we are welcoming you to the RADIO AGE family.

Valdan Blatz, of Wheeling, W. Va., has a set using UV-199 tubes, with which he has received over 75 stations in the past month. He wants to know if this will admit him to the Dial Twisters. It certainly will, and we shall send him his button at once. His circuit is the regular old "stand by," the three circuit outfit.

Here is a letter from an ardent booster of RADIO AGE.
RADIO AGE,
Chicago, Ill.,
Gentlemen: Just completed a building a wave trap from a diagram published in the RADIO AGE ANNUAL for 1925, page 66, figure 4. And with the usual RADIO AGE reliability, it works wonderfully well.

RADIO AGE ANNUAL is worth many times the purchase price to any experimenter and I take pleasure in recommending this publication in no uncertain terms. Thanking you again, I am Yours very truly, RALPH E. RILEY.

1711 Fifth Street.
Oakland, Calif.
Letters like this make us feel real "chesty." And they prove conclusively that our slogan is correct: "Let Our Hook-Ups be Your Guide."

Radio Age, Inc.
Chicago, Ill.
Dear Sirs:
I am sending herein a list of stations which I have received during the months of December and January. All of these stations were received on a two tube Reinzart Tuner, using peanut tubes. This set has given loud speaker volume on locals, and on some of the distant stations the announcer can be understood with the phones lying on the table. Hoping that my list will win a Dial Twister button, I remain, Yours truly,
JAMES SQUIRE.
12 Drake St.
Core St., Paul.
Montreal, P. Q.

Dear Sirs:
I am sending herein a list of stations which I have received during the months of December and January. All of these stations were received on a two tube Reinzart Tuner, using peanut tubes. This set has given loud speaker volume on locals, and on some of the distant stations the announcer can be understood with the phones lying on the table. Hoping that my list will win a Dial Twister button, I remain, Yours truly,

JAMES SQUIRE.
12 Drake St.
Corse St., Paul.
Montreal, P. Q.

Quite a nice list, isn’t it, fellows? We think he well deserves a Dial Twister Button. The lads up in Canada all seem to have ideal reception.

RADIO AGE,
Chicago, Ill.,
Gentlemen:
My being somewhat of an experimenter with the regenerative principle has resulted in a modification of the so-called three circuit arrangement that really does what I consider a creditable work considering the number of tubes used.

And having built and tested several of these modified sets and found the circuit to be no freak, I am sending in a diagram of the hookup and hope you will pass it on, through your columns. Results show that it will give loud speaker volume on two tubes for a considerable range, and in selectivity it may be said it gives equal footing with any neat or superhet, when using a short antenna. Rather strong, that, but—quite true, by test.

Along with the hookup I am sending a list of stations heard on each of two sets using this hookup, each being at different locations. I only give the most consistent of distant stations and only a few of the nearer ones, as they are too numerous to list conveniently.

Here is a list from cabinet 1. WGR, WBZ, KDKA, WGY, WEA, WNYC, WCAE, WEF, WSAL, WLW, WOC, KYW, KSD, WHAZ, WMAK, WTV, WLS, WAI, CFCA, WEBH, WCB, WJW, WHAS, WEAR and KDKA.

Here is a list from cabinet 2. WGR, WBZ, KDKA, WGY, WEA, WNYC, WCAE, WEF, WSAL, WLW, WOC, KYW, KSD, WHAZ, WMAK, WTV, WLS, WAI, CFCA, WEBH, WCB, WJW, WHAS, WEAR and KDKA.

A record was made several nights ago when 45 stations were tuned in and identified (on one tube) within 3 hours, the total combined mileage being 37,000. I am a constant reader of RADIO AGE, which is always interesting. Hoping for a DT button,
V. H. MILLER.
R. F. D., No. 8, Box 34.

This is a pretty good list, and will give some of you DT's a mark to shoot at. Space will prohibit our publishing the
Lacault Scores Again!

The new Ultra-Lowloss condenser is the latest improved radio device designed by R. E. Lacault, formerly Associate Editor of Radio News, the originator of Ultradyne Receivers and now Chief Engineer of Phenix Radio Corporation.

ULTRA-LOWLOSS CONDENSER

LIKE every Lacault development, this new Ultra-Lowloss Condenser represents the pinnacle of ultra efficiency—overcomes losses usually experienced in other condensers.

Special design and cut of stator plates produces a straight line frequency curve, separates the stations of various wave lengths evenly over the dial range, making close tuning positive and easy.

With one station of known frequency located on the dial, other stations separated by the same number of kilocycles are the same number of degrees apart on the dial.

In the Lacault Ultra-Lowloss Condenser losses are reduced to a minimum by use of only one small strip of insulation, by the small amount of high resistance metal in the field and frame, and by a special monoblock mounting of fixed and movable plates.

At your dealer's, otherwise send purchase price and you will be supplied postpaid.

Design of low loss coils furnished free with each condenser for amateur and broadcast frequencies showing which will function most efficiently with the condenser.

To Manufacturers Who Wish to Improve Their Sets

The Ultra-Lowloss Condenser offers manufacturers the opportunity to greatly improve the present operation of their receiving sets.

Mr. Lacault will gladly consult with any manufacturer regarding the application of this condenser to any circuit for obtaining maximum efficiency.

PHENIX RADIO CORPORATION, 116-B EAST 25th ST., NEW YORK

* Tested and Approved by RADIO AGE *
Standard Radio Receivers

Last month RADI0 AGE inaugurated a new department called "Know Before You Buy," to serve as a guide to the prospective radio purchaser in deciding on the receiver best suited to his individual needs. Fans throughout the country have shown an instantaneous response to this new feature, and accordingly it is continued in this issue and will be a feature of all forthcoming numbers of RADI0 AGE. Readers are invited to write us concerning the sets in which they are interested, and manufacturers also are asked to send us material describing their sets.

Telmaco Receiver Useful for Summer Trips

The Telmaco Acme Type P-1 receiver, shown in the photograph, is manufactured by the Telephone Maintenance Company of Chicago and contains the same standards of high quality that will undoubtedly prove popular with the summer radio fans this year.

The Telmaco Acme is a four-tube reflex receiver designed to assure selectivity, distance, clarity and volume, with minimum battery consumption, even under the stress of summer conditions. The set retails at $125, and weighs only 26 pounds in its complete carrying case for traveling. The loop aerial and loud speaker are built into the set. The loop is the only aerial needed.

The size of the case when closed is 8 inches wide, 10 inches high and 18 inches long. The set can be put into operation instantly without any hooking up other than that already contained in the outfit. The upper portion of the lid is lowered when the set is ready to be operated.

The Telmaco Acme is also provided withfone additional tube, so that the set can be quickly changed to a portable, entirely self-contained unit.

The lettering and decorations on the inside of the set are done in silver tone by the new Telmaco Pyrogravure process. The loop is contained in the walls of the case, being concealed from view and protected from mechanical injury. The set assembled is easily removed by lifting the lid of the enclosing mahogany cabinet made by the Telmaco concern. Likewise the mahogany case may be transferred to the portable arrangement.

Three stages of f. r. amplification, three stages of audio frequency amplification and crystal detector are used. Four CV199 or C399 tubes are used with a combined 6 volt battery consumption of .24 amp.

Practically all tuning is done with one 4-inch control.

"Marwol Baby Grand" is Ready for Vacations

A new receiver that is particularly light and compact and easily convertible into a portable set for summer use has been placed on the market by the Marwol Radio Corporation, 85 Mercer Street, New York City.

This is known as the "Marwol Baby Grand," and comes equipped for storage battery use, but may be changed to operate on dry cell tubes.

While the Marwol Baby Grand is much smaller than the well known Marwol Model A-1, it contains identically the same 5-tube tuned radio frequency circuits that is known for selectivity, range and ease of operation. The Baby Grand retails for $40.

A loop or outside aerial may be used, the latter, of course, giving the best distance. The Baby Grand has been found to produce results similar and favorably comparable with any five-tube receiver of the same type. It was designed by R. H. Martin, general sales manager of the company, to eliminate distortion over the entire wave-length range, and this it can be said to accomplish successfully.

The Marwol is small and accordingly is easy to carry and handle, while not taking up much room if used in the home as a permanent fixture. The Marwol people decided that the 5-tube tuned radio frequency type of receiver was the best suited to portable needs and likewise one of the most popular circuits of the day, so these features were incorporated when the new Baby Grand was designed.

Records of Distance and Volume with Howard Set

The Howard 5-tube Neutrodyne, made by the Howard Radio Company of Chicago, has been developed during the past several months until at present it is a highly efficient receiver and a very popular one among the DX fans.

The Howard Neutrodyne was designed primarily to eliminate annoying which sometimes exists in radio reception, such as restricted range, howling, indistinct reception, and interference of local broadcasting stations.

The cabinet of this improved receiver is of 3-4 inch black walnut, highly polished. It is fitted with a nickel-plated base, cover stop, and felt pads. The entire set can be removed from the cabinet by disconnecting the wires from the binding posts, removing two machine screws from the bottom of the cabinet, and sliding the panel upward in its slots.

Neutrodyne sets are radio frequency transformers especially designed for Neutrodyne use, are wound on hard rubber tubing. The primary winding is invisible, the wires resting in grooves cut in the rubber with rigid accuracy, by specially constructed machines.

The Howard 5-tube Neutrodyne, price $200.

Heavy phosphor bronze contact arms, spring re- inforced, insure contact on sides of the tube terminal pins in the Howard sockets, giving maximum tube efficiency. Panels and sub-panels are made of flawless Formica or Bakelite, no wood being used except in the enclosing cabinet. Wiring is square bus-wire.

The Howard set is designed to use five tubes, all alike, of the "A" type. It operates satisfactorily on either indoor or outdoor antenna, and for bringing in coasts to coast stations on a loud speaker, a single outdoor wire fifty feet long is advisable. The Howard set will receive with uniform efficiency over a minimum range of 190 to 610 meters.

The price of the Howard five-tube Neutrodyne is now $190.

Operadio Set Entirely Self-Contained

For nearly three years the Operadio Corporation of Chicago has concentrated on one model, with a view to obtaining quality of tone, greater power and range and loop reception and big battery supply in a portable, entirely self-contained unit.

