

15c

NEW NEUTRODYNE CIRCUIT—(See Inside)

15c

RADIO WORLD

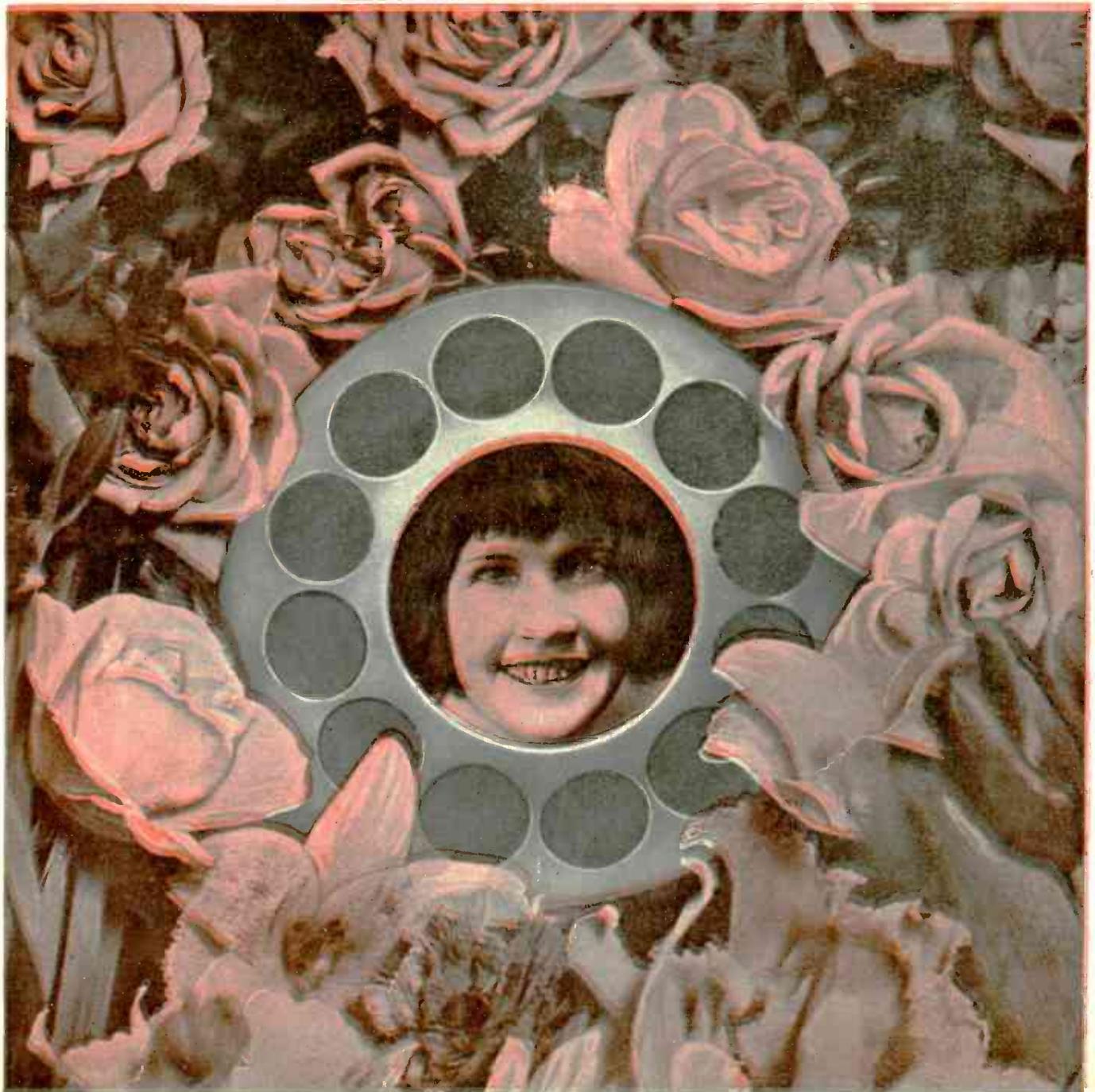
Title Reg. U. S. Pat. Off.

a-122
D. Brynman

APRIL 19, 1924

ILLUSTRATED

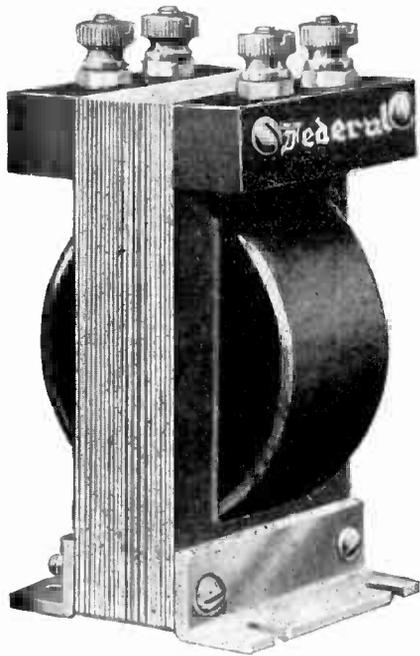
EVERY WEEK



EASTER GREETINGS through the microphone.

(Foto Topics)

Federal has done the experimenting for you



The now famous No. 65 Audio Frequency Transformer is but one of over 130 radio parts designed, manufactured and guaranteed by Federal.

\$7.00

THERE is no speculation about buying Federal Standard Radio Parts. You know beforehand just how complete, just how mechanically perfect your set will be according to the number of Federal parts that are included.

Federal has done all the experimenting for you—not hurriedly or superficially, but over a period of 25 years of intensive research. This, together with Federal's tremendous engineering facilities, makes it possible for Federal to protect you with an iron-clad guarantee on every Federal Standard Radio Part that you buy.

FEDERAL TELEPHONE AND TELEGRAPH CO.

FACTORY: BUFFALO, N. Y.

Boston New York Philadelphia Chicago San Francisco
Pittsburgh Bridgeburg, Canada London, England



The sign of Reliable Radio Dealers



Federal

Standard **RADIO** Products

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Journal Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Phones: Lackawanna 6976 & 2063.

Vol. V, No. 4. Whole No. 108

April 19, 1924

15c. per copy, \$6.00 a year

Power Amplification on Only One Tube

By Charles H. M. White

Consulting Engineer

HOME construction of power amplification for audio-frequency work has received little attention. One reason is the tendency to use dry cell tubes, not readily adaptable for power work.

Now the development of a tube lighting transformer has made it possible for any one with alternating current for lighting in his home to avail himself of the advantages of power amplification.

Of course any radio fan who has a six volt storage battery can use this battery as a source of supply for lighting the filament. It is necessary to use a high "B" battery voltage to get the desired amplification.

The exact amount of "B" battery will largely depend on the type of tube that is used. It will be generally necessary to use over 150 volts and less than 200 volts to make the tube "take hold."

When a power tube is used with a plate voltage that is too low, the amplification is often inferior to that obtained with a non-power tube using the same "B" battery.

One stage of power amplification will give you all the volume you desire and if you want more just add a few more volts of "B" battery and watch the volume swell.

On first thought it will appear that this type of amplification is very expensive, but as there is only one tube to buy and replace, you can easily afford to put the money so saved into a few more blocks of "B" battery.

At the present price of "B" batteries (dry cell type), 180 volts of the large size can be purchased for less than \$14 retail.

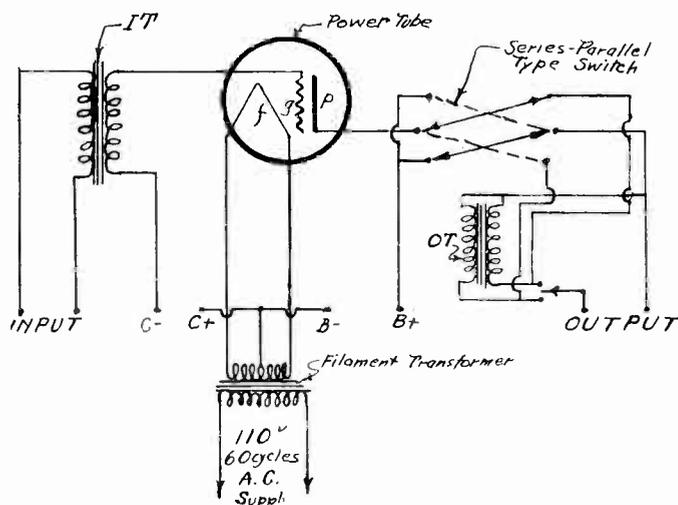
There is still another type of supply for those who have alternating lighting current in their homes—the use of a special high voltage transformer, with filters for supplying the plate voltage.

In the diagram is illustrated a standard hook-up for power amplification with a few special features. The input transformer IT can be any standard audio-frequency transformer of fairly high ratio and good quality. The higher the ratio for the same degree of quality the better the volume. A variable ratio transformer can be used at this point if you can readily procure one, because by varying the ratio you can easily select the correct volume for the desired amount of quality. The output transformer OT can be any standard low ratio audio-frequency transformer. The ratio of this transformer must not exceed 3 to 1, although a ratio lower than this would be better. If you can procure a regular output transformer with a 1 to 1 ratio it will not be necessary to have all the switching arrangement for reversing the ratio of the output transformer to allow for the varying impedances of different power tubes and loudspeakers.

The best possible arrangement for the output trans-

former is a variable ratio output transformer. Both variable ratio input and output transformers are available for amateur radio construction.

Why use only one stage of power amplification? The fewer tubes used for audio-frequency amplification the purer the tone production. Many radio fans who now have two stage audio-frequency amplifiers will notice that noise and distortion is squared every time



ONE-TUBE power amplification, using filament transformers.

another stage of ordinary amplification is added.

Many radio fans have noticed that one stage gives about the best results, since it happens to be the best compromise between volume and quality. With some second stages it seems volume exceeds the quality. Now it is only logical that if this reproduction of the first stage is amplified through a power tube, much better results will be obtained.

Several large set manufacturers have incorporated only one stage of audio-frequency in their sets because they realize that with sufficient volume for the detector this is sufficient when power amplification is used. As a matter of caution I advise that sufficient "C" or grid bias battery be used.

In this power amplifier a large 22½ volt tapped "B" battery type of dry cell block is better adapted to "C" battery work since quite a high "C" voltage will be necessary. Be sure when using the 22½ volt battery that you get the negative side of the battery next to the tube grid.

If a high ratio input transformer be used it might be found of advantage to shunt a 1 megohm leak across the secondary to improve quality. Likewise a 1 megohm leak can be shunted across the secondary side of the output transformer for improvement in quality.

The filament transformer is the ordinary type and can be purchased from any of the large radio supply houses. In effect, it is similar to the common bell-ringing transformer, with the exception that a tap is taken from the exact center of the secondary.

Amplidyne Circuit Makes Its Bow

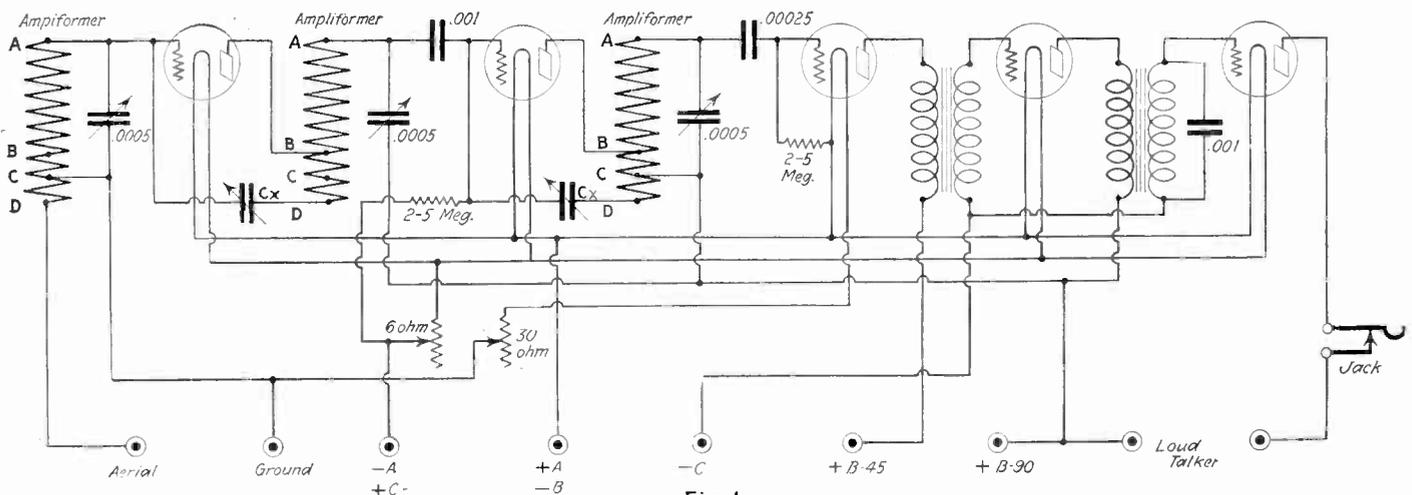


Fig. 1

THE NEW AMPLIDYNE CIRCUIT, using Honeycomb Coils and the Neutralizing Principle

A NEUTRODYNE circuit using spider-web coils, was described by Byrt C. Caldwell in *RADIO WORLD*, April 12 issue. Herewith is an article on the Amplidyne circuit devised by Thomas W. Benson. Readers constructing either or both of these are requested to report results to the Technical Editor.

By Thomas W. Benson

THE well-deserved popularity of the neutrodyne circuit is due to the stability of the radio-frequency stages which not only permits ease of tuning but gives maximum amplification for the type of coupling employed.

The difficulty most often met with in home-made sets is the mounting of the coils to reduce feedback.

The angle of the coils must be exact and should one of them become slightly displaced the circuit is unbalanced and uncontrollable oscillations result.

Another drawback to the circuit is the fact that true neutralization can not exist at all wavelengths. This condition is apparently reached in practice, but since the coupling between the plate coil and the section of the secondary used as a source of neutralizing current is not unity, the balancing current does not follow exactly all variations in the plate current.

With the above facts in mind, the writer undertook the development of a circuit, based on the well-known principle of neutralization, but which would retain all the good features of the neutrodyne, yet overcome any of the defects inherent in this class of receiver.

The result is the Amplidyne receiver. It has been tested by several persons under actual working conditions and found to give perfect satisfaction. Furthermore, the mounting of the coils is simplified, the inductances can be built at a low cost and the neutralization is under control.

The advantages of the latter feature becomes more apparent when tuning in distant stations. Normally the circuit is held balanced while tuning. When weak signals are picked up the circuit is slightly unbalanced, but not sufficiently to permit oscillations, and the signals will come in louder. This is because the more tendency there is for a radio-frequency amplifier to oscillate, the greater the amplification. The limit to this increase of amplification is the point where the circuit breaks over into oscillation.