The 1925 Model Operadio, a six tube, tuned radio frequency set, with six "A" batteries, four big 23/4 volt B batteries and a built-in loud speaker, is particularly interesting in its design to obtain reduction of electrical losses. The longest wave used is 3-6/4 inches. The tubes are supported in aluminum containers which also house the transformers, grid leaks, etc., insulated in special wax to eliminate atmospheric variance.

The cover serves as the aerial by a design patented by the Operadio Corporation.

The 199 type tube is used throughout, and a volt- meter operated by a convenient two-way switch shows the operator instantly his "A" battery drain or his "B" battery reserve. Two dials tune the set through special condensers of Operadio design and make.

These condensers, which are of low loss design, have an eight-to-one reduction on the knob and back hyster is eliminated by means of planetary drive. An exclusive feature is a fuse on the "B" battery circuit which prevents the tubes from burning out. The tone of the Operadio is clear and undisorted, and distance is equal to many eight-tube sets. All long range reception can be had on the loud speaker. The price, complete, is now $189.00.

The Operadio can be used as an ornamental decoration to the home of it may be carried about easily.
ATTENTION
Set Manufacturers

IF YOU ARE INTERESTED IN CUTTING DOWN YOUR PRODUCTION COSTS IT WILL PAY YOU TO COMMUNICATE WITH US. YEARS OF EXPERIENCE HAVE ENABLED US TO GIVE MANUFACTURERS THE BEST POSSIBLE PRICES CONSISTENT WITH HIGH QUALITY. DROP US A LINE AND GET QUOTATIONS. DO IT NOW. WE MAY BE ABLE TO SAVE YOU MORE THAN YOU IMAGINE.

THE BARSOOK CO.
53 W. Jackson Blvd., Chicago, Ill.

HERCULES AERIAL MAST
20 Ft. Mast $20
30 Ft. Mast $30
50 Ft. Mast $40
All aerials completely assembled with wire, wire and insulators. We pay the freight.
S. W. HULL & CO.
Dept. 5-6, 2446 E. 79th St.
CLEVELAND, O.

Send for FREE Bulletin 94
Whether you plan to build or to buy a receiving set, it will pay you to know something about the "inside" of radio. This booklet gives you the "inside dope" on some of the recent inventions embodying the latest ideas of radio engineers. In this bulletin is full information about the

Premier "HEGEHOG" Audio Transformer

Ratio 1 to 3, 1 to 4, and 1 to 5, 25 to 1
Ratio 1 to 10, 5 to 1

This light-weight audio transformer has earned a place at the very front rank for its remarkable quality and low price. It is 100% self-shielded against foreign noises. In small size it is a thing of beauty to everyone. It costs the same as a top-notch one, but it has the space requirements for radio transformation as few other transformers have. This is a big advantage itself, and makes it ideal for neat and compact wiring.
Free Hook-up Diagrams also sent on request; all popular types. Address:

Premier Electric Co.
3803 Ravenswood Ave., Chicago

Arrow Battery SLASHES Prices TO CONSUMERS ONLY

Prices Smashed! Quality Not Sacrificed
Here is real battery quality, guaranteed to you, at prices that will astound even the best battery-buying public. Order direct from factory. Put the Dealer's profit in your own pocket. You actually save much more than half, and so that you can be convinced of true quality and performance, we give a Written Two-Year Guarantee

Here is your protection! None to take a chance. Our battery is right—and the price is the lowest ever made. Convince yourself. Read the prices! Special 2-Volt Radio Storage Battery, 2.75. Special 4-Volt Radio Storage Battery, 6.00. 6-Volt 100 Amp. Radio Storage Battery, 9.00. 6-Volt, 50 Amp. Radio Storage Battery, 8.00. 6-Volt, 20 Amp. Radio Storage Battery, 6.00. 6-Volt, 120 Amp. Radio Storage Battery, 11.50. 6-Volt, 240 Amp. Radio Storage Battery, 13.00.

We ask for no deposit. Simply send name and address and style wanted. Battery will be shipped the day we receive your order.

Express C. O. D., subject to your examination on arrival. Our guarantee accompanies each battery. We allow you a 10% discount for cash in full with order. You cannot lose. Act quick. Send your order today—NOW.

Arrow Battery Co.
1215 West Wabash Ave.
Dept. 1
Chicago, Ill.

REFLEX
Erla—Acme—Harkness
Dealers: Send for Discounts

HUDSON-ROSS
123 W. Madison St. Chicago

Howard Five Tube Neutrodyne

To build the best—the ultimate—in radio receiving sets regardless of cost has always been our ideal and our aim.

That we have succeeded is best evidenced by the fact—not what we claim but what an actual demonstration will prove to you.

Hear the Howard Five Tube Neutrodyne at any Howard dealer and then decide.

Howard Manufacturing Company, Inc.
451-469 East Ohio St.
Chicago
**JEWELL**

The Fire Underwriters' Code requires that—

Each lead-in wire shall be provided with an approved protective device properly connected and located (inside or outside the building) as near as practicable on the point where the wire enters the building. The protective device shall not be placed in the immediate vicinity of easily ignitable stuff, or where exposed to inflammable gases or dust or flyings of combustible materials.

1. Buy a Jewell Arrester. (In brown porcelain case.) It has been passed or approved by Underwriters.

2. Send for Jewell Radio Instrument Catalog No. 15-A.

**Order from Dealer**

Jewell Electrical Instrument Co.  
1650 Walnut St. - Chicago

"25 Years Making Good Instruments"

---

**BIG MONEY!**

$3000 to $10,000 a year

Want to make big, easy money? Learn how to install, operate, repair, construct and sell Radios. Write now for facts about the amazing opportunities for Radio experts, and our special offer of a FREE 1000-mile receiving set, and how you can quickly train at home by mail.

Be a Radio Expert

No previous experience necessary. Anyone with ordinary education can learn Radio quickly under our simplified home-study plan. We send you right here to represent our Association. Be the Radio expert in your neighborhood. Get your share of the big profits. Hundreds you want Radios and advice how to operate. You can earn enough money right from the start to pay for course. Nothing difficult about it. Low cost and easy terms.

FREE 1,000-MILE Receiving Set

Don't miss this big special offer to supply FREE all parts necessary to construct a high-grade 1,000-mile receiving set. You can sell this set alone for practically the entire cost of the course. Send for the facts now. Find out all about this big-pay field. Address Radio Association of America, 423 Broadwood Ave., Dept. 25 Chicago, Illinois.

LISTEN IN!

Radio Age at KYW, 11:30 p.m., to 1 a.m., Saturday, May 2.

Radio Age at WEBH, 11 to 12 p.m., Tuesday, April 28.

TWO ALL-STAR POPULAR PROGRAMS

---

The Magazine of the Hour

**A New Power Supply Receiver**

(Continued from page 14)

Parts listed are given under headings that indicate their use in the receiver.

- **B** Rectifier System
- 3 Audio Frequency Transformers
- 2 Two 50k Fixed Condensers
- 2 Tube Sockets
- 1 Bell Sounding Transformer—6 volt
- 1 80 ohm rheostat
- 1 200 ohm rheostat
- 1 Nickel silver covered lamp cord
- 1 push switch
- 1 separable plug
- Audio Amplifier
- 1 200 ohm fixed condensers
- 2 tuning pots
- 2 tuning circuits
- 2 lengths of insulation tubing, 3 inch diameter, 3 inch length
- 1 2 ohm, No. 22 double side screwedenza wire
- 1 small slip connector or spring clip for tap adjustments
- 1 ground post
- 1 tube socket
- 1 double insulated crystal detector
- 2 1000 fixed, iron or steel variable condensers
- 1000 ohm variable condenser
- 1 8 volt Bell ringing transformer
- 1 "C" battery
- 1 Ammeter
- 1 10 or 15 amp shunt

Extra Parts

Earpiece and ground equipment

Loud speaker

Blue bird No. 16 buggy wire (for set connections)

Cabinet and baseboard about 20 by 12 inches

The circuit diagram is laid out approximately as the parts are to be placed on the baseboard, and further suggestions may be had from the photos. The "B" apparatus should be compactly mounted at the rear, so as to allow plenty of room for the important tuning apparatus at the front. The audio amplifier is located along the left edge of the board, starting at the front. Two binding posts are placed at the rear of the audio amplifier for the speaker and two others at the right hand rear corner for aerial and ground. The power lead is brought in at the rear center and is held down by a simple half-round clamp bent from a piece of iron or brass and fastened with two screws. A "twist" shaped clamp is bent from a small sheet of iron or brass as a clamp to hold the "C" battery, and another clamp of smaller size made to fasten the 2 mfd. condensers. The shape of this clamp varies according to the mark of condensers chosen—these being for the purpose of filtering the ripple out of the rectified "B" voltage.

**Coil Construction**

To TUNE the grid of the R. F. tube and to couple it to the aerial, a special coil is built—40 turns of the magnet wire are tightly wound on one of the lengths of tubing, taking "twist" taps at the 5th, 8th, 11th, 15th, 20th, 25th, 30th and 35th turns. The coil ends may best be connected to soldering lugas fastened at the edge of the tubing by short 6-32 machine screws. An extra screw and lug is provided at one end for the antenna wire. From this lug a short piece of flexible wire is brought to a clip connector, whereby contact from the aerial may be made to any one of the taps provided. The taps are merely twists in the wire, scraped as the winding goes on and twisted firmly. Before the coil is used, these are soldered for greater strength and better contact.

Next, a coupler is made for coupling the R. F. tube to the crystal. To control the sensitivity, its primary is made variable, and most any coupler on the
vibration is at one moment all energy of bending and at the next all energy of motion.

The effect of the impulses is cumulative. Each increases the energy of vibration by a little, until finally the vibration is large enough to set up frictional resistances which use up all the further impulses. Thus the small impulses give rise to enormous forces, but these are actually supplied by the elasticity and mass of the bridge. The bridge in a sense breaks itself.

Each Wave Adds to Energy

In a similar manner the weak waves coming to a receiving antenna set up in its circuit only a tiny electromotive force, far too small, in fact, to pass the necessary current for an audible signal through either condenser or coil alone. If, however, the circuit is properly tuned, each wave adds to the charge on the condenser and thus to the current which flows in the circuit, until at length it is so great as to requisition all the weak electromotive force induced in the circuit by the waves.

The circuit then oscillates steadily, but with vastly greater electromotive forces upon the coil and the condenser than the tiny voltage directly induced by the waves. It is these relatively large electromotive forces which are analogous to the large bending force and the force associated with the momentum of the bridge vibration. It is these large electromotive forces which overcome the large oppositions of condenser and coil to the passage of the current. Taken around the circuit, they are nearly equal and opposite, their small difference being the electromotive force induced by the waves, but the detector circuit is connected to receive their full effect.

It follows from these considerations that, if we could make the resistance of our receiving circuits small enough, waves, however weak, could produce appreciable voltages upon the detector.

On the other hand, the effect of waves for which the receiving circuit is not in tune is to alternately add and oppose the natural oscillations of the receiving circuit, with the result that very little current flows and the detector is practically unaffected.

A circuit may be tuned either by varying the capacity of its condenser (elasticity of the circuit) or by the varying its inductance (electrical mass of the circuit), and it is immaterial which, just as it is possible for a violinist to tune a string either by changing its tension or the length of the vibrating portion.

In conclusion, when you see your long distance radio friend silently turning a dial with a distraught air, you may feel sure that his anxious face does not indicate that he is afraid of losing a single word of the speaker. He is merely absorbed by the delicate task of so adjusting the electrical stiffness or electrical mass of his receiving circuits that they will allow the maximum current to flow and thus set up the greatest possible voltage across condenser, coil and grid.

KEEP reception clear!

Keep it clear. Keep it loud—with all the volume your set should have. Keep the battery at top notch—fully charged—peppy.

The Tungar charges your storage battery overnight while you sleep—and at a cost of hardly more than five cents. It's easy! Just two clips—and a plug for the house current. Or you can make a permanent connection, and just throw a switch. Keep your set at its best all the time—with a Tungar.

The Tungar is a G-E product, developed in the great Research Laboratories of General Electric.

The New Model Tungar charges radio A and B storage batteries, and auto batteries. Two amperes size (East of Rockies) . . . $16.00

A Tungar is also available in five amperes size, day or night charged (East of the Rockies) $26.00

60 cycles=110 volts.

Hear What YOU Like Send NO Money

FREELOG W. H. Griffin & Co.

If Your Neat's Gone Back On You—Rebuild it to the Kludag Coast to Coast Circuit, using same-old panel, almost same parts, but no Nightmare of Neutralization. Twenty-two feet of gold etched wire, will only extra parts and simple, complete instructions—$2.00, prepaid anywhere. Nothing more to buy. Over a thousand "converted" sets are daily bringing in clean, resonant volumes from O'Shaughnessy—10c to 50c.

Kladag Radio Laboratories, Kent, Ohio

* Tested and Approved by RADIO AGE *
Free Subscriptions for Your Time!

RADIO AGE, Inc., will give a year’s free subscription to this magazine to any reader who will obtain for us a news-dealer who will handle our magazine in a town or city where we are not already represented.

If you are now a subscriber to RADIO AGE, we suggest that you refer this notice to one of your friends who will doubtless be pleased to take advantage of this opportunity. Or you may extend your own subscription for one year without cost.

Free Subscription Blank

RADIO AGE, Inc.,
500 N. Dearborn Street,
Chicago, Ill.

Gentlemen: In order to get a free subscription to RADIO AGE, "The Magazine with Blueprima," for one year, I herewith send you the name of a dealer who will sell RADIO AGE in the city mentioned. It is understood that if you already have a dealer in this city that the offer of a free subscription does not hold good.

Dealer’s name.
Street Number. City State.

My name.
Street Number. City State.

4-25

*-tested and approved by RADIO AGE*
prophesied the future in handom. And it must be remembered that this show was the real thing; in other words, inside stuff. Only milliners were allowed admittance, even though an American housewife could hear the entire proceedings.

As the many beautiful models came down the run-way to the music of one of Boston's smart orchestras, Jean Sargent gave a memorable word picture of each, describing the gowns in careful detail. And the was did not regret listening in on this colorful feature—even if the color could only be seen by proxy. For when one heard the announcer say: "And here comes a very beautiful girl with a straight-line gown of lip-stick hue, wearing a diacite hat of dull red garnet satin," or, "There is a cute little blonde-haired lady making her entrance as the orchestra plays 'Blue-Eyed Sally'; she is wearing a gown of blue charmuese edged with old silver and her hat is one of the new large designs in color to match; very chic!" Whose imagination would not flutter after all that vivid description?

This millinery show was referred to above as the crowning triumph of the women's section of WNAC, but anyone who knows Jean Sargent knows that she will not be content to rest upon her laurels. Take for instance, this statement made several weeks before the millinery show, in the home-like atmosphere of one of the station studios:

"Within the next few months," she said, "I am planning to give the women more and more; for, after all, the women are becoming just as ardent in this radio game as the men. For instance, after putting on a special program of any variety, we usually find women to be more responsive than men. A woman is quicker to criticize than a man, and criticism is essential in the life of any first-class radio station."

WNAC is a progressive station, and its sponsor, John Shepard, Jr., is an idol in many of the hearts of New England radio fans. Frequently, the programs for women are relayed from the Boston station through the Providence station of the same company, WEAN.

And as the genial and highly popular director of WNAC, Major John J. Fanning, says: "The 'W' in both cases might stand for 'woman.'"

**STATIC—THE RADIO BUGBEAR**

How can it be best eliminated, or at least minimized to an unnoticeable degree? Roscoe Bundy, that famous radio analyst, has prepared an article on "Static" that will do away with the old fear of Summer reception. Look for it in the June RADIO AGE—out May 15th.

---

**Silver-Marshall, Radio Equipment Inc.**

**Silver Circuit Designs**

Have gained recognized supremacy for the SILVER 7-TUBE SUPERK and the SILVER 4-TUBE RECEIVERS. Sets built according to Silver Circuit Designs have been approved by the "WHO'S WHO" of Radio. . . . Have been lauded by thousands of successful builders as the most wonderful receivers for distance and loud speaker miles. . . . They have outperformed every promise and claim made for them, and secured results no other set or design could offer.

Silver Circuit Designs, by McMurdoo Silver, Assoc., J. R. E., who is unsurpassed in radio design work, are complete, explicit and simple designs that will make it easy for you to build the Silver way, and you will have a set that is years ahead with the finest of Radio Reception—a set that will be up-to-date for years to come.

Your order for any of Mr. Silver's designs will be filled by SILVER MARSHALL, Inc., without delay.

**Designs That Are Dependable**

Blueprints and Complete Building Instructions for the Silver Super....25c

The Book—"THE PORTABLE SUPER-HETERODYNE"...........50c

Complete Building Instructions for the Silver 4-Tube Receiver......25c

**Mail Your Order Today**

**S-M Two-Tens and Two Elevens**

**LONG-WAVE TRANSFORMERS MATCHED—TESTED—CHARTED**

S-M TRANSFORMERS unquestionably represent the most important achievement in Radio for years. . . . So uniform are they that each instrument can be tagged with its individual amplification curve . . . another S-M idea that demonstrates again that McMurdoo Silver's engineering methods are always a year ahead of the industry.

S-M Transformers are supplied in sets of two, or three TWO-TENS (iron-core interstage), and one TWO-ELEVEN (filter for input or output), with identical peaks and separate curves. Each curve is plotted in our laboratory and recorded directly on the tag tied to the transformer. Both peak at 5000 meters and pass an 11 kilocycle wideband without distortion. Price of either type . . . . EACH $8.00

**FREE! Write Today For**

"THE WHY OF SILVER CIRCUITS"

**Silver-Marshall, Inc.**

110 S. Wabash Ave., Chicago

---

**The Standard of the World**

**Freshman Variable Grid Leak**

The best-type Freshman Variable Grid Leak is the standard for those who build their own sets. It is the most compact and being entirely sealed it is unaffected by any climatic conditions.

Complete with either .0005 Freshman Condenser—$1.00

without condenser—$0.75

At your dealer's, or write Freshman Company, Inc., 249-251 W. 46th St., N. Y.

**CABINETS**

If you are interested in a radio cabinet in which is combined both beauty and practicability, just write LAKESIDE SUPPLY CO., Dept. R, 73 West Van Buren St., Chicago, Ill. Telephone, Harrison 2564

**Crescent Medium Resistances**

**LIST $1.50 EACH**

250,000 12.00

50,000 6.50

25,000 5.00

10,000 4.00

5,000 3.00

2,000 2.00

1,000 1.50

Special resistance to order, $2.50. When better resistances are made they bear the Crescent label! CRESSENT RADIO SUPPLY CO.

**CABINETS**

If you are interested in a radio cabinet in which is combined both beauty and practicability, just write LAKESIDE SUPPLY CO., Dept. R, 73 West Van Buren St., Chicago, Ill. Telephone, Harrison 2564

**Tested and Approved by RADIO AGE**
How to Make a Vacuum Tube Tester
(Continued from page 4)
been bolted down as tight as is safely possible.
A poor connection will add resistance to the circuit and may result in throwing the readings of the meters off quite a bit.
We will now turn to the wiring diagram and run the leads as indicated in the table on page 4, putting on the two tubes that will then be marked as desired and mounted in its cabinet or placed in its permanent location. Simple, isn't it? Only 25 leads to run. To connect the instrument for operation, the batteries will be connected as follows:

"B" or Plate Battery
Connect 90V of "B" grid battery from binding posts B - to B90, taking taps off at 22V/2 volts, 45 volts and 67½ volts, and connecting them to their respective binding posts B 2 ½, B45 and B 67 ½.

"A" or Filament Battery
Connect a 1½, 3 or 6 volt battery across binding posts A - and A +, the size to be according to the tube under test.

"C" or Grid Battery
Connect two 4½ Volt C batteries in series and across binding posts C + and C -, taking a tap between the two batteries and connect it to binding post C +.

Method of Operation
To test a tube or plot a curve, there are several characteristics about a tube that can be put to good use, when known. They can be found by using this tube tester. Let us take a Number 199 type tube and plot a grid potential and plate current curve, for example.

When the batteries are all connected, put the tube into the socket (T) using the adapter. First move the switch (BS) to the negative point, then move the switch (PS) to the right and set the transfer switch (TS) for the 0-10 volt scale on the meter (PF). Move the rheostat (R) until the meter shows 3 volts.
Adjust the potentiometer (GP) until the meter (GP) shows "O." Now throw the transfer switch (TS) for the 0-10 volt scale on the meter (PF), and adjust the rheostat (BR) until a 45 volt reading is obtained. Then cut out meter (GM) by use of the switch (GS) and move the resistance (R) until the highest reading is obtained on the milliammeter (MA). This will be the normal plate current of the tube, at 45 volts on the plate with a grid bias of 0" volts, and whatever filament voltage the meter (PF) will show.