Fig. 1 shows the complete circuit. The details of

the amplifiers are given in Fig. 2. It will be noted that the inductance is a honeycomb coil clamped between two pieces of bakelite with four terminals mounted on the bakelite.

Referring to Fig. 1, we note two taps on the coil. To make the amplifiers, take a 75-turn honeycomb coil and strip off two turns of wire. Now count back fifteen turns and raise the wire slightly, skin it and solder on a tap, this gives tap C. Fifteen more turns are counted back on another tap taken in the same manner, giving tap B. Thus we see that the inside end of the coil is tap A, then come taps B and C and finally the outside end of the coil, marked D. These leads are run to the terminals mounted on the bakelite, being sure they are mounted as shown in Fig. 2 and properly marked. A small brass angle is fastened to the corner of the amplifier to permit it being mounted on the condensers.

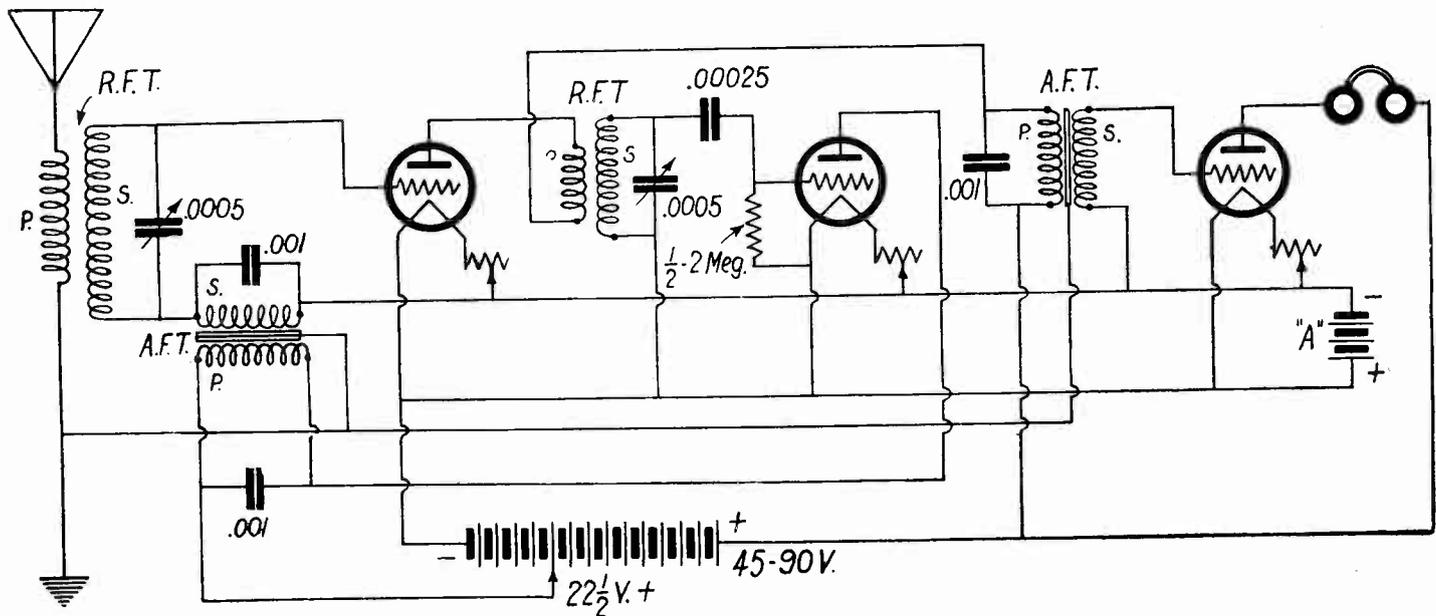
When the amplifiers are connected into the circuit as shown in Fig. 1, they become auto transformers that give good transfer of energy from one tube to the next. Just how this is accomplished will be understood from the illustration. The first amplifier is the antenna coupling. Here we find the aerial circuit includes the winding between points D and C, giving a fifteen-turn fixed primary. The remainder of the coil forms the tuned secondary circuit.

The plate circuit of the first tube includes the winding between B and C of the second amplifier, giving a fifteen-turn aperiodic plate inductance. This inductance is included in the tuned section of the coil that feeds into the grid of the next tube through the condenser in series to the grid. This condenser serves to keep the B battery off the grid.

To obtain the neutralizing current we make use of the fifteen turns on the end of the inductance which feeds back through a small variable condenser of the midget type, mounted on the panel, to the grid of the tube. It should be clear that the potential induced at the point D of the amplifier is opposite in potential to that at point B and any tendency of the current at point B to feedback to the grid through the capacity of the tube will be balanced by a feedback from point D through the condenser. We obtain unity coupling between the plate inductance and the neutralizing section of the winding, giving neutralization at all frequencies.

The coupling between the second tube and the de-
(Concluded on next page)

Stability Achieved in 3-Tube Reflex



A DISTANCE-GETTING, stable three-tube reflex circuit, that does not regenerate.

LIKE the well-known Neutrodyne receiver, this set uses a radio frequency amplifying transformer in the antenna and secondary circuits. This transformer and the one between the first tube and the detector are identical in construction and are made as follows. On a 3½-inch cardboard or better still, a bakelite tube, wind 45 turns of No. 22 D.C.C. wire. This comprises the secondary. Directly over the center of this secondary and separated from it by two layers of wax paper or Empire cloth, wind the primary. This consists of 8 turns of No. 18 D.C.C. wire. Ordinary annunciator wire may be used if desired. If cardboard tubes are used for winding these two transformers, thoroughly shellac them first or coat them with molten paraffin.

This receiving set does not employ regeneration, but if care is not taken in the placing of the radio frequency transformers, oscillation may take place. This, however, can be prevented by mounting the two R.F. trans-

formers so that their axes run at right angles to each other.

This will prevent any feed-back action between them and it becomes practically impossible for the radio frequency amplifier to oscillate due to the fact that the plate circuit is aperiodic and not tuned. Therefore, it cannot readily be brought to a resonance point with the grid circuit. For this reason also a potentiometer is not necessary, but if the reader desires he might try one connected across the "A" battery, with the filament connection of the audio frequency amplifying transformer connected to the center post of it.

It is indeed wise to equip the two variable condensers indicated with verniers, as the condensers are rather critical in their setting. This set requiring only two tuning controls is extremely selective and if care is taken to connect the rotary plates of the condenser to the filament circuit, little or no body capacity will be experienced.

Neutrodyne Uses Honeycomb Coils

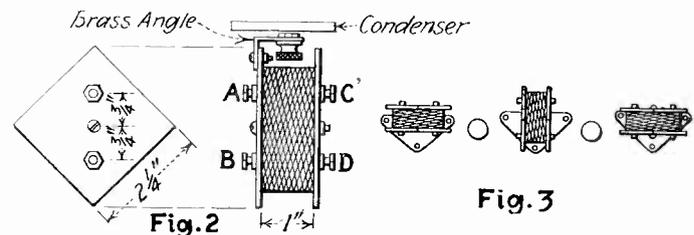
(Concluded from preceding page)

detector is identical in construction and operation. The position of necessary grid leaks are shown in the circuit, the proper values being obtained by test.

The audio amplifier is standard, except that negative bias is provided for the grids to reduce B battery current and obtain louder signals. A condenser is placed across the secondary of the last audio transformer to remove hissing and clear up the reproduction.

In mounting, the amplifiers should be placed about five inches between centers and mounted at right angles. This is readily accomplished by the type of mounting used, it being seen that the coils can be easily swung on the mounting till they lie at right angles. The size of the coil gives a small magnetic field and practically no feedback by coupling between them is noticed when they are mounted as shown in Fig. 3.

No further constructional data are really necessary. The usual neutrodyne construction can be followed and the resulting receiver will be found to give perfect results from the start. The tuning is similar to



POSITION of brass angle (Fig. 2) and coils (Fig. 3).

the neutrodyne, all dials read nearly alike and the logging of stations can be done for future reference. It will function with any type of tube, being better of course with the 201A tubes and with but slightly less volume with the UV199. The rheostats shown are for the storage battery tubes and proper rheostats should be employed if other types of tubes are used.

[In RADIO WORLD, issues of March 15, 22 and 29, complete data for constructing the neutrodyne circuit was published. These issues can be referred to and Mr. Benson's improvements incorporated.]

Science of Broadcasting Explained

By Paul D. Findley

THE equipment used for broadcasting consists in general of a microphone to convert the sound to electric waves, an amplifier, and a radio transmitter to send the waves through the air. In practice, the microphone is usually at some distance from the radio transmitter, and the two are connected by a telephone line. The electric waves are amplified before being sent over the line, and again at the transmitter. There are two types of stretched diaphragm, air damped microphones which have been extensively used in broadcasting—the condenser type and the carbon button type. The carbon button type is now generally preferred, as recent improvements have made it almost equal to the condenser type in freedom from distortion, and it has the positive advantage of requiring two less stages of amplification. Moreover, because of its small diaphragm motion, it is not liable to be overloaded.

It is very important not to overload any of the apparatus. This causes "non-linear distortion"—another name for the "fuzzy" sound which is so common and disagreeable a feature of broadcast reception. "Overloading" may be either in the transmitting station, or in the radio receiver, or in the loud-speaker. It may occur with even the best apparatus, if improperly handled, though it can be avoided if the apparatus is properly designed and carefully operated. For this purpose a measuring circuit has been developed, terminating in a meter whose needle follows every change in the loudness of the transmission. Then by a potentiometer control the amplification is adjusted to fully load, but not overload the apparatus. In this connection it is interesting to note that even the human ear is subject to overload, and will distort tones that reach it in more than customary volume.

Some idea of the difficulty of artistically transmitting a program by radio is given by the fact that in one selection by a large orchestra, the volume of sound produced may be 100,000 times greater at one time than at another. As no broadcasting equipment has yet been devised which will handle such a range of intensities, it is necessary to vary the amount of amplification given the current from the microphone so that the sending apparatus will not be overloaded. This adjustment is made at the amplifier associated with the microphone, and calls for the greatest skill and care and the assistance of testing and recording instruments of extreme precision. A "volume indicator" bridged across the wires from the microphone follows accurately the strength of this current which is being delivered, and the operator varies the amplification so that the soft tones will be audible to the listener and the extremely loud tones will not overtax the capacity of the apparatus.

The telephone line connecting this amplifier to the amplifier associated with the radio transmitter usually requires some adjustment before music can be sent over it without distortion. By means of "attenuation equalizers" an ordinary telephone line can be made to give almost perfect transmission.

The radio transmitter, which impresses the voice currents on a high frequency "carrier" and its associated amplifiers are generally kept at a fixed adjustment. Their range of frequency and intensity is determined, and all variation of amplification necessary is made at the first amplifier, as already described.

An important factor in good broadcasting is insuring

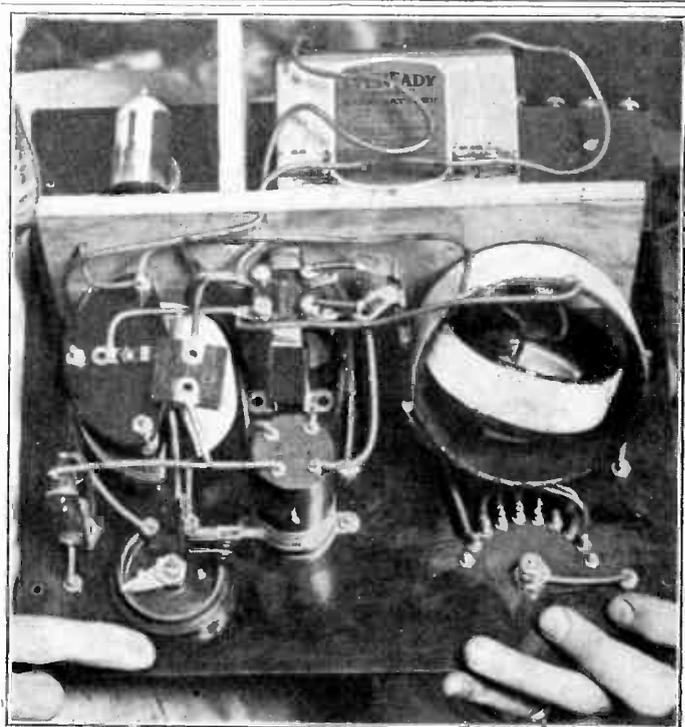
that all parts of the system maintain their high quality. Periodic tests should be made with currents of various intensities and frequencies to make sure that all apparatus transmits properly throughout its entire range.

Receiving sets are found in so many varieties that no detailed discussion of the various circuits was entered into. Some of the most common sources of trouble, however, were touched upon. Getting good results with a receiving set is largely a matter of arranging the various pieces of apparatus with a proper understanding of their characteristics. Transformers have been the causes of considerable trouble, although when the correct types are used satisfactory operation is obtained. Headsets, amplifiers and loud speakers of correct design will also tend to prevent the distortion which too commonly characterizes the output of an amateur's outfit.

With the broadcasting apparatus now available practically perfect transmission can be obtained, although with most of the loud speakers now on the market it is not possible to take the fullest advantage of this high class material. Recent scientific research, however, based on the science of acoustics as well as of electricity is producing apparatus which will satisfy even the most critical of listeners-in.

Take It Easy

THE first complaint of a fan, the first evening that he operates his set is, "The thing doesn't work like it did in the store," and he promptly proceeds to get "hot under the collar" and to feel as though he has been taken in. If he stopped to consider, the man operating the set knew its tricks and just how to "tease that volume out of it." A little patience, and you will be able to do even better—but not the first night.



(K. & H.)

ONE of the most interesting reflex sets is shown in this photo. The set is portable and self-contained, and operates a loud speaker on only one tube. It took E. Jay Quinby, who constructed it, several months to balance out the circuit so that it would work properly. He also found that it was necessary to use a bank wound rotor on the coupler. A crystal detector is used.

A Shut-in's Own Story of Newborn Joy

By Helen A. Hill

THERE is "something new under the sun," Solomon to the contrary notwithstanding. There is a "taste in the white of an egg," although ever since Job in his utter abandonment declared the opposite, the saying has been an aphorism. Lo, the radio has come. Enough said.

The shut-in needs no artificial electric thrill of optimism when she can hear every day from the department store across the bay the "Redheaded Music Maker" sing untiringly, "It Ain't Goin' to Rain No More."