To plot a plate current curve (See Figures 3 and 4), move your switch (PS) to the 22½ volt tap and adjust your resistance (BR) until the voltmeter (PF) reads 20 volts. Adjust the filament rheostat (R) until the maximum reading is obtained on the milliammeter and spot this reading as shown on the chart. Now adjust your switch (PS) and your rheostat (BR) until the meter (PF) shows 20 volts, and spot the reading of the meter (MA), repeating this operation in steps of 5 volts until you cover the desired range. Connect these points on the chart with a line and you will have a plate current chart at a "0" volt grid bias.
To plot a plate curve at various grid voltages, and for positive and negative grid biasing, move the switch (BS) to the positive or negative point and adjust the potentiometer (GP) until the desired grid voltage is obtained from the meter (GM).
Always cut the meter (GM) out of the circuit by use of the switch (GS) when reading the plate current on the meter (MA). A grid voltage curve for various plate currents and voltages will be made in the same manner, except by taking periodic readings from meter (GM), say about one-half volt apart and plotting the curve the same way.

Formulas and other data for testing and plotting curves will be published in an early issue of RADIO AGE, with a view to covering as much about tube characteristics as is useful to the fan. Tables for average computation will also be shown.

Pickups
By Our Readers
(Continued from page 44)
circuit used by Mr. Miller, which is a variation of the three circuit principle. Any of you who are interested might drop him a line and get the desired information direct from him, after which we are going to award him a DT degree for the splendid results he is having as a result of exhaustive experiment.

RADIO AGE,
Gentlemen:
I am a reader of RADIO AGE and I have learned many a thing from your columns. I know the fans are after circuits that are simple and powerful and this sure will bring in DX as clear as a bell. This is Capacity Feed back circuit and here is a record of DX Saturday evening from 10 p.m. until 12 midnight at my friend's home in Woodhaven, L. I., Jerome Kupfer, 8411 94th Street.
KDA, KXY, KFI, WSAS, KSD, PXX, HAVANA, WHAS, WOO, WIP, WTAM, WGM, W4J, WGR, and WREO.
These were all heard on a loud speaker all over the house and clear. If any of you fans can show me something better, well, go to it, boys, I am on the job to learn any time. If you will write to me I will gladly join you working out circuits with my favorite RADIO AGE Magazine.

Your's truly,
William Benner.

304 Park Ave.,
Brooklyn, N. Y.

Here is a good offer, fellows. Any of you who want information on circuits of this type should get in touch with "Bill." The circuit he describes we are unable to print this month, but will use it in the near future. It must be very efficient judging from his DX log and the offer he makes.

(Turn to next page)
Better Than a Laboratory Standard

The usual method of measuring condenser resistances is by comparison of readings obtained when the condenser to be measured is interchanged with a precision, laboratory "standard" in the same circuit.

Professor G. M. Wilcox, of Armour Institute of Technology, recently conducted tests on two B-T Lifetime Condensers taken from stock and found they were of lower resistance than his laboratory standard.

Part of Professor Wilcox's letter reads as follows: "When the B-T Condensers were in the circuit the current was 1 to 2 per cent greater than that obtained with the Laboratory Standard."

Condensers, "Better than Laboratory Standard," are representative of the efficiency of B-T products generally.

Such apparatus in combination with a specially designed circuit made possible the B-T "NAMELESS," now known nation wide for its selectivity and range.

The new 7th edition of "Better Tuning" describes the "Nameless," including 48 pages of hook-ups and helps of value to any radio fan. At your dealer's or by mail on receipt of 10 cents.

BETTER TUNING
BREMER TULLY MFG. CO.
532 S. Canal Street, Chicago

Hudson-Ross Sells only Guaranteed Radio Apparatus. Send for discount.
123 W. Madison St. Chicago

FLINT RADIO CO. 1854 Wilson Ave., Chicago, Ill.

Free Mailing Lists

Free Radio Console
MFG. CO. 562 VEDDER ST.
CHICAGO. WRITE FOR CIRCULAR

Radio Console MFG. CO. 562 VEDDER ST.
CHICAGO. WRITE FOR CIRCULAR

FLINT audio frequency transformers for all hook-ups $3.50 and types of tubes. "Economy of price, and perfect operation insured. "Money back if not satisfied. If your dealer cannot supply, order direct. FLINT RADIO CO. 1854 Wilson Ave., Chicago, Ill.
Radio is going to take tremendous strides during the next few months. The up-to-date radio fan cannot afford to lose interest during the warm months if he expects to be acquainted with the newest developments next fall. A subscription to RADIO AGE, at $2.50 a year, postpaid, will insure you being constantly informed of the latest in the ethereal art. DO IT NOW.

Maximum Miles Per Watt with This Transmitter

TO THE man who has a limited amount of capital to invest and wants to obtain the maximum miles per dollar, which is essentially the maximum miles per watt, this efficient little set should appeal. The set is a 25 watt transmitter using 4-5 watt tubes. By means of a double throw, double pole switch, the set may be used for either phone or continuous wave telegraphy. The circuit is the well-known three coil Weissenn.

Power Supply. Telephony has today reached such a state of development that not only must the voice be carried in an intelligent manner, but it must be a true reproduction of the original, free from distortion and unaccompanied by stray noises and hums. The "pure wave" is also an important factor in telegraphy efficiency and the reduction of interference. The nearest practical approach to this "pure wave" is the current delivered by a properly designed motor generator set. From the viewpoint of good telephony efficiency, flexibility and convenience, an "Eico" Item No. 33 has been chosen as the source of power supply. This type is a four bearing two unit set. The generator is of the double commutator type, supplying 100 watts at 10 volts for the filament and 200 watts at 300 volts for the plates. Regulation of the output power is obtained by means of a rheostat in the field of the generator.

Filter. The filter is the conventional three section "pi" type. The inductances should all be equal and from 10 to 30 henries each. The condensers should be from 2 to 4 henries each. The rules for combining filter sections should be strictly adhered to; i.e., C1 equals C2 and C3 equals C4. These conditions are met if the use of telephone, the modulation choke could be omitted. The omission of this choke would permit the large condensers of the filter system to by-pass the modulating frequencies and all attempt at telephony would result in an unintelligible gurgle. A five to ten henry choke will be sufficient. Due to the by-pass effect of the larger condenser for audio frequency, the radio frequency by-pass condenser C1 should not be larger than .01 mfd.

Meters. Upon the intelligent use of the meters depends the efficiency of the set. A properly operated set will work rings around an improperly operated set of much larger power. The plate milliammeter should be of 0-300 milliampere capacity. The filament meter from 0-12 volts. The antenna ammeter should be of the thermocouple type from 0-3 amperes. The above meters are essential to the practical operation of the set. Two additional meters will be of great help. A plate voltmeter from 0-500 volts and an additional thermocouple meter to put in the antenna circuit. With an ammeter in the antenna lead and one in the counterpoise lead, it will be impossible to obtain a balanced condition with a resulting greater efficiency.

General. The three coils may be of the helix or pan-cake type. The bleded pan-cake type is to be preferred, as the coupling may be easily varied and part turn taps are more easily effected. The serial and counterpoise condensers should be of the transmitting type, capable of withstanding radio frequency of high voltages. The use of two is not essential if a balanced condition is not sought. The usual condensers across the grid and plate coils have been omitted. While they are a slight aid in tuning, they constitute a constant loss and often cause the radiation of other waves than the fundamental. Keying is accomplished by means of a relay which may easily be made from a telegraph sounder. As this relay is in the grid circuit, it should be mounted as near the tubes as possible, and be connected with short leads. Both the relay and the current through the modulating transformer are controlled from jacks on the panel. A small knife switch should be used to shunt the relay when telephony is being used. A 4-8 volt battery should be used for modulation and may also be used to operate the relay.
International Radio Problems
Come to Fore

WASHINGTON, D. C.—With the passage of the bill carrying the State Department's budget of $75,000, plans for the International Radio Conference to be held here in September are being formulated. The actual agenda depends somewhat upon what action the world telegraph conference at Paris takes this Summer. The United States will not be officially represented as it is not a party to the conventions. A careful study of the action taken there, especially with reference to the attitude of the World Powers, will be made by American Governmental officials and radio experts, in order that the general trend of opinion on electrical communications may be followed.

It may be found more practical to eliminate discussion on strictly technical matters, such as specific wave channels, power limitation and such matters, as they might tie up development in a mass of technicalities, which could not be changed for three or four years. The essentials of world-wide radio communication will be covered in the Paris Conference, since they are incorporated under the clause of the old telegraph convention of 1908, covering ship-to-shore radio communication. It is believed that the Paris conference will extend these regulations to cover trans-oceanic radio services. If this is the case, radio service in general, licenses, classification of messages, accounts and rates may be outlined at Paris prior to the American conference.

It is quite probable that a broader conception may be placed upon the old plan for allocating high-power commercial stations throughout the world. Advanced thinkers on this subject believe that the location of commercial stations within the boundaries of a country is a matter for the particular country to determine. The international allocation of signals, such as distress and general calls, as well as the assignment of high-powered station call letters, will be discussed, although it is believed that this matter will continue to be handled by the central bureau at Berne. International broadcasting by amateurs may be considered, as recently the amateur has come into world prominence, and his call letters, although national, have no definite significance in another foreign country, and may be duplicated.

As most of the countries of the world are parties to either the telegraph or the radio conventions, it is likely that more than fifty separate governments will send delegates to the United States this fall to participate in the deliberations on radio regulations.

The 1920 Conference

In October, 1920, about a year before America in general became vitally interested in radio, a preliminary radio conference was held in Washington, where representatives of Great Britain, France, Japan and Italy met to draw up an outline program for future discussion. Most of the visiting delegation were headed by the respective am-

---

**RADIO AGE for May, 1925**

---

**The Magazine of the Hour**

---

**WOW, THERE'S A TUBE JOB FOR YOU!**

---

**BAKELITE SOCKETS**

---
**Europeans Seek Protection for Radio News**

Recognizing radio as a modern means of transmitting news, the members of about twenty-five press associations in Europe have taken steps to protect their property when it is en route through the air. Resolutions signed by such well-known news agencies as Havas of France, Continental of Germany, Fabra of Spain, Reuters of Great Britain, Stefani of Italy and Rosta of Russia have been filed with the International Union at Berne. Other suggestions will be submitted to the International Convention for the Protection of International Property, which meets at the Hague in October.