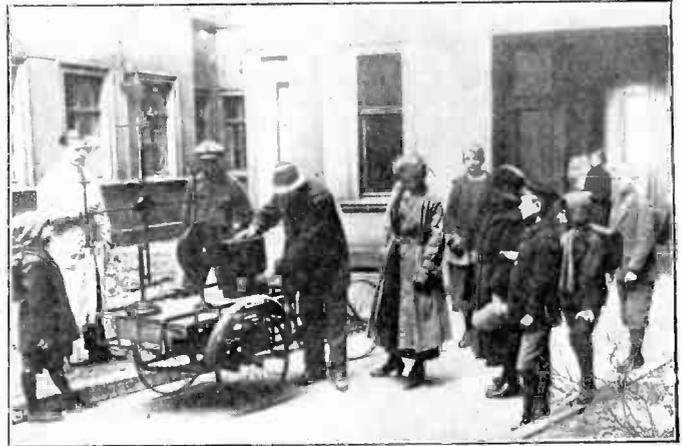
She hears at what she pictures as a dignified banquet of the fine organization of the Daughters of the American Revolution a spirited band strike up "Cheer! Cheer! the Gang's All Here," and when the laughter has subsided, a few daring venturesome strains of "How Dry I Am!" She feels the good-will and relaxation of the atmosphere and laughs with them. The "dryness" is all gone.

In a disinterested fashion she tunes in a minute and ascertains there is to be a lesson on poultry. She is about to turn rudely when she discovers that there is a real, live person at the other end. He says, "Good evening!" to his daughter and son-in-law in some distant city who are listening in. She knows at once that he is human. He states as an aside that his son-in-law is a baseball player and his listeners-in may wonder what interest he can possibly have in poultry. The speaker assures his audience that his son-in-law has an interest in it—for home consumption. On the top of this bit of seasoning she settles down and listens through contentedly to a lecture on the technicalities of poultry raising, which does not concern her in the least.

She lies awake wide-eyed one night after having heard a scientific lecturer say that undoubtedly the next discoveries would be in the spirit world, and probably future generations would be picking out the voices of Socrates, Moses, etc., as a pastime. She wonders if the spirits are not hovering around her in the darkness.

But, in a serious vein, there is no emotion that the radio does not call forth. You hear a voice singing, "My Wild Irish Rose." You vision once when you were well and strong and see a beautiful girl you once knew, singing this in all her youthful loveliness, scattering wild roses as she sang. You see Youth, Beauty, Love, Summer, and all the world is young again.

You hear the voice of a friend tell of his privileged visit to the tomb of Tut-Anhk-Amen and you live again in that ancient time, see all the wealth, wonder at the blind gropings of that ancient race for life after death. Next day you call a friend, a delightful English lady, who enthuses about it and proves to be a lover of Egyptian mythology and loans you a book on the subject that she has brought from England. You and



(Keystone View)
IN DAYS OF OLD when men were bold and German brass bands held their sway over bar-rooms and back alleys, they appeared in person; but now they play from the broadcasting station and the oom-pah is picked up by the radio penny catcher.

your fine old father, who, though deaf, also heard the speech, read the book and find a revived interest in talking over those ancient beliefs.

You have a secret enjoyment in watching the radio eyes of the neighbor's children who frequently come in and spell you off on tuning in. What can equal the thrill of a twelve-year-old when he gets his first station and shouts: "I got Dallas!"

You hear one of America's enterprising women make a plea for the elimination of war at a banquet of the League of Women Voters. A friend who is a member of that organization has casually dropped in that evening and hears it with you. A few days later a prominent woman of your city reports her attendance at a great national convention of educational leaders, and having heard with difficulty a certain speech which she describes as the best thing on the program. Lo, your amazement when she says this and you realize that it is the same speech that you heard perfectly in the comfort of your own home. Truly, being a shut-in has its compensations.

You hear a beautiful voice singing to you a message of hope, "The Wind's in the South Today." You send for the song and pass it on to a favorite singer of your city, who in turn will sing the message to others. And so the circle widens.

You hear a fine male voice reciting, "Sail on! Sail on! Sail on!" In the face of that, how dare you grow discouraged? You will keep afloat, with Hope at the prow.

Surely the pulse of the whole world is throbbing. There is a "taste to the white of an egg." The consolation of well-meaning friends does not now produce upon you the effect of ipecacuanha. You pity them. They don't understand. You have a radio.

Correction

In our list of broadcasting stations WGR, Federal Telephone & Telegraph Co., Buffalo, N. Y., should be 319 meters, 940 kcys.

Mellon and Work Have No Set in Home

WASHINGTON, D. C.—A few years ago, the country heard frequently of Roosevelt's "tennis cabinet"; more recently it read of Harding's interest in golf which extended to so many members of the cabinet that a "golf cabinet" was forecast. To-day, President Coolidge is the central figure of a "radio cabinet."

Postmaster Work and Secretary Mellon, of the

Treasury, have as yet no sets of their own, although the former supervises the use of radio in the Bureau of Mines and in the Geological Survey, and the latter in the Coast Guard. Secretary Work is interested and has spoken from WRC, but Secretary Mellon has refused several times to have a try at broadcasting.

The others all have sets in their homes and enjoy them greatly.

One Hand Tunes 2 Dials at Same Time

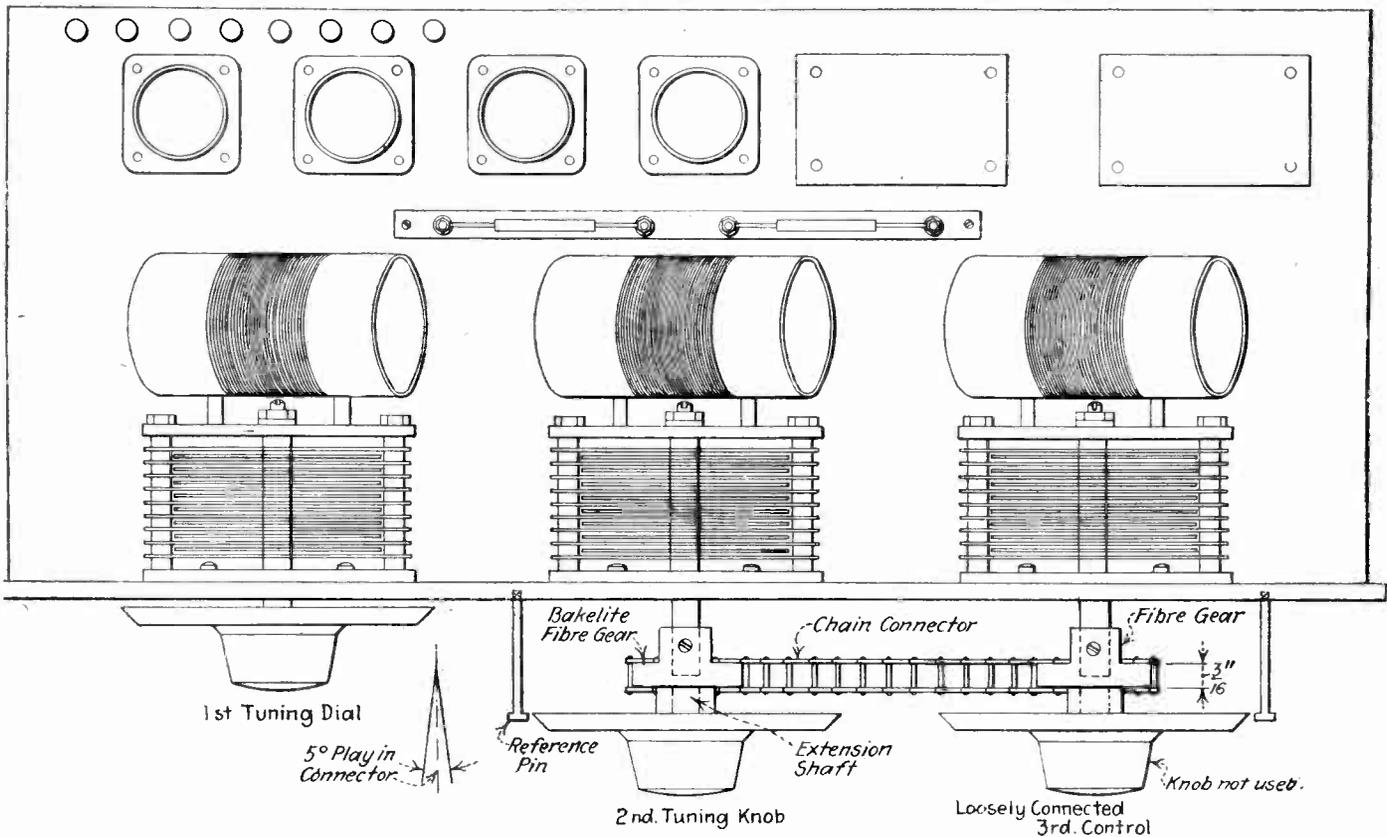


Fig. 1 Simplifying 3 Tuned Radio Stages to 2 Controls.

HOW TO ELIMINATE ONE CONTROL by using a single agent to tune two dials

By Philip Edelman

BEGINNING with three tuning control dials before there are any stations logged for reference, is difficult for the new set owner. It is like trying to unlock a safe without knowing the exact combination.

Without sacrificing any selectivity, I show how to simplify three controls to two (Fig. 1). This could be extended to work all controls simultaneously, but two dials are easier for the beginner. The idea is mechanically to couple the last two tuning controls so that there is a little loose connection or play, allowing five degrees variation to make up for differences in setting the last two tuned stages. This will take care of the majority of cases.

When the second tuning knob is turned, the third knob is carried along at the same time.

But the second knob can be turned back slightly while the third condenser remains in its last position. In this way, all combinations are obtainable, as usual, but with one tuning knob omitted. It is left on the shaft, for reference, as a dial only.

To make attachment, no change in wiring is required, as bakelite fibre gears are used with a chain connector on the outside of the panel. The necessary work can be done at any small machine shop if the suitable gears and chain are not found in correct size at your supply house. As shown, the play should be sufficient to permit 5 degrees variation between the two control shafts. Reference pins can be used as illustrated in place of usual scale mark "zero" on panel.

If small gears and brass chain is used, this will be a neat arrangement. In making a set, it is also possible to have this mechanical connector at the rear of the panel. Do not use metal gears on both shafts, as then

the two condensers will be short circuited unless an insulating bushing is employed. As shown, this connector makes a serviceable and neat improvement, simplifying the control of tuned radio frequency sets.

[The above article applies particularly to the neutrodyne and other tuned R. F. sets.—Editor.]

Cut Down on the Filament Juice

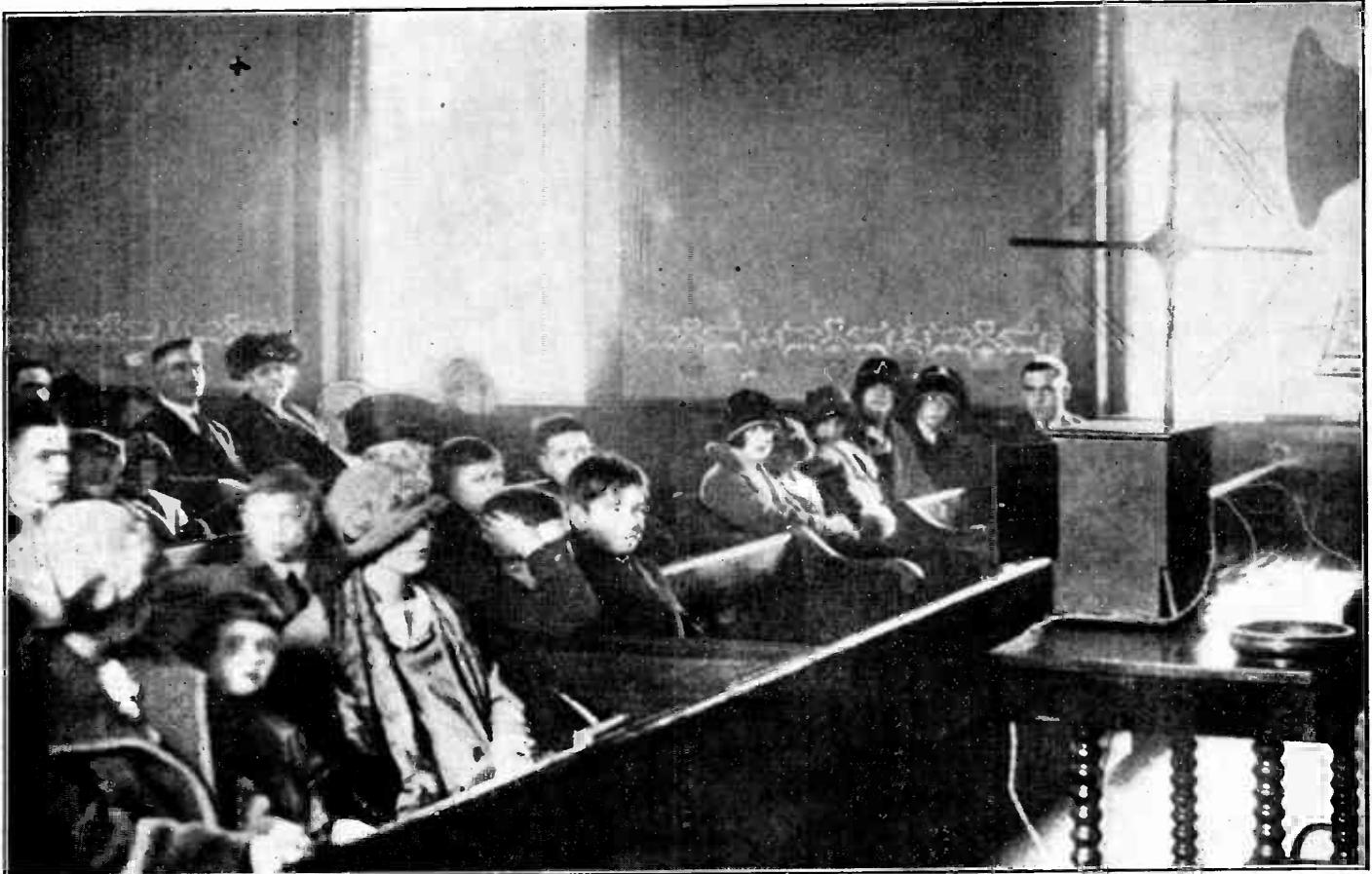
IN ninety-nine cases out of a hundred, the average case of howling can be attributed to the novice in radio burning his tube up as bright as it will go. Cut down the juice and you will save tubes.



(Photograms)

ARE TELEPATHY AND RADIO ONE?—Dr. W. H. Peck, noted scientist, is shown demonstrating through his quinxplex radio set this theory that telepathy and radio are one. This set has no visible aerial or loud speaker, both being inside the cabinet. Maria Ivogun, noted coloratura soprano of the Metropolitan Opera Company, watching the experiment by Dr. Peck.