What amounts to radio censorship is suggested, broadcast transmission would be controlled, receiving sets limited and many phases of radio operation definitely regulated, if the plan is carried out internationally.

Especially do the foreign press associations insist on ethical property rights, patent protection, and punishment when their copy is picked up and used without permission. They recommend that a technical means which will prevent the reception and use by unauthorized persons of Press matter transmitted by radio, be developed. Simple methods of ciphering and deciphering, insuring rapidity of handling, have been devised, and partially secret radio apparatus has been perfected but not yet adopted generally. In Europe the government controls and operates radio as they do practically all communication systems; therefore, it might be a practical possibility. But in the United States, where private companies handle communications, great difficulties would be encountered in this connection.

It was also recommended that national governments agree not to authorize the establishment or maintenance of any private radio receiving stations until the authorities have had the opportunity to strictly limit the capacity of the receiving set. That is, receivers would be constructed or set so as to pick up only manner broadcast on certain wave bands and not on those channels carrying news. This sealing of sets has been attempted in some countries unsuccessfully, and certainly would be a tremendous undertaking in the United States with several million unlicensed receiving sets to locate and adjust, even if it became a law.

**Strong Ban Asked**

Positive legislation against violation of secrecy and illicit use of press material is needed. Adoption of unauthorized radio news, these organizations desire imprisonment, confiscation and damages, as well as forfeiture of licenses, if illicit use is proven. Reduced telegraph rates for press material, great difficulty and assurance that delayed messages would go forward at press rates, despite the lapse of time, make press rates to applies.

Further, the signatories ask that if broadcast concessions are made, the con-
cessionaires be required not to send out political, commercial, financial or other news except that which is submitted and filed by recognized news agencies. This is a curious reversal of the situation in the United States, where the Associated Press has refused to permit its news items to be broadcast. The property value of press news has never been established internationally, it is pointed out, except that in some instances protection after publication is afforded, which would not benefit the news collecting and distributing agencies. In other countries, only what are considered literary works are protected by law.

The members of the foreign press associations claim that radio broadcasting is a menace to them as well as to the public, on account of "the ease thereby given to the spread of uncontrolled news."

How these suggestions will affect the news associations and the private communication companies in this country, as well as the broadcasters and listeners, is unknown, but as American representatives will be present at the conferences, it is assumed that all interests will be protected in the event international agreements are drawn up.

Market for Tapped "B" Batteries Falling Off

The waning popularity of the "soft" tube has greatly reduced the demand for tapped "B" batteries, according to manufacturers of dry cells for plate current supply.

Until the development of satisfactory methods of radio frequency amplification, sensitiveness in the detector was a highly important requirement for long distance reception. The great disadvantage of the "soft" tube is the precise adjustment of plate and filament voltage which is required to operate it at the most sensitive point. Very few users of "soft" tubes, on account of this difficulty, ever secure the added sensitiveness which it gives only under the most favorable circumstances.

The adjustment problem is further complicated by the fact that the most sensitive combination of plate and filament voltage, once found, does not remain fixed. Sometimes a new adjustment in order to "hold" a distant station is required in the midst of a program.

The more modern types of high vacuum tubes, utilizing a fourth of the filament current required by "soft" tubes, give as good results as those obtained with the "soft" detector tube, for sets using radio frequency amplification.

Dealers selling tubes perform a service to their customers if they make sure that the type passed over the counter is best adapted to the use for which it is intended. In any receiver employing radio frequency amplification, the saving in filament current and the availability of more compact and more economical "J" batteries, make it advisable to recommend high vacuum tubes instead of the obsolete "soft" detector tube.

IS IT JAZZ?

It is! Anything you hear on RADIO AGE'S Congress Carnival from KYW, Chicago on Saturday, May 2, from 11:30 p.m. to 1 a.m., is going to be jazz and then some. Tune in for a good time!

Reliability

That trait of thoroughness which merits confidence is always met with high regard. For there is deep satisfaction in knowing that the task in hand is being done as well as it is possible to do it.

This appreciation for reliability has established the leadership enjoyed by Jefferson Transformers. Sheer quality and performance have won the favor of unbiased radio authorities the world over.

Full, rounded amplification over the entire musical range—a constant delight to radio listeners. Such splendid performance is the result of 20 years' specialization in the manufacture of transformers. Replace the transformers now in your set with genuine Jeffer son's and see how your set will improve.


507 South Green St.

Manufacturers of:

Radio Transformers
Bell Ringing Transformers
Spark Transformers
Fuse Holders
Automobile Ignition Coils
Jump Spark—Make and Break Contacts
Auto Transformers
Testing instruments
Toy Transformers

Furnace and Oil Burner Transformers
Bell Burner Ignition Coils
Special High and Low Voltage Transformers

We Equip You

To be a Federal Radio Dealer and guarantee your success under the "Goldilist Plan," which allows you to return merchandise which you are unable to sell. We sell wholesale to dealers only. Give us specifications for stations you have been unable to get. Send individuals over, or send a short letter, giving all information in which you are interested. We will give you our best price and FREE Instruction Book "HOW TO SELL RADIO."}

HAVE YOU BOUGHT YOUR ANNUAL?

* Tested and Approved by RADIO AGE *
FIT FOR A KING

Britain's greatest engineers in designing receiving equipment for its Majesty KING GEORGE V. chose Resistance Coupled Amplification. None other would do.

THE DAVEN RESISTANCE COUPLED SUPER AMPLIFIER will give to your favorite tuner, that finesse in quality amplification desired for the Chambers of Buckingham Palace. With Resistance Coupling the most delicate shadings in musical compositions, either with instruments or the voice, are reproduced with a faithfulness not obtainable with any other method of audio amplification.

Your Dealer will be glad to show you the Super Amplifier which can be attached to your favorite tuner in but a few moments. It costs less to install than other methods of amplification and adds greatly to the life of your "B" Batteries. DAVEN RESISTANCE COUPLED KITS are put up in three and four stages and are for those who would rather assemble their own than buy the complete, ready to attach, Super Amplifier. Obtain from your Dealer the RESISTOR MANUAL, our complete handbook on Resistance Coupled Amplification. Price 25c., Postpaid 35c.

The Aristocrat of Amplifiers

DAVEN RADIO CORPORATION
"Resistor Specialists"
NEWARK, NEW JERSEY

IF readers wish to show their approval of RADIO AGE'S stand against the Radio Corporation of America, they can do it in the most practical way by sending in $2.50 for a year's subscription or if they are already subscribers, urge a friend to subscribe. We believe the fans are with us. Address RADIO AGE, Inc., 500 N. Dearborn St., Chicago, Ill.
KYW Heard Regularly in Samoa

SOUTH Sea nights,—a languid tropical moon,—the cool of the seaward veranda and the ever-present shimmering glass on the table, with its attendant tinkle, have always been regarded as the white man's paradise, especially for those rovers who dot the spacious Pacific and who prefer to think of the United States as a haven 7,000 miles or so away.

But radio, with its magic wand, has annihilated distance and although the night in the micron's republic are still part and parcel of the colonials' lives, yet a new attraction has been added.

All of which should serve as a prelude to the letter of ecstasy received from A. F. Dunwoody, of Apia, Samoa, a mere seven or eight thousand miles from Chicago, in which it is stated that the programs broadcast by KYW from the Balloon Room of the Congress Hotel, where Coon and Sanders play,—which music and fun goes under the name of the "Sleeping Moon,"—is heard nearly every night out in Apia, Samoa.

This is not the first time that KYW has been heard in Samoa, for last year Mr. Dunwoody also wrote the station regarding his reception of its programs. But the thing which appeals to Mr. Dunwoody is the fact that the Insomnia Club feature broadcast by KYW from the Congress Hotel every morning from 1 a.m. to 2 a.m. and on Sunday morning from 1 a.m. to 3 a.m., reaches Samoa about seven o'clock in the evening and serves as an excellent aperitif for the evening meal of many a radio enthusiast.

Between Chicago and Samoa, the latter being in the one hundred and eightieth parallel, there is approximately six hours difference in time. Making it possible for Mr. Dunwoody to sit down to his supper table in Samoa and hear radio jazz music broadcast by KYW from the Balloon Room where the original Nighthawks, Coon and Sanders, play at a time that is exactly the breakfast hour of the residents of the Middle West of the United States.

Apparently there is little interference developing in the South Sea, although thousands of ships on the Pacific are transmitting on 600 meters and KYW's wavelength is 553.4 meters, for Mr. Dunwoody does not report any trouble in picking up KYW's carrier wave and holding it until he has extracted all the pleasure and fun from its Insomnia Club.

Banks Kennedy Now a Radio Age Star

Banks Kennedy, who has amused countless thousands through his radio antics from KYW and WEBH, Chicago, has been "signed up" permanently as a RADIO AGE performer from those and other similar stations. Kennedy first started to twinkle when he introduced his famous "If I Can Arrange It" song, and he has been at it ever since. He is heard from WEBH Tuesdays and Thursdays, after 11 p.m., and at KYW the first Saturday in every month beginning at 11:30 p.m., on the Congress Hotel Jazz Carnival.
<table>
<thead>
<tr>
<th>Call Letters</th>
<th>Station Name</th>
<th>City, State</th>
</tr>
</thead>
<tbody>
<tr>
<td>KFDA</td>
<td>Federal Radio</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDFH</td>
<td>Freedom House</td>
<td>Seattle, Washington</td>
</tr>
<tr>
<td>KDFJ</td>
<td>Dreamland</td>
<td>San Antonio, Texas</td>
</tr>
<tr>
<td>KDFM</td>
<td>Friendship</td>
<td>San Francisco, California</td>
</tr>
<tr>
<td>KDFX</td>
<td>Freeport</td>
<td>New York, New York</td>
</tr>
<tr>
<td>KDKC</td>
<td>King Keen</td>
<td>Kansas City, Missouri</td>
</tr>
<tr>
<td>KDKF</td>
<td>Capital</td>
<td>Austin, Texas</td>
</tr>
<tr>
<td>KDKR</td>
<td>Dreamland</td>
<td>Kansas City, Missouri</td>
</tr>
<tr>
<td>KDKY</td>
<td>Dreamland</td>
<td>Kansas City, Missouri</td>
</tr>
<tr>
<td>KDKW</td>
<td>Dreamland</td>
<td>Kansas City, Missouri</td>
</tr>
<tr>
<td>KDKX</td>
<td>Dreamland</td>
<td>Kansas City, Missouri</td>
</tr>
<tr>
<td>KDKZ</td>
<td>Dreamland</td>
<td>Kansas City, Missouri</td>
</tr>
<tr>
<td>KDLR</td>
<td>Dreamland</td>
<td>Lansing, Michigan</td>
</tr>
<tr>
<td>KDLX</td>
<td>Dreamland</td>
<td>Lansing, Michigan</td>
</tr>
<tr>
<td>KDMX</td>
<td>Dreamland</td>
<td>Lansing, Michigan</td>
</tr>
<tr>
<td>KDOM</td>
<td>Dreamland</td>
<td>Lansing, Michigan</td>
</tr>
<tr>
<td>KDRB</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDRD</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDRF</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDRG</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDRH</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDRJ</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDRK</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDRM</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDRN</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDRP</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDRQ</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDRS</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDRT</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDRU</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDRV</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDRW</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDRX</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDRY</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDRZ</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSA</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSB</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSC</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSD</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSE</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSF</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSG</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSH</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSI</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSJ</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSK</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSL</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSM</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSN</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSO</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSP</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSQ</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSR</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSS</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDST</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSU</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSV</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSW</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSX</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSY</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDSZ</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDFA</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDFF</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDFF</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGG</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGH</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGI</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGJ</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGK</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGL</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGM</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGN</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGO</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGP</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGR</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGS</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGT</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGU</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGV</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGW</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGX</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGY</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGZ</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDFA</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDFF</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGG</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGH</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGI</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGJ</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGK</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGL</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGM</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGN</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGO</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGP</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGR</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGS</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGT</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGU</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGV</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGW</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGX</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGY</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGZ</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDFA</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDFF</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGG</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGH</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGI</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGJ</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGK</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGL</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGM</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGN</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGO</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGP</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
<tr>
<td>KDGR</td>
<td>Dreamland</td>
<td>Dallas, Texas</td>
</tr>
</tbody>
</table>
"Listen in!"

President A. J. Griffin of the Albany Park Kiwanis club, Chicago, is showing one of the Salvation Army nurses and a baby how to run the new radio set, a gift to Salvation Army's Women's Home and Hospital, 5040 N. Crawford ave., by the north-west Kiwanians.

The radio set was presented at a luncheon served recently in the dining room of the institution and attended by fifty members of the Kiwanis club. Music for the luncheon was furnished by a part of the Salvation Army band. Commissioner William Pearl made the address of acceptance. Before they left, the Kiwanians took a trip of inspection through the building.

The Women's Home and Hospital, a refuge for unfortunate mothers, completed by the Salvation Army last April, is located on an excellent site with woods and a pretty neighborhood about it. The grounds of the Home are being improved and when finished promise to make the place one of the beauty spots of Chicago.

"Congress Classic" at KYW

One of the most popular of the classic type of entertainments put on by Station KYW is given each Saturday night at the Congress Hotel, Chicago, where KYW broadcasts a good portion of its programs.

The Congress Classic, as it is known on Saturday nights from 9:30 to 11:30 p.m., is booked by Frank Florentine, general manager of the Congress Hotel, and is announced by Eddie Borroff, who also does the announcing on the Congress Carnival which runs on Saturday nights from 12 to 1 a.m.

During the week there is dinner music broadcast from the Congress, made up of selections played by Joska DeBahary and his Continental quartet, playing in the Louis XVI room from 7 to 7:10; then a journey to the Pompeian room to hear the Coon and Sanders Original Nighthawks from 7:10 to 7:20, and then back to the Louis XVI room where Joska DeBahary finishes off with classical selections from 7:20 to 7:30. This concludes the early broadcasting from the Congress, but at 1 a.m., the Insomnia Club goes back on the air from the Balloon Room, Coon and Sanders original Nighthawks playing until 2 a.m.

Free Sets for Slogans

Radio sets with a total value of $64,000 will be given to fans all over the United States by the All-American Radio Corporation of Chicago. The gifts will be given in return for suggestions for a new slogan for the corporation's products. All the fan has to do is to go to his nearest dealer, get a blank and fill it in with his name, address and suggestion for the slogan.

For some time past, the All-American has been using the slogan "The Largest Selling Transformer in the World." The production of other lines of radio apparatus, such as the All-Amas Junior and Senior semi-finished sets, has made necessary a change. The slogan should apply to the complete line of transformers, sockets, semi-finished sets, etc.

Each dealer will award either a Senior or a Junior All-Amas set to the winner. The contest will end the last of April.

If readers wish to show their approval of RADIO AGE'S stand against the Radio Corporation of America, they can do it in the most practical way by sending in $2.50 for a year's subscription or if they are already subscribers, urge a friend to subscribe. We believe the fans are with us. Address Radio Age, Inc.
No great trouble is experienced here, unless the amplification is carried too far. Usually two stages will suffice and if more are added, the tube noises, static and vibrations of the set are so magnified that the clearness of reception is impossible, although some set manufacturers have succeeded in so carefully balancing their circuits that three stages are used in some cases.

There are two popular methods of obtaining audio frequency amplification, both of which have their advantages and disadvantages. One is the transformer coupled type and the other is the resistance coupled arrangement, and at this time there is considerable talk about which is the better of the two. In resistance coupled amplification, very high resistances are used between the plate battery and the plate, which makes it necessary to use extremely high voltages on the plate circuits. It is not uncommon to use from 150 to 300 volts, according to the amount of resistance used. This high pressure is necessary in order to force the proper amount of plate current through the high resistance.

In this case there is no amplification with the exception of that due to the tube, and in order to get any great amount of volume, more stages must be used than would be necessary with transformer amplification. With more tubes, we are sure to find more tube noises in the final stage.

Taking for example a two stage resistance coupled amplifier, using the standard UV-201-A tubes with an amplification constant of approximately 8, we would have 8x4=32, or roughly speaking, an amplification of 64, while with a two-stage, transformer coupled amplifier using transformers having a ratio of 4 to 1, we would have 4x4=16, or 1024. In this case, also, much less plate voltage would be required to pro-

duce this great difference in amplification value. It is claimed by many that resistance coupled amplification is better, because there will be no distortion, but there is the exception that every time the signal is passed through a tube and there is no reason why a carefully designed transformer should increase this distortion, although it is true that because of the greater amplification afforded by the transformer method, the inherent noises from the tubes and other sources will be amplified in proportion to the signal amplification. For this reason we may get the impression of more distortion. The original cost of installation of the resistance type is necessarily greater, due to the fact that more tubes, sockets and batteries are required to get the same volume which may be obtained by the transformer arrangement.

Amateurs Get New Waves

Secretary Hoover today authorized the amateurs to operate with one meter in length in addition to their previous assignment. The permission covers the channels between .7477 and .7496 of a meter, in other words, a band about the 3-4 meter wavelength. Few people realize the immense number of possible operating channels that lie in the low wavelengths. While the band now assigned to amateurs is only nineteen thousandths of an inch in width, its extremes are separated by one thousand kilocycles. The secret is, of course, not developed to make this possible, but the amateurs now have one opportunity to see what they can do.

Now you can UNDERSTAND RADIO!

514 PAGES

100,000 SOLD

Compiled by HARRY F. HART E. E.

Formerly with the Western Electric Co., and U. S. Army In
troduction to Radio, technically edited by P. R. Bean

More than 100,000 radio fans rely on this I. C. S. Radio Handbook to take the mystery out of radio. Why not let it in the book that can quickly help you decide what the things that insure success? Hundreds of illustrations and diagrams explain everything so you can get the most out of whatever receiver you build or buy.

Contents: Electrical terms and circuits, antennas, batteries, generators and motors, electronic (vacuum) tubes, most receiving hook-ups, radio and audio frequency amplification, broadcast and commercial transmitters, receiver, antenna, batteries, generators and motors, electronic (vacuum) tubes, most receiving hook-ups, radio and audio frequency amplification, broadcast and commercial transmitters, receivers, wave meters, super-regeneration, codes, license rules. Many other features.

A practical book. Written by experienced radio engineers, in plain language. Something useful on every one of its 544 pages. A book that will save you many times its small cost.

Just mail the coupon with a dollar bill and your name and address, and this 514-page I. C. S. Radio Handbook will be sent to you by return mail. Note the other good books listed below at low prices.

International Correspondence Schools
38th St. and Scranton. Penna.

Send 1 dollar for a copy of one of the following books and we will return them within five days and you will receive your money back. Just mail this form:

Radio Handbook, $1

Electrical Handbook...

Chemistry Handbook...

Engineering Handbook...

Traffic Handbook...

Building Trades Handbook...

Machine Shop Handbook...

Seminar's Handbook...

Advertising Handbook...

Bookkeeper's Handbook...

Civil Engineer's Handbook...

Steam Engine's Handbook...

HONEYCOIL COILS

The Universal all-wave inductance for high and low frequencies. Send 25c for Super Honeycob, 50c for Honeycob-Coil Circuits and Complete Catalog. Made in America. Send 50c for Super Honeycob.

LETS RADIO AGE help make this a Real Radio Summer for You! Subscribe Now!
Thorola “Doughnut Coil”

An important development in radio reception is announced by the Reichmann Company of Chicago, in connection with its production of the new Thorola Line Loss Doughnut Coil. This coil, subjected to the most rigid tests, will not pick up or absorb any signal other than that brought in through the antenna system. Its magnetic field is also entirely confined, so that there is no spray to cause interference and interference between various parts of the set.

The new coil is of the toroid type, but differs greatly from all other coils of this type in that it shows extremely low losses. It was designed by Frank Reichmann, designer of the Thorola and Thorephone loud speakers, and marks the first step of the Reichmann Company into the general field of radio manufacture.

Two types of the new coil will be put on the market; one to be used as a coupler and the other as a radio frequency transformer. They will improve practically every kind of circuit and are a distinct advancement in radio.

Baby Grand Reproducer is Unique Speaker

The Grigsby–Grunow–Hinds Co. of Chicago announce the addition of a “Baby Grand” Model to their line of Majestic Reproducer loud speakers. The Baby Grand is a compact loud speaker that retails for $9.00, complete, for home use.