Radio Substitutes for Absent Pastor



WHEN THE REVEREND H. J. FULTON, pastor of the Hampden, Mass., Community Methodist Church, could not appear before his congregation, it was feared that they would have to go without the regular sermon, but one of the flock who had a portable radio receiver set it up and tuned in on the church services from the South Church at Springfield, Mass.

Reorganization of Chicago Broadcasters

PLANS are afoot for the erection of at least fourteen new Class B broadcasting stations, and seven are already under construction, according to the Department of Commerce. To date, there are 49 of these high-class and high-powered stations, but with the development of the art, more powerful stations have come into vogue and as a result bigger and better stations are expected in New York, Chicago, New Orleans, Denver, Hartford, Houston, Hot Springs, Cincinnati, Fort Bragg, N. C., and Berrien Springs, Mich.

In Chicago, a sort of reorganization in super broadcasting is under way. WJAZ, the well-known station of the Chicago Radio Laboratory, will become station WGN, and the Chicago Tribune will use this station on 370 meters instead of 448 meters. The Herald and Examiner, with Sears-Roebuck Company, will share a new B station which will operate on 345 meters, splitting time on sharing this wave length with WCBD at Zion City. The Daily News station WMAQ will operate on 448 meters, dividing time with the Rainbow Gardens.

A Portable Set Answers Call of the Outdoors

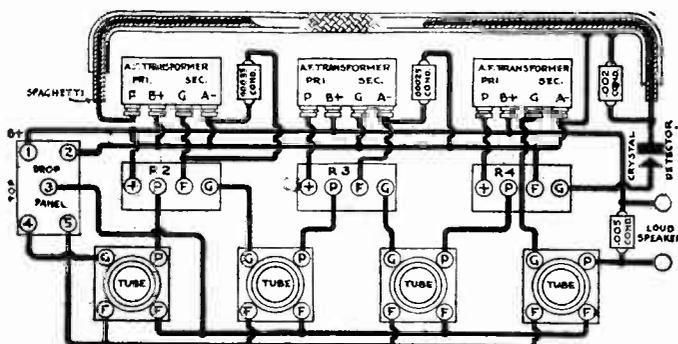
MANUFACTURERS, in turning out recent models of radio receiving sets, have taken into consideration the approach of the "open season" and are in many cases putting out portable sets that are getting real DX. It has been found that

many fans, with the coming of the warmer weather, are not willing to disarrange the home set for week-end trips and at the same time are not desirous of taking on one of the portable type unless it can deliver the goods in a manner similar to the home outfit. Incidentally, organizations featuring outdoors are for the first time tying up with radio. For instance, the National Outdoor Sports Exposition, to be held at the Grand Central Palace May 26-31, will have a radio division. In this many outdoor radio models will be featured.

An example of a portable set that gets real DX is the Portable Acme-Triflex. For the vacation season this set is ideal as the complete outfit goes into a suitcase. The original Acme-Triflex consists of the following parts:

- 1 24-Plate Hargold Vern. Condenser.
- 3 Acme Audio Transformers.
- 3 Acme Radio Transformers.
- 1 Acme Pot Rheo.
- 4 Bakelite Sockets.
- 1 Tri-Flex Crystal Detector.
- 4 Freshman Condensers.
- 10 Feet Bus Bar.
- 8 Engraved Binding Posts.
- 21 inches Copper Mesh Tubing.

This portable model has low construction cost, yet has features that appeal to fans with exacting requirements.



THE PORTABLE FOUR-TUBE SET is shown in diagram.

Operating the Dials Is an Exact Art

By B. J. Blake

COMPARATIVELY few radio fans realize the trouble and disturbance they cause when they operate their receivers improperly. Most of the howls, whistles and squeals can be laid to incompetent or careless operators. Many realize what trouble the other fellow is causing but fail to bear in mind that they, too, set up similar noises by improper manipulation. Then again, there is a class of radio listeners who never read radio publications and are not in the least concerned about how or what they do.

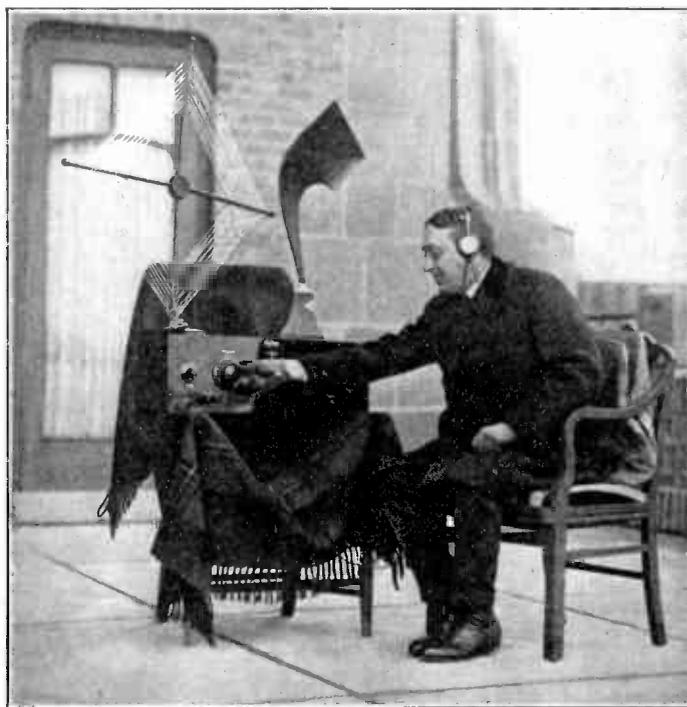
Operating a radio receiver is not just the vain twisting of a control dial until something happens; it is far more than that—it is a systematic, scientific manipulation of variable conditions so that the desired results are obtained. The man who just turns dials in a childish and unknowing fashion waiting for the “magic box” to spring a “hocus pocus” trick is not only cutting himself off from a lot of useful entertainment but is also seriously hurting his friend near by. If you do not know what dial No. 1 accomplishes, find out from someone who does know, and if you do not know why the volume increases as you turn another dial, take the time and get the desired information.

What is re-radiation? Interfering radiation, often improperly called re-radiation, is the transmission of radio-frequency waves from a receiver. Any radio receiver that oscillates transmits radio-frequency waves, although these waves are relatively small in magnitude as compared to the wave radiated from the antennae of a broadcasting station. It must be remembered, however, that the relative magnitude of this wave as compared to the wave reaching the antennae of the receiving set is larger. Therefore, an oscillating receiver next door which is transmitting radio-waves from its antennae impinges on your antennae a radio-frequency wave which is of stronger magnitude than the wave from the broadcasting station. This is true because the set next door is so very much nearer than the average broadcasting station. The re-radiated wave from a neighbor's antennae if of a very high frequency produces a whistle or audible squeal on your antennae because the two frequencies, the one of the station and the other from the near-by set, form an audible “beat note” when they are very near the same frequency value.

It is readily seen how this type of interference can multiply. In the closely settled apartment house districts of large cities it is often almost next to impossible to hear a weak station through the maze of whistles set up by surrounding receivers.

The most serious forms of interfering radiation are caused by regenerative receivers. A poorly made or designed regenerative receiver will often lack the correct amount of smooth regenerative control. It will not only oscillate, but will jump into oscillation very violently. Such a receiver in the hands of a novice is not only difficult to control but very capable of producing the heart-rending and concert-destroying noises. And it is generally the man who owns this class of outfit who is always looking for distant stations while the local broadcast is going on.

It is probably his desire to satisfy himself that this much simplified receiver is capable of producing distant work. He is constantly shifting his dials with his tube oscillating, trying to pick up the “best note” of a distant station. He thereby produces a serious squeal or whistle which not only disturbs those near him but causes many of them to readjust their quiet sets



(Atlantic Foto)

Governor Silzer of New Jersey tunes in at Atlantic City.

in an effort to remove his whistle. Often, too, this starts their tubes oscillating, producing more whistles, and soon the surrounding neighborhood is a mass of horrible noise. This type of radio fan is a great hindrance to the general public's enjoyment of radio concerts. He is a very selfish and inconsiderate party who thinks not of others, and, it is often his squeals that cause others to get their sets squealing also.

The solution of interfering radio-frequency radiation from receiving sets can be solved in two ways: first, by the employment of a “muffler tube” in front of the receiver, and, second, by a full knowledge of the controls and the general operation. The first method is of course the better. In subsequent issues of *RADIO WORLD* I shall give some simple methods of accomplishing this purpose at the lowest possible cost. The second method, which is nothing more than a training of the unskilled manipulator, is the cheaper but is quite a task. While it is true that the radio publications can materially assist, the bulk of the work is up to the trained operator to teach the man next door. Do not hesitate to tell and show him the proper way. Talk about the evil every time you get around a bunch of enthusiastic fans. In this way you will spread useful propaganda and pave the way for clear radio reception.

As I have previously said, most radio fans are willing to be taught, and the harm they are now doing can be attributed more to their ignorance of the truth than to deliberate carelessness. The first thing to show the new fan is the actual meaning of his various controls. Teach him to determine when his set is oscillating. Show him how to tune in by placing his tickler coil so that this sound is not heard. Tell him that when a whistle is heard as he tunes past a station he is improperly operating his set by having his receiver re-radiating.

Technical writers in their articles always put great stress on the fact that tuning must always be done patiently and carefully.

One-Tube Set That Does Not Radiate

By Byrt C. Caldwell

THE beginner who wishes real success with his receiver should start with a simple one-tube set, and then gradually progress, building larger and more complicated receivers. Meanwhile he gains a thorough understanding of the actions of receivers until he is practiced enough to build a set using the most difficult circuit, without fear of failure.

Instead of building each receiver separately, we can start our large receiver, using one tube, and then, as we become thoroughly familiar with this, we can add another, until the set is completed.

In this article, we will start out with the construction of a simple non-regenerative one-tube receiver.

To start this receiver, we must have the following apparatus:

- 7 x 24 inch panel, Radion or bakelite.
- 7½ x 23 x ½ inch baseboard.
- Two 3 inch dials
- Switch outfit.
- Four 1½ inch bezels.
- 1 single circuit jack.
- Six binding posts.
- 30-ohm rheostat.
- One 300-ohm potentiometer.
- One socket.
- Variocoupler.
- 23-plate condenser.
- Grid leak and condenser.
- Screws, bus wire, copper terminals, variocoupler switch point connectors, and soldering outfit.
- Tube, phones, and batteries.

The first thing is to drill the panel. Cut a piece of paper to the exact size of the panel, and paste it directly to the front of the panel. Then, carefully mark out the locations of the instruments. The diagram (Fig. 2) of the front of the completed receiver shows the center points of the instruments. Directions accompany all of the instruments as to the screw holes and the size of drill to use. When the panel is completely marked out, drill all of the holes carefully, taking good care that the drill does not slip before it starts to cut. The holes for the switch consist of a 5/16" hole, with seven 5/32" holes, spaced 3/8" apart, at a distance of 1½" from the center of the large hole. When all of the holes have been drilled, soak the paper with water, and remove it from the panel.

Now, fasten the panel to the baseboard, and assemble the instruments on it. Place the binding posts on the back edge of the baseboard as shown, and place the socket directly behind the potentiometer. Connect the grid leak (1½ megohm) and condenser (.00025 mfd.) directly to the grid binding post of the socket.

We are now ready for wiring. All connections must be soldered. The diagram (Fig. 1) shows the hook-up, and the drawing of the arrangement of the instruments (Fig. 3) shows how the wiring is done. Some of the instruments here are not drawn to the correct size, so that the wiring may be made more clear.

The antenna is connected to the top tap of the variocoupler, and the ground is connected to the switch. The switch point connectors are screwed to the switchpoints, and soldered to the taps of the variocoupler. One side of the rotor is connected to the fixed plates of the condenser, and from there to the grid leak and condenser. The other side is connected to the movable plates, and from there to the negative of the filament battery.

The negative of the B battery is connected to the positive of the filament battery, and the positive of the B battery is connected to the jack. The P of the socket is connected to the other side of the jack. The negative of the filament battery is connected to the A minus of

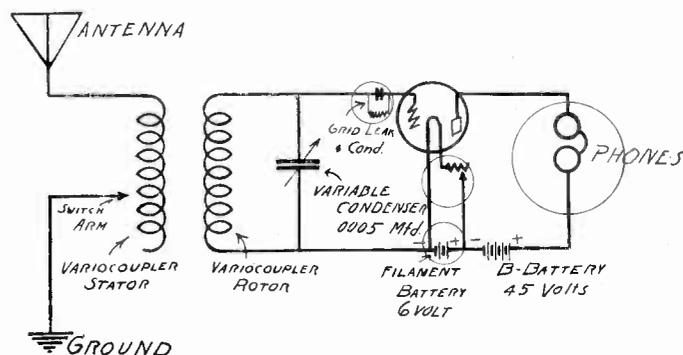


FIG. 1.—This one-tube circuit, easy to build, is recommended by Mr. Caldwell for construction, especially by beginners, because it does not radiate, but does produce clear, faithful tones. It is a non-regenerative circuit.

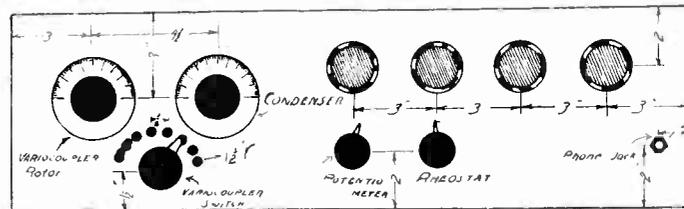


FIG. 2 shows front of a completed receiver. This panel accommodates the one-tube non-generative circuit described by Mr. Caldwell. Allowance is made for addition of three more tubes, so that a stage of R. F. amplification may be added, as well as two stages of A. F. for loud-speaker operation. The potentiometer figures in the added construction to be dealt with in a succeeding article.

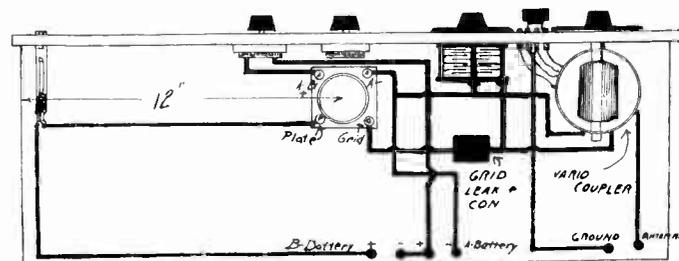


FIG. 3—Arrangement of the instruments of the one-tube outfit only, except that the unconnected potentiometer is shown at right of the rheostat. Looking down on the socket, the connections are, left top, A plus; top, right, A minus and B minus; lower left, plate; lower right, grid.

the socket, and the positive of the filament battery is connected to the rheostat, and from there to the A1 of the socket. The potentiometer is not used yet.

Now put the tube (UV201A) in the socket, connect the 6 volt filament battery, the 45 volt B battery, and the antenna and ground. Plug in the phones, and tune with the variocoupler and condenser. Do not expect to get great distances on this one tube receiver, as it is but a plain detector circuit. However, the signals are clear and of fine quality.

New Antenna Annually

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

RADIO WORLD

TELEPHONES:
LACKAWANNA 6976 and LACKAWANNA 2068
PUBLISHED EVERY WEDNESDAY (Dated
SATURDAY OF SAME WEEK)
FROM PUBLICATION OFFICE,
1498 BROADWAY, NEW YORK, N. Y.
BY HENNESSY RADIO PUBLICATIONS
CORPORATION
ROLAND BURKE HENNESSY, President
M. B. HENNESSY, Vice-President
FRED S. CLARK, Secretary and Manager
1498 BROADWAY, NEW YORK, N. Y.
Boston Representative: Chas. H. M. White, 1267 Com-
monwealth Avenue, Allston, Mass.
Chicago Representative: Mat H. Friedman, 519 East 60th
Street, Chicago, Ill.
San Francisco Representative: Conger & Johnston, Hol-
brook Building.
Los Angeles Representative: Conger & Johnston, Higgins
Building.
European Representatives: The International News Co.,
Brema's Bldg., Chancery Lane, London, Eng. Paris,
France: Brentano's 38 Avenue de l'Opera.

Roland Burke Hennessy

Editor

Herman Bernard
Managing Editor

N. N. Bernstein
Technical Editor

SUBSCRIPTION RATES

Fifteen cents a copy. \$6.00 a year. \$3.00 for six
months. \$1.50 for three months. Add \$1.00 a year
extra for foreign postage. Canada, 50 cents.

Receipt by new subscribers of the first copy of RADIO
WORLD mailed to them after sending in their order, is
automatic acknowledgment of their subscription order.
Changes of address should be received at this office two
weeks before date of publication. State whether sub-
scription is new or a renewal.

ADVERTISING RATES

One page: One time—\$150.00.
Half, Quarter, Third and Two-thirds pages at propor-
tionate rates.

One inch, one time—\$5.00. Per agate line \$0.40.
On four consecutive issues, 10% discount.
On thirteen consecutive issues, 15% discount.
Cover and preferred-position rates made known on
application.

Terms: 30 days net. 2% 10 days.

CLASSIFIED ADVERTISEMENTS

Five cents per word. Minimum, 10 words. Discount
of 10% on 4 consecutive issues—15% on thirteen consecu-
tive issues. Cash with order.

Entered as second-class matter, March 28, 1923, at
the Post Office at New York, New York, under the act
of March 3, 1879.

IMPORTANT NOTICE

While every possible care is taken to state correctly
matters of fact and opinion in technical and general writ-
tings covering the radio field, and every line printed is
gone over with a scrupulous regard for the facts, the
publisher disclaims any responsibility for statements re-
garding questions of patents, priority of claims, the proper
working out of technical problems, or other matters that
may be printed in good faith and on information furnished
by those supposed to be trustworthy. This statement is
made in good faith and to save time and controversy in
matters over which the publisher cannot possibly have
control.

APRIL 19, 1924

Use, Don't Fight, Radio

ONE of the most significant
radio deals of recent times was
that made between the Aeolian
Company and the Radio Corpora-
tion of America by which the
Aeolian concern agreed to handle
R. C. A. goods through the medium
of the phonograph trade.

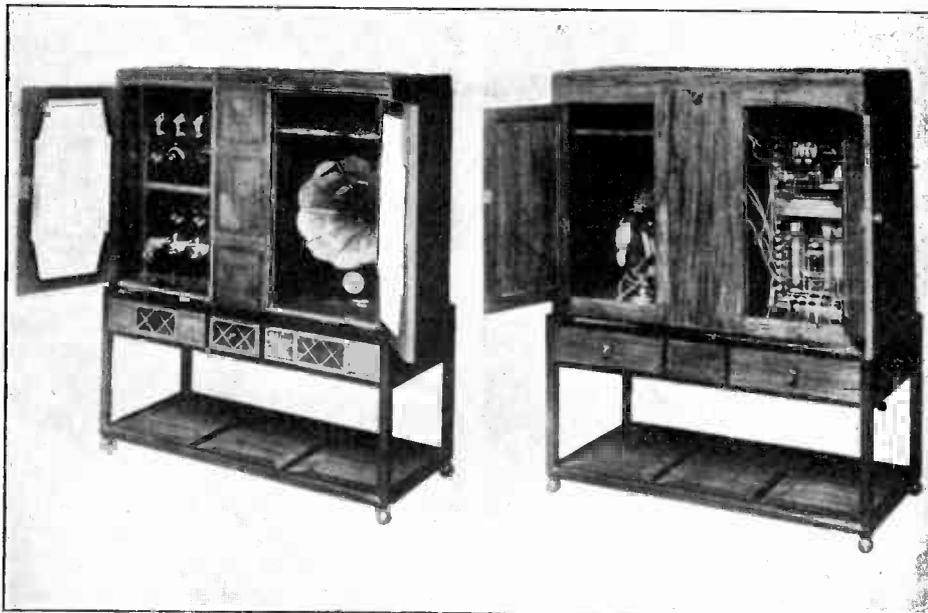
Radio has delivered a body blow
to the phonograph trade. The sales
of talking machines have fallen off
to such an alarming degree during
the past two years that leaders in
that industry have been alarmed.

The first general impulse in the
phonograph industry was to fight
radio as the thief of profits.

Some sensible person has seen
a great light and convinced his asso-
ciates that instead of fighting radio
the thing to do is to link up with it.

All of which is mighty fine for
the phonograph interests and not
at all bad for the R. C. A. and radio
in general.

The Set King George Uses His Majesty Operates It on a Loop



(Kadel & Herbert)

AT LEFT, front view of the set presented to the King of England. At right rear view.

THE first pictures to be received in America of King George's new
set show that apparently the King is a radio frequency fan. His
seven-tube set is self contained in a masterpiece of cabinet work.
You can bet that this set won't cause interference on account of radiation.

His receiver uses no antenna or ground. When Captain P. P. Eckersley,
chief engineer of the British Broadcasting Company, built this outfit, he
knew that the King preferred it that way in Buckingham Palace.

The cabinet is mahogany with ebony panels and inlaid ivory lines, the
whole being mounted on an ebony stand. The moulded framing of the two
doors is ebonized and small panels of "mother of pearl" inlaid on them.
Royal purple silk panels are used for the centres of the doors.

Notes for Set Builder

THE advantage gained by the
little extra work in connect-
ing up a double-circuit jack in a
set that comprises more than a
single tube is that there is no
chance for any current being dis-
sipated through leakage in the pri-
mary of the transformer.

* * *

IN the use of some tubes micro-
phonic noises are often heard,
some to such an extent that it is
unpleasant. These microphonic
noises are due to vibrations of the
elements inside the tube and can
be eliminated in the following man-
ner:

The tube socket should be
mounted on heavy, thick felt, or

very soft rubber, and no direct con-
nection, such as screws, should hold
the base of the socket to the base
on which it is mounted.

Another method is to mount the
sockets on a sub-panel, which is
suspended on springs, or strips of
thick rubber, so that any vibrations
will not be transmitted to the tube
itself.

* * *

IN the mounting of tube sockets
relative to the position of the
filament the following should be
observed: The tube should be
mounted in such a manner that the
filament is vertical. The reason for
this is that, if the filament is
mounted horizontally, it will sag,
due to the heat expanding the fila-
ment, and in time will touch one of
the other elements, which will short
it. The position in which a tube is
mounted has nothing to do with its
operation. It is simply a matter of
the care of the tube that it should
be mounted as above outlined.

The Radio Woman: She Proves Ingenious In an Emergency

WHEN the orchestra failed to appear on time, at Aeolian Hall, New York, recently, Florenz Tamara solved the problem of how to procure music to which to dance.

Miss Tamara and Addison Fowler were to give a performance. The audience was waiting. She and Mr. Fowler held anxious conference. Suddenly she cried:

"I've got it! There's a radio set back stage."

Her companion guessed the rest in an instant. The pair rushed behind the scenes and explained their plan to the stage manager. He co-operated and the result was that, though the dancers were as much surprised as anybody as to what kind of time they would have to dance to, they fared well until the regular orchestra arrived.

The music was broadcast by WJZ as part of the regular program from that station. The audience



(Kadel & Herbert)

STRAINS BROADCAST FROM WJZ served as the impromptu music for Florenz Tamara and Addison Fowler in New York the other night. Photo shows the top of the orchestra pit, eloquently empty of even one musician's head. The pair seem to be enjoying their experience, though they didn't know what kind of time was coming next.

was quick to sense how a woman's wit had saved the day and salvos of applause were evoked by the performers, who enjoyed it immensely.



(Atlantic Foto)

ALTHOUGH it may seem a little chilly for some persons, these three girls take delight in at least wearing bathing costumes at Atlantic City. Whether they actually went into the water is hard to tell. However, they provided themselves with considerable means of amusement by land and air, if not aquatic. Photo shows a bathing beauty in the foreground wearing earphones while fishing for fish. The other kind of fishing that she did was for DX stations with the box loop and a couple of dials. Her two chums are listening in, too.

Blind Boys Skillful in Making Sets



(Kadel & Herbert)

STUDENTS of Perkins' Institute, though blind, make radio sets as well as sighted boys do.

BLIND boys build their own radio receivers entirely, producing really remarkable sets using from one to six bulbs. These lads are students at the Perkins' Institute, Watertown, Mass.

The photograph shows the boys in the act of winding coils for variometers and couplers. Their fingers do double work—that of winding the wire and at the same time counting the number of turns. They never miss a turn. And it is only by

the sense of touch that they can tell what kind of insulation is on the wire.

Taps are connected, and the whole set is wired from memory. Their work is remarkably accurate and neat. Some sighted radio fans would be glad to be able to produce such examples of workmanship. Radio, to these blind boys, means much as a means of entertainment.

And then when they tune in on the set—
Oh, boy!

CW Sets Installed on Lifeboats



(International Newsreel)

THE REV. ALBERT C. FOX, president of Marquette University, Milwaukee, who is an ardent fan, spends much time listening in on his radio. He also frequently gives interesting talks via radio through Station WHAD at Marquette.

Beginner's Dictionary

CALIBRATION—To measure and scale off an instrument, the measurements of which are unknown, with a calibrated instrument whose measurements are known.

CHOKE COIL—A coil of wire, usually with an iron core, that has great self-induction. This great induction has the effect of "choking back," or "impeding" radio currents.

INSULATOR—Any material that will not allow the passage of electricity through it.

OHM—The unit of resistance.

MEGOHM—One million ohms.

ARADIO transmitting and receiving set on board some of a liner's lifeboats is becoming popular. Thus help can be summoned even in the event of the ship's station being disabled, while affording an excellent means of mutual communication among lifeboats as well as for communication with ships passing in the neighborhood.

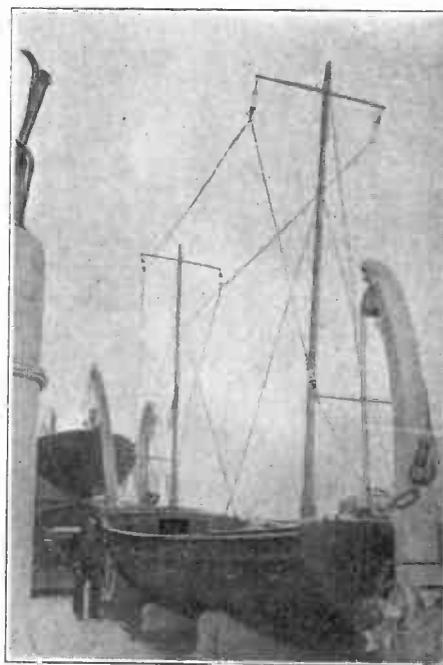
A model installation of this kind has recently been provided on the Columbus of the North German Lloyd. In fact, both engine-driven lifeboats of this newly-built vessel comprise transmitting as well as receiving antennae and complete wireless posts on the Telfunken quenched spark system.

Each of these two boats comprises two masts about 20 feet high, arranged to be folded down and to carry a double antenna wire lengthened fore and aft. The engine driving the propeller is arranged in the center of the boat and through a friction clutch acting on the fly-wheel disc of the engine, operates a small single-armature converter supplying electrical energy to the transmitter installed in the bow.

Both the transmitter and receiver are accommodated in a trunk arranged to be folded up and down in hinges.

The detector set as well as the Morse key and the rheostat are placed in the upper part under the folded-up lid of the trunk; the central part accommodates the variometer, loading coil and ammeter, while the lower part of the trunk contains the transformer and impulse circuit. Three waves, 300, 400, 600 meters, are used for transmitting, the receiving range comprising the interval 300-3000 meters.

The two engine-driven lifeboats are to be used in case of accident to take charge of those propelled by oar-power.



(Radio World)

LIFEBOAT aboard the Columbus, showing double antenna erected on masts and slanting down to bow and stern.

A COMPLETE list of broadcasting stations was published in RADIO WORLD April 5 issue. Another will be published soon, brought up to date of going to press.

Woman Helps in Home Radio Problems

By Betty O'Neill

WHEN my brother first built a radio set, and all of us around the family table wondered whether it could possibly work, I was of course very reticent about making any suggestions. I was afraid of radio and knew nothing about it. I kept aloof from it more from fear than from preference, however, because I certainly wanted to hear the fine programmes that the newspapers told were being broadcast.

Well, finally the set was finished, it worked, and moreover it took Brother Jimmy, the proud constructor, only fifteen minutes to teach me how to tune it. Grandmother learned in twenty-five, all the while asking if there was any danger of the wires carrying lightning into the house—a fear that even timid grandmother now has overcome.

Everything was tentative during those stages of the radio development of our household. Even the set was only fragily assembled, without cabinet, and placed on a bare, unsightly table near where the lead-in entered.

Let me tell you some of the things that a woman helped to do toward radio problems in the home.