The tone quality of the Baby Grand reproducer is beyond compare, according to the makers, who use the well-known G–G–F Model WC Constant Tension Diaphragm unit. Volume is also said to be unusual in this unit. The horn is made of Du Pont Pyralin, which is said to eliminate harshness or metallic sounds.

Adjustable volume enables the user to regulate the reproducer. The height of the Baby Grand is 13 inches overall. The diameter of the bell is 9 inches.

R. E. Laucalt Joins Phenix as Chief Engineer

The Phenix Radio Corporation announces that Robert E. Laucalt, E. E. A. M. I. R. E., designer of the Ultradyne, has become Chief Engineer for their Corporation, in which capacity he will further his inventive genius in behalf of the Phenix Ultra products. His entire time will be devoted to the design, development and perfection of certain radio devices that are destined to throw new light upon radio receiving apparatus in the future.

This work, like the famous Ultradyne, originated from and is an outgrowth of his four years as Radio Research Engineer with the French Signal Corps Laboratories, where he put to good use his previous intensive electrical studies, designing various types of radio apparatus and instruments, working on the first short-wave radio compass equipment used at the front in 1915, also on the earliest wired radio and aeroplane radio equipment.

Mr. Laucalt was one of the first amateurs in France, his radio experiments dating back as far as 1911. In the Research Laboratory of the French Signal Corps—Mr. Laucalt worked on the T/T Ground Telegraphy System, a wired radio system used for direct and instantaneous communication between different radio compass stations, by means of which the positions of enemy stations were determined.

In recent years, Mr. Laucalt worked on radio telegraphy, also on transmitting pictures by wire, while assisting Mr. Bolin, the French inventor. His experience, extending over a period of many years, gives Mr. Laucalt a wonderful background for unusual development in his new connection as Chief Engineer of the Phenix Radio Corporation.

New Sales Manager for Crosley Corporation

Walter B. Fulghum has been appointed General Sales Manager of The Crosley Radio Corporation and began his duties March first. He comes to the organization with broad knowledge of merchandising and sales methods, having been associated for many years with the Victor Talking Machine Company as head of their Order Department in Camden, N. J. In addition to the experience in the manufacturing side of the business, he has had experience in the retail business and many will recall his record of boosting business in the sale of phonographs in the months of July and August and under other conditions. His broad experience will enable him to appreciate the problems of both distributor and dealer.

Radio Concerns Reorganize

Expansion and stabilizing of the radio industry have resulted in the reorganization of several of the leading manufacturing concerns and the issuing of stocks. These stocks have made sensational records in the New York and Chicago Stock Exchanges recently, due to the record volume of sales of radio apparatus.

The latest reorganization plan to be carried through is that following the formation of the All-American Radio Corporation, which has taken over the business of the Rauland Manufacturing Company, manufacturers of the largest selling line of radio transformers in the world. The new company is headed by E. N. Rauland, one of the pioneers in radio manufacturing and who applied for a license to manufacture under the radio patents held by the United States Navy has been approved by Secretary Wilbur of the Navy Department.

Important extensions in the business of the company are planned immediately. Special attention will be given to the research laboratory work.

Forty thousand shares of All-American stock were offered to the public at $26 a share. It was oversubscribed six times and before being listed on the Chicago Stock Exchange, it was bid up to $36 a share. The statement of the company shows cash assets of nearly $530,000.

Mr. Rauland started the business as the All-American Electric Manufacturers. In 1922 it was incorporated as the Rauland Manufacturing Company. Its chief products have been audio and radio transformers, sockets, fixed couplings and the well-known All-Amux semi-finished one and three tube sets.

New Steinite Distributors

The radio world will be interested in knowing that arrangements have now been completed which enable the Steinite Laboratories, Atchison, Kans., to announce that the firm of E. O. Jackson & Company, 501 South State Street, Chicago, have been designated as exclusive distributors of their products throughout the United States and Canada.

The items manufactured by the Steinite people, and now made famous by extensive advertising, comprise the Steinite long distance crystal set, one, two and five tube receivers, two stage amplifiers, crystal, crystal detector, and interference eliminator.
CLASSIFIED ADVERTISEMENTS

Don't overlook the value of RADIO AGE's classified advertisements. Many such messages have paved the way to independent incomes.

The classified advertising rates are three cents per word for a single insertion. Liberal discounts are allowed on three, six, and twelve time insertions, of five, fifteen and thirty respectively. Unless placed through an accredited advertising agency, cash should accompany all orders. Name and address must be included at foregoing rates and no advertisement of less than ten words will be accepted.

AGENTS WANTED

RADIO—Join our sales organization and make big money. We want a man in every county to sell well-advertised sets and parts made by the leading manufacturers. Widener of Kansas City makes exclusive to us. We offer liberal commissions for retail and wholesale. Write today for catalogs and discounts. Land Radio Company, Div. 52, 1027 N. State St., Chicago.

MANUFACTURER'S AGENT serving on Radio-Electrical Jobbers, Chicago and vicinity, has opening for 3 salesmen calling on volume business, as we cater to large jobbers. Edelstein, 1804 McCormick Bldg., Chicago.


HELP WANTED

RADIO SALES MEN and SET BUILDERS—We need you and you need us. If you are reliable and acquainted with the known in the industry, write. We will appoint you as an assistant and pay you according to your worth. We have orders for parts at prices that will enable you to make a good profit. Write today for our sales plan. Waveland Radio Co., Div. 51, 1027 N. State St., Chicago.

MANUFACTURING FACILITIES

AN OLD AND WELL ESTATISHED MANUFACTURING COMPANY in the Middle West with LARGE and WELL EQUIPPED FACTORIES and UNUSUAL FINANCIAL RESOURCES, DESIRING TO ENTER THE RADIO INDUSTRY, WANTS TO PURCHASE THE MANUFACTURE AND SALE OF RADIO SETS OR DEVICES, AT CURRENT PRICES BASED ON Royalty Basis. Address Box 1A, RADIO AGE.

RADIO


Standard endless radio joke. Bottles post attaches, two colors, 12 for 50c. A. Z. Crenshaw, 703 W. 25th St., Cleveland.

Three Cosmopolitan Phonautographs, each $1.50 book of instructions included. F. A. Blum, 4913 Illinois Ave., Chicago.

FOR SALE—3 Henschel tuning units, 3 Cardwell Condensers, 3 Rhythmeter, 2 loudspeakers. All good working order. New, East Price, Local use.

RADIO CIRCUITS

BLUEPRINTS—Make your own set from proven original and up-to-date multigraphs. The following are copies of almost one hundred different types: Hi-Five tube neophytes—$5.00. 5-in.-3Threeneevoomb regenerative—$3.50. Do-It-Yourself single circuit—$2.00. All three of above, for $1.00.

These blueprints will enable you to make all easy read circuit drawings. MIDLAND PRODUCTS COMPANY, 1143 W. Chicago, III. Ask for our complete list, No. R-31.

RADIO DEALERS

DEALERS—Write for our illustrated catalog of reliable Radio Merchandising Corporation, Dept. D, 1830 Wabash Ave., Chicago, III.

STAMPS AND COINS

150 Genuine Foreign Stamps. Mexico War Issues. Venezuela, Salvador and India Service, Guatemalas, etc., only 50c. finest approval sheets. 50 to 80 per cent. Agents Wanted. Big 72-p. Lists Free. We Buy Sets. Best prices paid. The Homan Stamp Co., Dept. 1527, St. Louis, Mo.

WANTED

WANTED—To complete my set RADIO AGE need August 9, September 13, October 11, November 5, December 1, and January 5. Must have bound or unbound. Advise price. Llloyd C. Henney, Amidon, Arizona.

CLASSIFIED AD.

Adapted copy for the June RADIO AGE must be sent in by May 1, 1925.

Writers

NEW WRITERS WANTED—Articles, stories, poems, reviews, serials, etc. Entirely new field. "No book, no money." NOT A CORRESPONDENCE COURSE. Moving picture editors and publishers trying for new original material. You may write on any subject of your choice. Send manuscripts for books and magazines. Send self-addressed envelope for list of 100 subjects. CALIFORNIA STUDIOS, P. O. Box 697, Los Angeles, Cal.

Inventions

WRITERS—Cash in on your knowledge of radio by writing for Radio Magazine and Newspaper Supplements. Write up your radio experience. Your own ideas are wanted. Nor have to be written by an expert articles. Experienced authors will correct and improve your manuscripts. Make them typewritten. Bonus for first 10 publications. Fee for articles and pamphlets. FULL PAY FOR PAPERS AND ARTICLES. Send some or all of your manuscripts for books and magazines. Send self-addressed envelope for list of 100 subjects.

Wells and Associates, 254 East Ohio St., Chicago, III.

New Ideas wanted—Well known radio manufacturer will consider ideas for circuits, arrangements, or parts which may be used in our radio equipment. If you have any new and useful ideas we will pay you for them. Address, "How You Can Sell Your Manuscripts." Wells and Associates, 254 East Ohio St., Chicago, III.

Radio Age for May, 1925

New "Fada" Announcement

The following is the substance of a recent letter sent to the distributors of F. A. D. Andrea, Inc., relative to their policy on maintenance of prices. "Liquidation is being put into effect by dropping the prices of our sets. You have our unqualified assurance that no such move is contemplated by Fada. We have previously written you as regards guarantee on prices until July 15, 1925. We are prompted to write you again giving you full assurance on this matter because of a number of concerns having asked certain of their products advertised recently by large retail outlets and at an enormous price reduction. Among advertisements of this nature which have recently come to our attention, the names of a number of prominent radio manufacturers, who in our opinion should readily recognize the need for constructive action at this time rather than resorting to dumping of surplus, merchandise, have been involved. "It is our firm intention to continue our present sales campaign with the authorized jobbers and to refrain absolutely from any price concessions to large retail outlets. We believe a jobber who has invested money in our stock and has merchandised our product along authorized lines is entitled to proper protection. We believe a dealer who has helped us maintain our prices and our jobbers is entitled to a clear path in its sale to the user and should not be hampered by undue competition which we feel is being started from certain large retail outlets. To the best of our ability we will guard against any such retail outlets offering our merchandise which may result in unfair competition to our regular dealers."