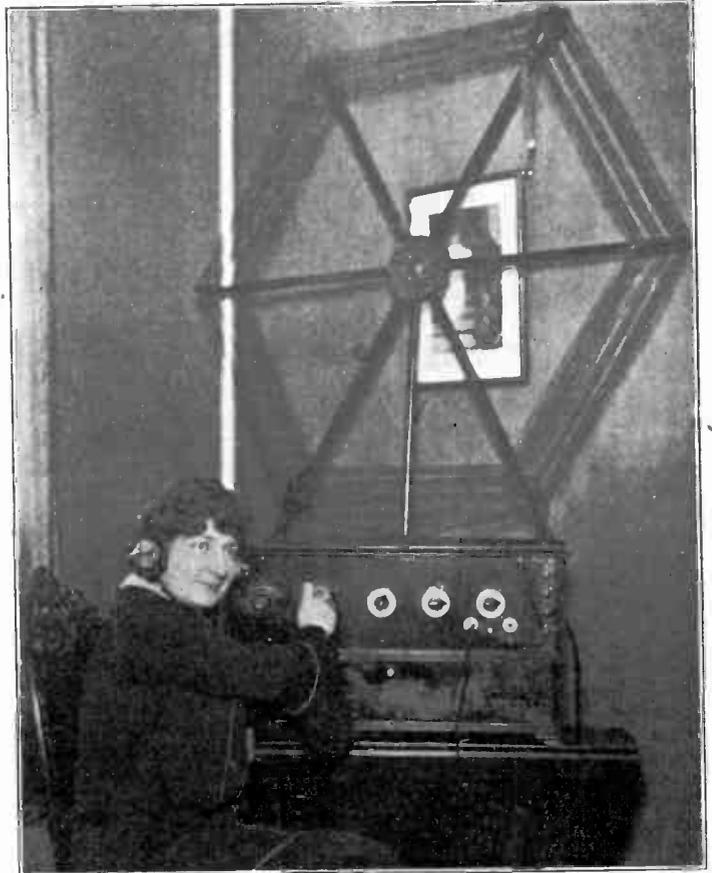
First, it was agreed we would have the radio in the living room. Jimmy had found the best cold-water pipe connection under the kitchen sink. Now, to get the ground connection from the kitchen to the set required carrying a wire past a sliding door into the living room. That meant, as Jimmy explained, the sliding door simply had to stay wide open all the time unless he could dig a groove in the oak woodwork, a suggestion which everybody greeted with a general negative shaking of the head. I just couldn't see why that door had to stay open all the time, when occasionally somebody in the living room might be talking to an interesting person without any desire that the kitchen help, for instance, should know every single confidential word that was spoken. I mentioned the need for privacy to Jimmy, but he said that if there was no ground wire, there would not be a "peep" out of the set.

I knew not what to do, for I really desired that the best compromise be reached in view of the needs and desires of all members of our happy family. Luckily, Jimmy brought home a copy of RADIO WORLD, and there I read how a pipe sunk five feet into the ground, under the window-sill, and connected through an insulated lead-in to the set was excellent for a ground. I memorized some of the technical phrases, I recall, and sprang them on Jimmy, who nearly had a Dutch fit at my "familiarity" with his pet hobby.

Well, that solved one problem, though a minor one. Jimmy now admits it was technically an improvement, too, because he found out that the long wire had decreased the efficiency of the set.

Just where to install the set was another consideration into which I injected my own views. Jimmy was for putting it right next to the window where his aerial lead-in entered, which was the "off" side of the room, to keep the lead-in short as possible.

GETS 2LO ON A LOOP!—Mrs. Arthur Lynch, of Garden City, N. Y., faintly but distinctly heard London through earphones in the recent test. Her Super-Heterodyne consists of eight tubes. It was designed by Dr. J. Harris Roger, of Hyattsville, Md. The loop has eight sections of 12 turns each, total 1,516 feet. Mrs. Lynch also heard Aberdeen (2BW) and Cardiff, Wales (5WA). She hopes soon to be able to hear 'em ironing in Peking.



(Foto Topics)

In that way, we would have to change the habit of years, because our phonograph was on the opposite side of the room, and we had always had our backs to the west when we "faced the music." Moreover, the buffet was on the same side as the phonograph, and where there is a choice, most persons, I've noticed, will face the buffet. Also, the radiator was on the side of the room opposite to the buffet, though at the other end, and putting the radio set right next to the radiator seemed to throw the room out of artistic balance.

Well, the family discussed that subject for an hour one night. Jimmy had his technical reasons for wanting the set to stay where it was, and I suggested that it be where it belonged, next to the phonograph.

We finally found that it would be easy enough for Jimmy to move one end of the aerial on the roof and bring the lead-in through the window nearest the phonograph. There was just room for the set on a small bamboo-topped table next to the phonograph, with both set back in a bayou in the wall.

Soon Jimmy added two more bulbs to the original one-bulb set and rigged up the phonograph as a loud speaker.

I remember when Jimmy gave his first demonstration of that result, as a special surprise designed especially for grandmother, to whom he introduced the "new long phonograph records."

The wall, which was set back about two feet, left just enough room for the phonograph and the radio side by side, the storage battery being placed on the floor. I bought a shallow crock just big enough to place the battery in, because Jimmy had said that when it was being recharged there was danger of the battery spilling some of its acid contents and damaging the floor and rugs. Moreover, he arranged all the wires so they came out of the back of his set, as I had suggested that would look much better, and everybody's satisfied.

But Jimmy is building an eight-tube set that will not leave room for the phonograph in the tiny alcove so there's trouble ahead.



(International)

DEPTH OF EMOTION MEASURED—The effect on this girl of her sweetheart's kiss is being tested at KDKA with the ultra-audible microphone invented by Dr. Phillips Thomas (in shirtsleeves). Suppose at this moment the machine were turned on himself? Well?

BROADCAST PROGRAMS FROM FAR AND NEAR

Explanation of Time Abbreviations

G. M. T.—Greenwich Meridian Time
E. S. T.—Eastern Standard Time
C. S. T.—Central Standard Time
M. T.—Mountain Time
P. T.—Pacific Time

Station KDKA, Pittsburgh

326 Meters (920 Kcys.). E. S. T. Apr. 17.—9:45 A. M.—Union live stock market reports. 11:55 A. M.—Arlington time signals. 12 M.—Weather forecast. 12:20 P. M.—Lenten services of the Trinity Church. 8:00 P. M.—Good Friday services of the First Baptist Church, Pittsburgh, Pa. 9:15 P. M.—Concert. 9:55 P. M.—Arlington time signals. Weather forecast.

Apr. 18.—6:15 P. M.—Dinner concert by the KDKA Little Symphony Orchestra. 7:15 P. M.—Feature. 7:30 P. M.—Wendell Hall, the Ever-ready Battery entertainer. 8:00 P. M.—Farm program. 8:30 P. M.—Concert by the Choir Ensemble Society of Pittsburgh. 9:55 P. M.—Arlington time signals. Weather forecast. 11:30 P. M.—Concert.

Apr. 19.—6:15 P. M.—Dinner concert by the Westinghouse Band. 7:15 P. M.—Baseball review by James Long, sport writer for the Pittsburgh Sun. 7:30 P. M.—Story by Dr. David Lang. 8:30 P. M.—Concert by the Westinghouse Band.

Station WHN, New York

360 Meters (830 Kcys.). E. S. T. Apr. 17.—9:30 P. M.—Lou Gold's Wigwam Club Orchestra. 10:00 P. M.—Spanish program auspices All Nation's Ass'n, Henry Tutor Mason, founder and president. 11:00 P. M.—Edward Greany, pianist, and Arthur Loew, banjosit, in popular selections. 11:40 P. M.—Richard Douglas, tenor.

Apr. 18.—K.I.K. Entertainers. 11:15 P. M.—Fred Whitehouse Song Review. 11:45 P. M.—Jack Morrissey, tenor, and Lucille Dumont. 12:15 A. M.—The Great Sir Joseph Ginzburg. 12:30 A. M.—Bert Lewis, tenor, of the Barn Club. 12:45 A. M.—Harry Richman of the Wigwam Club. 1:00 A. M.—Ormande Sisters. 1:15 A. M.—Musical program to be announced.

Apr. 19.—9:00 P. M.—Harry Hock Entertainers. 9:30 P. M.—"Patriots Day" by Major A. P. Simonds. 9:40 P. M.—Mrs. Matty Levine, concert pianist. 10:00 P. M.—Al. Wilson, singing. 10:10 P. M.—Fitzpatrick Bros., singing old time songs. 10:20 P. M.—Con Conrad, song writer and composer. 10:35 P. M.—Jimmy Clarke in piano selections. 11:00 P. M.—Fritzi Leyton and Her Entertainers. 11:15 P. M.—Ross Fowler, baritone. 11:30 P. M.—Rubey Cowan Entertainers.

Station KFIX, Independence, Mo.

240 Meters (1250 Kcys.). C. S. T.—Regular schedule. Tuesdays, 9 P. M. Thursdays, 9 P. M. Sundays, 11 A. M. and 7:30 P. M.

Station WDAF, Kansas City, Mo.

411 Meters (730 Kcys.). C. S. T. Apr. 17.—3:30 P. M.—D. Ambert Haley's Dance and Concert Orchestra. 6:00 P. M.—Marketgram, weather forecast, time signal and road report. The children's story and information period. Music—Fritz Hanlein's Trianon Ensemble. 11:45 P. M.—The "Merry Old Chief" and the Coon-Sanders Novelty Singing Orchestra.

Apr. 18.—3:30 P. M.—Regular "request" program by the Leo R. Davis "Radio" Orchestra. 6:00 P. M.—Marketgram, weather forecast, time signal and road report. The children's story and information period. Music—Fritz Hanlein's Trianon Ensemble. 8:00 P. M.—Novelty night. 11:45 P. M.—Nighthawk Frolic.

Apr. 19.—3:30 P. M.—The Riley Ehrhart Orchestra. 6:00 P. M.—Marketgram, weather forecast, time signal and road report. Edgar A. Linton. The children's story and information period. Music—Fritz Hanlein's Trianon Ensemble. 11:45 P. M.—Nighthawk Frolic.

Station WAAW, Omaha, Neb.

360 Meters (830 Kcys.). C. S. T. Apr. 16.—8:00 P. M.—Marketgrams.

Apr. 17.—8:00 P. M.—Educational program. Talk, agricultural topics, W. J. Martin, U. P. System. Next Sunday's Sunday School lesson.

Apr. 18.—8:00 P. M.—Bridge talk by Mrs. Guy U. Purdy. 8:25 P. M.—Special Good Friday service by First Lutheran Church of Papillion, Neb.

Apr. 19.—Marketgrams.

Station KFAE, Pullman, Wash.

330 Meters (910 Kcys.). P. T.—Features of radio programs broadcast by KFAE the last two weeks of April are talks by Dr. F. F. Potter on "Reparations and War," and Lieut. A. B. Pence on "Casualties During the War." Agricultural talks, music, book reviews, and other features will complete programs for the hour from 7:30 to 8:30 (Pacific time) Monday, Wednesday, and Friday nights.



(Keystone)

JOSEPH F. RUTHERFORD, head of the International Bible Students' Association, who owns and operates his own broadcasting station at Rossville, Staten Island, N. Y. The call is WBBR.

Station KGW, Portland, Ore.

492 Meters (610 Kcys.). P. T. Apr. 16.—11:30 A. M.—Weather forecast. 12:30 P. M.—Concert by Darby's Orchestra of Cotillion Hall. 3:30 P. M.—Children's program. 7:30 P. M.—Weather forecast and market reports. 8:00 P. M.—Orchestra concert. 9:00 P. M.—Alexander Hamilton Institute business talk. 10:00 P. M.—Dance music by George Olsen's Metropolitan Orchestra.

Apr. 17.—11:30 A. M.—Weather forecast. 12:30 P. M.—Concert. 3:30 P. M.—Woman's story program. 7:30 P. M.—Weather forecast and market reports. 8:00 P. M.—Accordion solos by Johnny Sylvester. 8:15 P. M.—Studio program of dance music by George Olsen's Metropolitan Orchestra.

Apr. 18.—11:30 A. M.—Weather forecast. 12:30 P. M.—Program by Peck Holton's Orchestra. 7:30 P. M.—Weather forecast and market reports. 10:30 P. M.—Hoot Owls.

Apr. 19.—11:30 A. M.—Weather forecast. 3:30 P. M.—Children's program. 10:00 P. M.—Weather forecast and dance music by George Olsen's Metropolitan Orchestra.

Station WGY, Schenectady, N. Y.

380 Meters (790 Kcys.). E. S. T. Apr. 17.—11:55 A. M.—Time signals. 12:30 P. M.—Stock market report. Produce market report. Weather report. 2:00 P. M.—Music and household talk. 6:00 P. M.—Produce and stock market quotations; news bulletins. 6:30 P. M.—Dinner music by Romano's Orchestra. 7:45 P. M.—Radio drama, "Passers By," by WGY Players.

Apr. 18.—11:55 A. M.—Time signals. 12:00 Noon. 3:00 P. M.—Good Friday Service at State Street Methodist Church, Schenectady, N. Y. 12:45 P. M.—Weather forecast. 6:00 P. M.—News bulletins. 6:30 P. M.—Children's program. 7:35 P. M.—Health talk, N. Y. State Department of Health. 7:45 P. M.—Travelogue "Bermuda," by Dr. Sigel Roush. WGY Orchestra. 10:30 P. M.—Program by Rice String Quartet.

Apr. 19.—11:55 A. M.—U. S. Naval Observatory time signals. 12:30 P. M.—Stock market report. 12:40 P. M.—Produce market report. 9:30 P. M.—Dance music by Romano's Orchestra, New Kenmore Hotel, Albany, N. Y.

Station WHAH, Joplin, Mo.

283 Meters (1060 Kcys.). C. S. T.—Tuesday evenings of each week, from 9:00 to 11:00 P. M.—Maurice Jones Dance Orchestra. Thursday evenings of each week, from 9:00 to 11:00 P. M.—Semi-classical music. Sunday evenings of each week, from 9:00 to 10:00 P. M.—Radio chapel service.

Station CKCH, Ottawa, Canada

435 Meters (690 Kcys.). E. S. T. Apr. 19.—8:00 P. M.—Concert broadcast direct from the grill room of the Chateau Laurier Hotel.

Apr. 26.—8:00 P. M.—Dance music by the Chateau Laurier Orchestra direct from the grill.

Station KSD, St. Louis

546 Meters (550 Kcys.). C. S. T. Apr. 16.—6:30 P. M.—Program of Abergh's Concert Ensemble, broadcast direct from Hotel Statler. 9:00 P. M.—Studio program of Tyrolean Music. 11:00 P. M.—Broadcasting direct from Hotel Statler, dance music played by Rodemich's Orchestra.

Apr. 18.—12 M.—Broadcasting the Good Friday "Tre Ore" Service given at the Church of St. Francis Xavier. 8:00 P. M.—Broadcasting the cantata, "Seven Last Words of Jesus," by Mercadente, sung at Christ Church Cathedral.

Apr. 19.—8:00 P. M.—Missouri Theatre Orchestra concert and specialties broadcast direct from the theatre.

Station WFAA, Dallas, Texas

476 Meters (630 Kcys.). C. S. T. Apr. 16.—12:30-1:00 P. M.—Musical recital by the Red-Headed Girl of The Dallas Journal.

Apr. 17.—12:30-1:00 P. M.—Address, Epps G. Knight, business man, on "Dallas in Old Days and Dallas Up to Date." 6:30-9:30 P. M.—Musical recital. 6:45-7:00 P. M.—Boy Scout program for radio troop. 11:00-12:00 P. M.—Circle Theatre Orchestra in musical recital.

Apr. 18.—12:30-1:00 P. M.—Address, Dr. Robert Stewart Hyer. 8:30-9:30 P. M.—Musical recital.

Apr. 19.—12:30-1:00 P. M.—Address, Capt. S. C. Kile, superintendent, United States Veterans' Bureau. 8:30-9:30 P. M.—Piano recital. 11:00-12:00 P. M.—Dance music program by Adolphus Hotel Orchestra.

Station KFI, Los Angeles

469 Meters (640 Kcys.). P. T. Apr. 16.—4:45

P. M.—Evening Herald News Bulletins. 6:45 P. M.—Nick Harris Detective Stories and concert. 8:00 P. M.—Evening Herald and Examiner concert. 10:00 P. M.—Hollywoodland Community Orchestra. 11:00 P. M.—Ambassador-Max Fischer Coconut Grove Orchestra.

Apr. 17.—4:45 P. M.—Evening Herald and Examiner News Bulletins. 6:45 P. M.—Y. M. C. A. concert, sales lecture. 8:00 P. M.—Ambassador Hotel concert. 9:00 P. M.—Examiner concert. 10:00 P. M.—Concert by Celeste Rhyas, pianist.

Apr. 18.—4:45 P. M.—Evening Herald and Examiner News Bulletins. 6:45 P. M.—Vocal and instrumental concert. 8:00 P. M.—Evening Herald and Examiner concert. 10:00 P. M.—Vocal and instrumental concert. 11:00 P. M.—Ambassador-Max Fischer Coconut Grove Orchestra.

Apr. 19.—4:45 P. M.—Evening Herald and Examiner News Bulletins. 6:45 P. M.—Popular concert. 8:00 P. M.—Vocal and instrumental concert. 9:00 P. M.—Examiner concert; 10:00 P. M.—Ann Risher concert. 11:00 P. M.—Ambassador-Max Fischer Coconut Grove Orchestra.

Station WBAP, Fort Worth, Texas

476 Meters (620 Kcys.). C. S. T. Apr. 16.—7:30

P. M.—Concert offered by Sam S. Losh, baritone, and pianist, and a group of his pupils. 9:30 P. M.—Concert by George Freeman's Sooner Serenaders, the Texas Hotel Orchestra.

Apr. 17.—7:30 P. M.—Concert by the old time fiddlers of Strawn, Texas. 9:30 P. M.—Concert by Owen Crockett's Yeomen Orchestra.

Apr. 18.—7:30 P. M.—Concert by the Junior Euterpean Club. 9:30 P. M.—Concert by artists of Texas Christian University.

Apr. 19.—7:00 P. M.—Review of the Interdenominational Sunday School Lesson and Radio Bible Class.

Station WLW, Cincinnati

309 Meters (970 Kcys.). C. S. T.—Apr. 16.—10:30

A. M.—Weather forecast and business reports. 3:00 P. M.—Market reports. 4:00 P. M.—Program for the "Shut Ins" by the Wurlitzer Concert Co. 7:15 P. M.—Selections from "If Wishes Were Horses," a musical play. 8:00 P. M.—"All About Stamp Collecting"—Mr. E. B. Power. 8:15 P. M. Choir concert, "The Crucifixion," given by the combined choirs of the St. Mark's Evangelical Church. 8:45 P. M.—Medicine in the "Days of King Tutankhamen." 9:00 P. M.—Special program by the Warner & Swope Coon Dog Orchestra.

Apr. 17.—10:30 A. M.—Weather forecast and business reports. 3:00 P. M.—Market reports. 4:00 P. M.—Piano solos by Miss Adelaide Apfel. Talk by Representative of the League of Women Voters. 10:00 P. M.—Concert of the Junior Faculty of the Cincinnati Conservatory of Music. 11:00 P. M.—Special features and Doherty's Melody Boys.

Apr. 18.—10:30 A. M.—Weather forecast and business reports. 1:30 P. M.—Market reports. 3:00 P. M.—Stock quotations. 4:00 P. M.—Special program.

Apr. 19.—10:30 A. M.—Weather forecast and business reports. 1:30 P. M.—Market reports.

Station WWJ, Detroit

517 Meters (580 Kcys.). E. S. T. Apr. 21.—8:00 A. M.—Setting-up exercises. 9:45 A. M.—Public Health's Service bulletins. 10:25 A. M.—Official weather forecast. 11:55 A. M.—Arlington time relayed by the Western Union. 12 M.—Edward Barnes, baritone; LeRoy De Turk, tenor. 3:00 P. M.—The Detroit News Orchestra. 3:30 P. M.—Official weather forecast. 8:30 P. M.—The Detroit News Orchestra.

Apr. 22.—8:00 A. M.—Setting-up exercises. 9:45 A. M.—Fred Shaw, pianist. 10:25 A. M.—Official weather forecast. 11:55 A. M.—Arlington time. 12 M.—Edward Barnes, baritone; LeRoy De Turk, tenor. 3:00 P. M.—The Detroit News Orchestra. 3:30 P. M.—Official weather forecast. 5:00 P. M.—Baseball scores. 8:30 P. M.—The Detroit News Orchestra.

Apr. 23.—8:00 A. M.—Setting-up exercises. 9:45 A. M.—Public Health Service bulletins. 10:25 A. M.—Official weather forecast. 11:55 A. M.—Arlington time. 12 M.—Music by Jean Goldkette's Orchestra. 3:00 P. M.—The Detroit News Orchestra. 3:30 P. M.—Official weather forecast. 5:00 P. M.—Baseball scores. 8:30 P. M.—The Detroit News Orchestra.

Station WJAR, Philadelphia

395 Meters (760 Kcys.). E. S. T. Apr. 16.—11:45 A. M.—Daily almanac. 12:02 P. M.—Organ recital from the Stanley Theatre. 2:00 P. M.—Arcadia Concert Orchestra. 4:30 P. M.—Artist recital from the studio. 7:30 P. M.—Dream Daddy with the boys and girls. 8:00 P. M.—Arcadia Concert Orchestra.

Apr. 17.—11:45 A. M.—Daily almanac. 12:02 P. M.—Organ recital from the Stanley Theatre. 2:00 P. M.—Arcadia Concert Orchestra. 4:30 P. M.—Program under the direction of the Omicron Chapter of Mu Phi Sorority. 7:30 P. M.—Dream Daddy with the boys and girls.

Apr. 18.—11:45 A. M.—Daily almanac. 12:02 P. M.—Organ recital from the Stanley Theatre. 2:00 P. M.—Arcadia Concert Orchestra. 4:30 P. M.—Program of sacred music. 7:30 P. M.—Dream Daddy with the boys and girls. 8:00 P. M.—Talk.

Apr. 19.—11:45 A. M.—Daily almanac. 12:02 P. M.—Organ recital from the Stanley Theatre. 2:00 P. M.—Arcadia Concert Orchestra. 4:30 P. M.—Program of dance music by the Cotton Pickers. 7:30 P. M.—Dream Daddy with the boys and girls.

Station WNAC, Boston

278 Meters (1080 Kcys.). E. S. T. Apr. 16.—1:00 P. M.—Shepard Colonial Orchestra. 4:00 P. M.—Miss M. J. Kane, pianist; Miss Theresa Sprague, soprano; Robert Keene, baritone; Mrs. Ward B. Mowrey, violinist. 6:00 P. M.—Children's half-hour. 6:30 P. M.—WNAC dinner dance. 8:00 P. M.—Program to be announced.

Apr. 17.—1:00 P. M.—Chamber of Commerce luncheon, broadcast from Copley-Plaza Hotel. 4:00 P. M.—Ralph H. Sawyer, baritone. 6:30 P. M.—WNAC dinner dance. 8:00 P. M.—M. I. T. show, "The Hidden Idol." 10:00 P. M.—Dancers Club, Bert Lowe and his Orchestra.

Apr. 18.—1:00 P. M.—Shepard Colonial Orchestra. 4:00 P. M.—Nelson Waring, pianist. 6:00 P. M.—Children's half-hour. 6:30 P. M.—WNAC dinner dance. 8:00 P. M.—Sinfronic Fraternity concert.

Apr. 19.—4:00 P. M.—Tea dance. 6:30 P. M.—WNAC dinner dance. 8:00 P. M.—Dance music, Checker Inn Orchestra, Copley-Plaza Orchestra, State Ballroom Orchestra.

Station KPO, San Francisco

423 Meters (710 Kcys.). P. T. Apr. 17.—12 M.—Time signals from the Naval Observatory. 1:00 P. M.—Rudy Seiger's Fairmont Hotel Orchestra. 2:30 P. M.—Musical matinee. 4:30 P. M.—Rudy Seiger's Fairmont Hotel Orchestra. 5:30 P. M.—Children's hour stories. 7:00 P. M.—Rudy Seiger's Fairmont Hotel Orchestra. 8:00 P. M.—Organ recital by Theodore J. Irwin. 9:00 P. M.—Program by the Scots Minstrels. 10:00 P. M.—E. Max Bradford's Versatile Band.

Apr. 18.—12 M.—Time signals from the Naval Observatory. 1:00 P. M.—Rudy Seiger's Fairmont Hotel Orchestra. 2:30 P. M.—Organ recital by Theodore J. Irwin. 3:30 P. M.—Rudy Seiger's Fairmont Hotel Orchestra.

Apr. 19.—12 M.—Time signals from the Naval Observatory. 1:00 P. M.—Rudy Seiger's Fairmont Hotel Orchestra. 2:30 P. M.—Junior musicale of San Francisco. 3:30 P. M.—Max Bradford's Versatile Band. 8:00 P. M.—Dance music by Art Weidner and his popular dance orchestra.

Station WOC, Davenport, Iowa

484 Meters (620 Kcys.). C. S. T. Apr. 17.—10:55 A. M.—Time signals. 11:05 A. M.—Market quotations and agriograms. 2:00 P. M.—Educational program. 6:30 P. M.—Sandman's Visit. 6:50 P. M.—Sport news and weather forecast. 9:00 P. M.—Orchestra program.

Apr. 18.—10:00 A. M.—Opening market quotations. 10:55 A. M.—Time signals. 11:00 A. M.—Weather and river forecast. 2:00 P. M.—Closing stocks and markets. 6:30 P. M.—Sandman's visit. 6:50 P. M.—Sport news and weather forecast. 8:00 P. M.—Musical program.

Apr. 19.—11:05 A. M.—Market quotations. 12:30 P. M.—Closing stocks and markets. 3:30 P. M.—Educational program. 6:30 P. M.—Sandman's visit. 6:50 P. M.—Sport news and weather forecast. 9:00 P. M.—Orchestra program.



(International Newsreel)

MRS. THOMAS PRESTON, who was the wife of the late former President Grover Cleveland, is shown broadcasting from Station WOR. This was the first of a series of half-hour talks by wives of ex-Presidents.

Station WOR, Newark, N. J.

405 Meters (740 Kcys.). E. S. T. Apr. 17.—6:15 P. M.—Albert E. Sonn, technical editor, Radio Department of the Newark Sunday Call, in his weekly talk on "Radio for the Layman." 6:30 P. M.—"Music While You Dine" by Tom Cooper's Country Club Orchestra.

Apr. 18.—6:15 P. M.—Agnes Leonard in songs for the children. 6:00 P. M.—"Man in the Moon" stories for children. 7:00 P. M.—Billy Cripp's Entertainers.

Apr. 19.—6:15 P. M.—"Music While You Dine." Paul Van Loan's Cinderella Orchestra. 7:15 P. M.—Fred J. Bendel, sports writer, Newark Morning Ledger, in his weekly talk on "Sporting News Up-to-the-Minute."

Apr. 20.—Gene Ingraham and his Bell Record Orchestra. 9:00 P. M.—Hon. Alton B. Parker in a talk on the Sulgrave Institution. 9:30 P. M.—Mrs. Louise Hayes, soprano, and Chev. Angelo Minghetti, tenor, in a joint recital of operatic selections.

Station KHJ, Los Angeles

395 Meters (760 Kcys.). P. T. Apr. 17.—6:45 P. M.—Children's program. 8:00 P. M.—Program presenting the choir of St. Luke's Episcopal Church.

Apr. 18.—6:45 P. M.—Children's program. 7:00 P. M.—Organ recital from the First Methodist Episcopal Church. 8:00 P. M.—Program presented through the courtesy of the Wiley B. Allen Music Company.

Apr. 19.—12:30 P. M.—Floryane Thompson, soprano. 1:45 P. M.—Special program presenting Dr. Mayer Winkler, Rabbi of Sinai Congregation. 6:45 P. M.—Children's program. 8:00 P. M.—Program presented through the courtesy of the Glendale Realty Board.

Station CKAC, Montreal

425 Meters (Kcys.). E. S. T. Apr. 17.—4:00 P. M.—Weather, stock, news, music. 8:30 P. M.—Canadian National Railway artists.

Apr. 19.—7:00 P. M.—Kiddies' stories in French and English. 7:30 P. M.—Rex Battle and his Mt. Royal Hotel concert orchestra. 8:30 P. M.—Frontenac Breweries Band and artists direct from Frontenac Breweries. 10:30 P. M.—Joseph C. Smith and his Mt. Royal Hotel dance orchestra.

Apr. 20.—4:30 P. M.—Sacred concert.

Station WGI, Medford, Mass.

485 Meters (620 Kcys.). E. S. T. Apr. 17.—12:40 P. M.—New England weather forecast furnished by the U. S. Weather Bureau. 6:30 P. M.—Closing Stock market reports. Boston police reports. 7:30 P. M.—Evening program.

Apr. 18.—12:40 P. M.—New England weather forecast furnished by the U. S. Weather Bureau. 6:30 P. M.—Closing stock market reports. Code practice. Boston police reports. 7:30 P. M.—Evening program.

Apr. 19.—12 M.—Wilfred J. Kelley broadcasting Paul Revere's Message. 6:30 P. M.—Code practice. 7:30 P. M.—Talk on current events.

Station PWX, Havana

400 Meters (750 Kcys.). E. S. T.—Broadcasts Wednesday evenings at 8:30 P. M.

Station KYW, Chicago

563 Meters (560 Kcys.). C. S. T. Apr. 17.—6:45 P. M.—Children's bedtime story. 7:00 P. M.—Dinner concert broadcast from the Congress Hotel. 7:35 P. M.—Sport talk. 7:45 P. M.—Talk on Finance and Markets. 8:00 P. M.—Twenty Minutes of Good Reading. 8:20 P. M.—Musical program. 5:00 P. M. to 5:00 A. M.—Universal News and Herald and Examiner news bulletins.