Radio Show for St. Louis in October

Plans are already being formulated for the holding of the St. Louis Radio Show at the Coliseum in St. Louis, Mo., during the week of Oct. 24-26. The show is under the direction of the St. Louis Radio Trades Association, of which Colin B. Kennedy, prominent radio manufacturer and radio show adviser, is president, and Nickamp is to be director of the show. The week of Oct. 12 has been designated as "Radio Week" as a means of giving the listening interest in the field of radio stars and announcers from all over the country will attend the show, and broadcasting will be conducted direct from the Coliseum, where special studios will be equipped. Already scores of exhibitors have either signed up for booths or announced their intention of doing so.

According to plans now under way, this will be the "National Radio Show of the Great Southwest" for 1925.

If readers wish to show their approval of the stand taken by Radio Age against the Radio Corporation of America, they can do it in their interest by sending $2.50 for a year's subscription to our magazine, or if they are already subscribers, urge a friend to subscribe. We believe the fans are with us. Address Radio Age, Inc., 500 N. Dearborn St., Chicago.
With the Manufacturers

(Continued from page 56)

Care in Connecting Condensers

Important

Fixed condensers, when used in radio receivers, are not always given the proper care which they need for the important work they have to do. The placing of hot soldering irons against a condenser will in most cases do one of three things: change the capacitance; short the circuit or open the circuit.

Another thing that does not give the condenser an even chance is the use of solder too hot. This should be avoided for the reason that they will sometimes draw up too tightly and change the capacity. The use of soft iron builds up a temporary magnet circuit.

As a means of getting the utmost out of a circuit and to utilize all signal strength instead of losing it, Mr. Eby, the Ridge Manufacturing Co., 3818 N. Ridgeway Ave., Chicago, has perfected the "Handy Condenser Clip" to eliminate the foregoing handicap and make the radio receiver just that much better.

H. H. Eby Mfg. Co.'s Patent

H. H. Eby Mfg. Co., of Philadelphia, the makers of Eby Binding Posts, make the following announcement:

"The United States Government has issued patent No. 1,592,44, dated March 10, 1925, to Hugh H. Eby, president of the H. H. Eby Mfg. Co. This patent fully covers the binding posts which we have manufactured and sold for the last five years. Our attorneys have advised us that if we intend to protect our customers and ourselves against infringing manufacturers, the legal technicalities of the case require an announcement of the issuance of the patent and the fact that we are prepared to defend our rights.

"We have gone a step farther and clearly marked the base of every post which leaves our factory with our name and model in order to make identification easy.

"We have felt very much gratified by the many instances which we have seen of the great importance of the radio trade as a whole. After all, Americans hate a fraud. A large number of our jobbers and numerous manufacturers who are using our posts on their sets have sent us samples of various posts which have been offered to them by unscrupulous competitors. They have recognized the fact that we were the originators of this type of post and have assured us that they would continue to buy from us, no matter how many other companies tried to steal our ideas of design and construction."

Radio Loud Speaker Horn Good for Portables

The American Hard Rubber Company has come to the aid of the portable radio fan with a Radion horn and phone cap to fit any speaker of the headphone or telephone type. The horn is small enough to be placed in a radio cabinet, measuring but 10 inches high. It has an excellent tone quality and will make a microphone loud speaker out of any set. Simply screwing the cap over the unit of the telephone. The price of the horn is $2.50.

Meco Introduces New Radio Sets

Simplified tuning obtained by two dial controls with only one dial to log are the principal features of the radio receivers announced by the Metropolitan Electric Company of Des Moines, manufacturers of the well known Meco Tubes.

The radio sets will be marketed under the brand name of "Meco" and will all be of five tubes.

Three different models are being manufactured. All of the sets are similar in operation, circuit and size. One model will retail at approximately $60.00. Another cabinet model will retail at approximately $100. And the period design console model will be priced at about $250.00.

The Meco radio sets operate on radio frequency action, having two stages of radio frequency amplification, two stages of audio amplification and detector.

When ordered, Meco sets will be supplied with tubes matched to the set at the factory. This effects better reception and eliminates much of the trouble for purchasers and dealers alike.

The extreme selectivity of the Meco sets is attributed to the simplified tuning produced by two dial controls.

Mohawk Corporation to Expand

The Mohawk Electric Corporation is about to open a new branch office at 1400 Broadway, New York City. Appointment of H. G. Cisin as manager of this branch has also been announced. Mr. Cisin has been associated with the Mohawk organization in the capacity of sales and advertising manager since the company started manufacturing the Mohawk single dial S-tube receiver, and his promotion to manager of this important New York post will not surprise his many friends in the radio industry.

Besides being well-known in the trade, Mr. Cisin is also known to radio fans as the author of several technical works on radio and electricity. Besides the new metropolitan office being established in New York, the Mohawk Electric Corporation also maintains sales offices in district sales branches in Boston, St. Louis, Los Angeles, San Francisco, Portland, Denver, Minneapolis, Detroit and Cedar Rapids. The main offices are located in Chicago.

The Liberty Radio Chain Stores

David Kanofsky, President of Liberty Radio Chain Stores, at a dinner given by him to his Metropolitan managers and salesmen, expressed great optimism for the future of Liberty. In his remarks Mr. Kanofsky hinted that an important consolidation was under consideration and called attention to the fact that the company plans to open additional stores, as well as plans to open retail radio stores throughout the country.

Mr. Kanofsky expressed great satisfaction in the results thus far accomplished, and stated that he looked forward to the new 6-Tube "Clearfield," which will be marketed through the Liberty organization, to prove an outstanding success. He also stated that the buyer had evidenced a great interest in this new set, which is enclosed in plate glass; hence its name, Clearfield.
All You Want to Know About Hookups!

Let the Radio Age Annual for 1925 Teach You Radio!

If you are going to build yourself a new radio this Spring and Summer, or if you want to buy a new set for your Summer vacation, the RADIO AGE ANNUAL for 1925 will fulfill your every technical need. Scores of tried and true hookups, tested in every detail in the RADIO AGE Laboratory, are contained in this wonder hookup book of 120-pages, with its complete beginners' section, 32-page blueprint section for beginner and expert, and its wealth of material for the advanced radio fan and set-builder. You will find it a worthwhile investment if you get your copy of the new 1925 RADIO AGE ANNUAL and take it with you on that trip, no matter where you go. It will always be ready to serve as a handy radio hookup guide to solve your technical problems. The galaxy of clear pictures, wiring diagrams and isometric drawings makes the ANNUAL for 1925 the year's outstanding radio book. Clip the coupon now before the first edition is exhausted!

$1.00 a Copy

RADIO AGE ANNUAL FOR 1925

Some of the Features

- Hookup guide to the annual sections with such popular hookups as the aperiodic variemeters, loop sets, feed-back receivers, neutrodyne, roller hookups, Baby Het No. 2, a Wonder Super-Het, and others.
- How to get rid of interference.
- How to make an amplifying unit.
- How to recognize and deal with every kind of tube trouble.
- Another super-heterodyne for the super-experimenters.
- Hints on tracing troubles in super-heterodyne circuits.
- A three-tube long distance regenerator.
- A 3-tube set that easily receives KGO on the loud speaker from Ohio.
- Improving the ever popular Reinerms.
- And many other up-to-the-minute hookup and articles.

RADIO AGE ANNUAL COUPON

RADIO AGE, INC.
500 North Dearborn St., Chicago, Ill.

Gentlemen: I want to be one of the first to get the RADIO AGE ANNUAL FOR 1925. Enclosed find $1.00. If I am not satisfied with the ANNUAL I will return it within five days and you will refund my dollar.

Name: ____________________________
Address: __________________________
City: ____________________________ State: __________

5-25
How to fit storage batteries to your set

It pays to buy wisely—to select batteries that bring out the best in your set and are of the right capacity to give fine reception at recharging intervals best suited to your convenience.

The new Prest-O-Lite Radio Chart tells you how to select such batteries. The part of the master chart shown here covers "A" Batteries for 5-volt tube sets. Use either of the two sizes recommended for your set, depending on the days of service you wish between recharging (based on the average use of your set of three hours a day). You will find the larger capacity battery more desirable unless facilities are provided for frequent and easy recharging. For "B" Batteries, and "A" Batteries for peanut tubes, see the complete chart at your dealer's.

Special structure plates, high porosity separators and scientific in ternal construction make Prest-O-Lite Batteries dependable sources of the even, unvarying current absolutely necessary for volume, clarity and distance.

Prest-O-Lite Batteries are made to give long, faithful service. They're easy to recharge—and offer you truly remarkable savings. Though standard in every respect, they are priced as low as $4.75 and up. See them at your dealer's—or write for "How to fit a storage battery to your set—and how to charge it."

THE PREST-O-LITE CO., INC., INDIANAPOLIS, IND.
New York
San Francisco
In Canada: Prest-O-Lite Company of Canada, Ltd., Toronto, Ont.

Write today for this free booklet
Whether you have a one-tube set or most advanced multi-tube outfit, you'll find a fund of interesting information in our booklet, "How to fit a storage battery to your set—and how to charge it."

This booklet gives you the complete Prest-O-Lite Radio Chart—technically accurate recommendations covering both "A" and "B" storage batteries for every type of set.

In addition, there is much vitally important data on battery care and upkeep—information that any radio fan will find of real value in keeping his set at its maximum efficiency. Write for your copy right now.
The recognized outstanding achievement in radio is the Crosley Trirdyn. An overburdening amount of evidence proves that it is excelled by none and superior to most receivers costing many times more. It is a three tube radio combining one stage of tuned radio frequency, regenerative detector and reflex amplification. This combination enables three tubes to do the work of five or six. Bring in every large station in the country on the loud speaker. Is very selective, easy to tune and economical to operate. The straight Trirdyn Regular, formerly $55; now $50. The Trirdyn Special in large cabinet to house dry cell batteries formerly $75; now $60. To these have been added the new Trirdyn Special in a beautiful cabinet with sloping panel at $65. Demand a Crosley Trirdyn at any good dealer. All Crosley radios are licensed under Armstrong Regenerative U. S. Patent 1,113,149. Write for catalog.

Prices quoted without accessories. West of Rockies add 10%.

THE CROSLEY RADIO CORPORATION
POWEL CROSLEY, JR., President
563 Sassafras Street  Cincinnati, Ohio

Crosby owns and operates Broadcasting Station WLB

* Tested and Approved by RADIO AGE *