Apr. 18.—6:00 P. M.—Spanish lessons by Prof. A. A. Braschi. 6:33 P. M.—News, financial and final markets. 6:45 P. M.—Children's bedtime story. 7:00 P. M.—Dinner concert broadcast from the Congress Hotel, Chicago. 10:00 P. M. to 2:00 A. M.—Midnight Revue.

Apr. 19.—6:45 P. M.—Children's bedtime story. 7:00 P. M.—Dinner concert broadcast from the Congress Hotel. 9:05 P. M.—"Under the Evening Lamp" service including short stories. 10:00 P. M.—Late show.

Station WBZ, Springfield, Mass.

337 Meters (890 Kcys.). E. S. T. Apr. 17.—6:00 P. M.—Dinner music by the Leo F. Reisman Ensemble. 7:00 P. M.—Music talk by Robert Elisha Stanley Olmsted, Professor of vocal music at Smith College. 7:30 P. M.—Bedtime story for the kiddies. 7:40 P. M.—Concert by Mr. Spencer Terry, baritone. 9:00 P. M.—Concert by Combined Clubs of Massachusetts Institute of Technology, broadcast from Steiner Hall, Boston. 9:55 P. M.—Arlington time signals.

Apr. 18.—6:00 P. M.—Dinner concert by the WBZ Orchestra. 7:30 P. M.—Bedtime story for the kiddies. 9:55 P. M.—Arlington time signals. 11:00 P. M.—Program of Chamber Music by the WBZ Orchestra.

Apr. 19.—7:00 P. M.—Dinner concert by the Hotel Kimball Trio. 7:30 P. M.—Bedtime story for the kiddies. 7:40 P. M.—Concert by the Smith College Trio. 8:30 P. M.—Concert of Folk Songs in five languages arranged by Stetson Humphrey. 9:55 P. M.—Arlington time signals.

Station KFNF, Shenandoah, Iowa

266 Meters (1130 Kcys.). C. S. T.—Broadcasting schedule—Wednesdays and Saturdays 7:30 to 9:00 P. M. Sundays at 6:30 to 7:30 P. M. 12:30 to 12:55 P. M. each week day.

(Concluded on page 33)

A List Showing the Total Votes Cast Will Be Published in an Early Issue

Who Is America's Most Popular Radio Entertainer?

Everybody is interested in this query: Who is America's most popular radio entertainer? You have your favorite. Who is she or he? Let us know your choice, whether a comedian, an opera singer, a jazz band, or a story-teller.

RADIO WORLD wants to be able to tell the world the name of the entertainer who stands highest in the regard of listeners-in.

Use the accompanying blank and mail to Broadcasting Manager, RADIO WORLD.

Cut off. Fill out. Mail today.

BROADCASTING MANAGER, RADIO WORLD,
1493 Broadway, New York City.

Dear Sir:

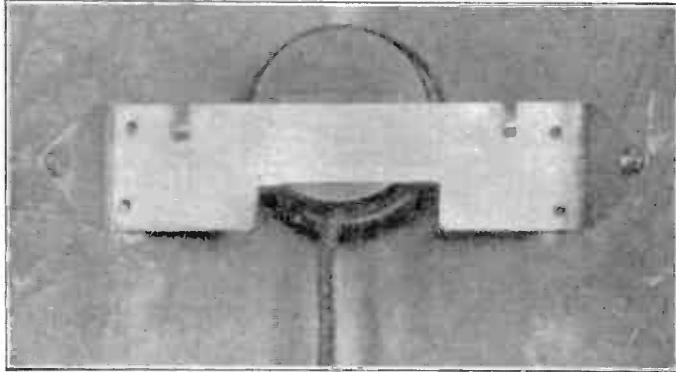
My favorite entertainer is..... Station.....
Name.....
Street Address.....
City and State.....

A complete list of broadcasting stations was published in the April 5 issue of RADIO WORLD. Another list, corrected to the new date of publication, will be printed in an early issue.

Inspired Via the Ether His Set a Ring Radio



(Luce Lupton)
EVERY LITTLE WAVE LENGTH has a meaning of its own. Who wouldn't like to be a little wave length for Marion De Roche when she rehearses the latest movements? No wonder the waves are wild at Atlantic City.



(Photonews)
EAR PHONE placed in a corner of the room makes the angle of the wall act as a sounding board, Edward A. LeFabre (at right) found.



(Atlantic Foto)
A PORTABLE SET on the Atlantic Foto Service's auto is used in receiving instructions from the main office, Atlantic City.



(International Newsreel)
DAVID LEVISON, a first year high school student of Cincinnati has constructed a crystal receiver worn on ring.



(Photonews)
EDWARD A. LE FEBRE, of Astoria, L. I., is shown with a loud-speaking unit using walls of box as reflector.



(International Newsreel)
MILITARY RADIO construction a wireless work. Ex



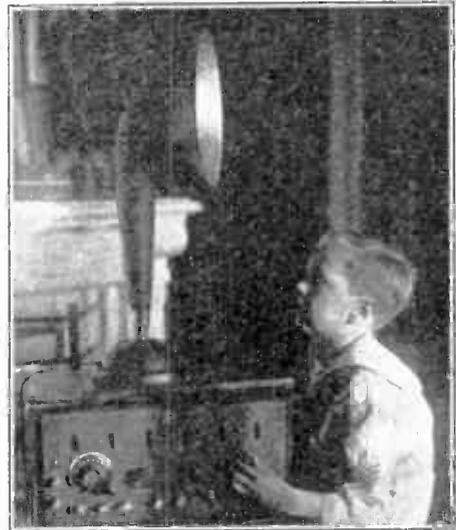
(Harris & Ewing)
THIS MODEL of a small it can be acco demonstrating the R lighthouse transmits c fairly lower power. danger by warning si tion signals come, thu

to Fore in Military Training

Listens for Dad



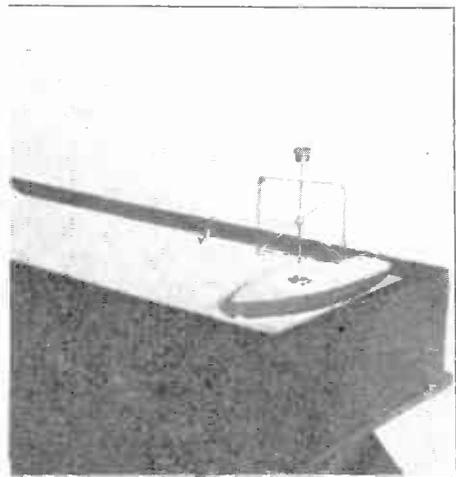
Company B, 101st Signal Battalion, N. Y. N. G., are keeping abreast of the times in modern operation. In emergency they utilize telephone and telegaph wires for both wire and excellent instruction is given to members of the signal division in the National Guard. They are shown tapping a telephone line.



(Foto Topics)
GORDON HUTCHINS, JR., of Riverdale, N. Y., whose father is Lieut. Commander G. Hutchins, U. S. N., listens in on the higher waves in hopes of catching a message from Daddy abroad.



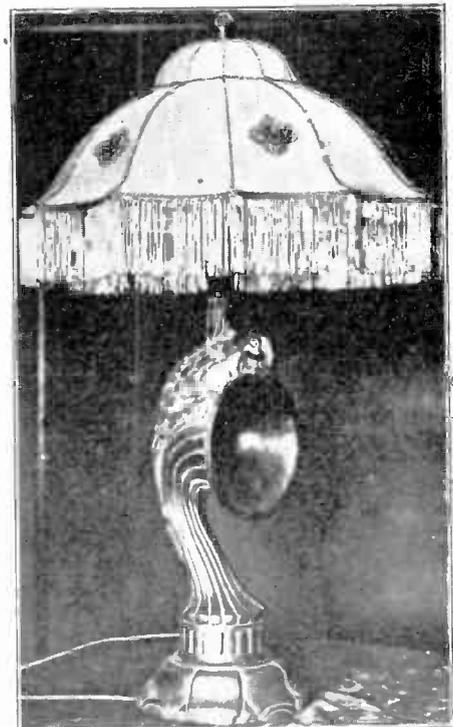
(Kaiser & Herbert)
CHAUNCEY OLCOTT, the famous Irish songster and actor, is always hooking-up radio sets in his leisure moments. Mr. Olcott says he would like to carry on and to have his friends listen to him in the old country via the radio.



Lighthouse signalling station and ship is so accommodated in a suitcase, and is used for radio Fog Signalling System, whereby a certain signals on a special wave length on The wireless operator is made aware of signals. The loop shows from which directions enabling the captain to avoid the rocks.



(Kaiser & Herbert)
THE CANADIAN CUSTOM House Radio station on the borderline near Jackman, Maine. Bootleggers are now hard put to evade the long arm of the law. The Custom House Station receives and broadcasts information. Its service has been so often used against border violators that a plan is afoot to enlarge its power.



(Wise World)
DOUBLY USEFUL as well as ornamental, is this combination table lamp and loud speaker. The heavy cast horn does not allow vibration.

The Radio University

A Question and Answer Department conducted by RADIO WORLD for its Subscribers by its Staff of Experts.

Address Letters to Radio University Department
RADIO WORLD, 1493 Broadway, New York City

As I would like to make the Old Reliable Armstrong Circuit described in the RADIO WORLD for January 5, I would like to know the range of the set in miles and meters?—Byron M. Crawford, 209 North Madison Street, Chilton, Wis.

The wave length range of this set embraces all those used by the broadcasters, that is from about 200 to 600 meters. With a long and high antenna, fairly good distance can be expected.

I have built a WD11 set as specified in the article by Mr. Gordon in RADIO WORLD for January, 1923. I did not connect the batteries as per the hook-up, but connected the positive side to the plate. The variable condenser only works when the rotary plates are practically disengaged from the stationary plates. What can I do to make the condenser work over its full range?—I. O. Ziemann, Fall Creek, Wisconsin.

You are correct in connecting the positive side of the B battery to the plate. Check up carefully on your connections to the condenser. It seems that you have it placed in the wrong circuit.

Will you please advise me if stations can be logged on the Superdyne set which recently appeared in three issues of your magazine?—L. J. Boothroyd, 347 Twelfth Street, Elyria, Ohio.

Stations can be logged approximately on this set. The tickler coil will have to be adjusted for highest signal strength after the other controls are set.

Will you give me the general constructional data on a low meter set to be used on the 100-meter broadcasting?—R. L. Hilton, 2 Laurance St., Waterville, Maine.

A receiving set for the purpose you mention will appear complete in an early issue of RADIO WORLD.

I am just beginning in radio, so would like to have a simple hook-up of a crystal set using one vario-coupler. What size antenna do you recommend? What is the best crystal for me to use?—Arthur O. Brown, Redbank, N. J.

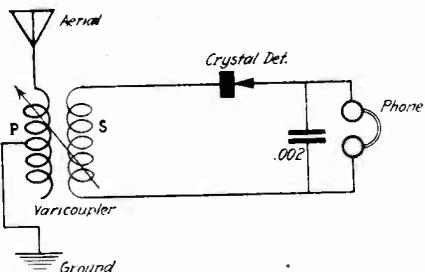


FIG. 3—Simple crystal hook-up, using vario-coupler detector and phones.

Fig. 3 shows diagram of simple crystal receiving set using one vario-coupler. The condenser across the phones has a capacity of .002 mfd. Make your antenna at least 100 feet long. Galena is the best crystal.

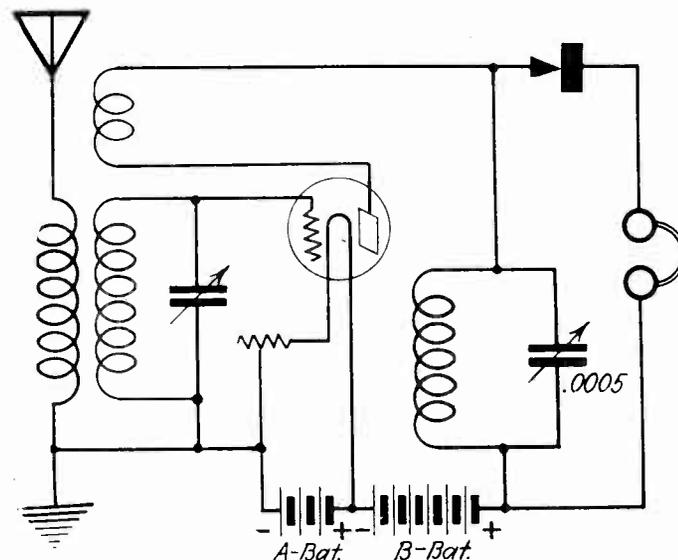
I have built the Superdyne as described in RADIO WORLD, but am short the wave length switch. Where can I procure the double-pole, double-throw, anti-capacity switch, push-pull panel mount type?—R. H. Stearns, 1809 Pittston Ave., Scranton, Pa.

Communicate with the Globe Radio Equipment Co., 217 West 125th Street, New York City. They probably have such a switch in stock.

I would like a diagram of a single circuit, feed back or a three circuit set. I have one 43-plate vernier condenser, one 43-plate plain condenser, two 180-degree vario-couplers, two variometers, two rheostats (plain), one vernier rheostat, two phone condensers, one grid leak, and condenser, one 200-ohm potentiometer, two WD11 tubes, one UV199 tube. I also have a two-stage amplifier. One of the audio-frequency transformers has a ratio of 10 to 1, the other 5 to 1. Which transformer should be placed in the last stage?—Ralph Kendall, Arvada, Colorado.

It is against the policy of RADIO WORLD to advise single circuit tube sets on account of the interference they cause with nearby listeners-in. The three-circuit set is permissible when one

stage of radio-frequency is employed before the detector. This will make it a four-tube outfit, and has the advantage of eliminating radiation, at the same time increasing selectivity and distance. Such a circuit, using two variometers, and one vario-coupler, appears on page 7 of RADIO WORLD for April 12. You may use the UV199 in the radio-frequency unit. Advise the use of UV199 or UV201A throughout rather than WD11 tubes. In the audio-frequency unit, place the 10 to 1 transformer in the first stage and the 5 to 1 in the last stage.



R.W. Fig. 4

I have built the Superdyne set, construction data of which appeared in RADIO WORLD for Dec. 15, 22, 29. I get fine results on the radio-frequency and detector tubes, but when I plug in the audio-amplifiers, I hear nothing at all. What is my trouble?—Wm. F. Plitt, 9 E. Market St., York, Pa.

Go over the amplifier wiring very carefully, checking it back with the diagram. If you find this absolutely correct, change the double circuit jacks, as they may be short-circuited. Test each tube to be sure each one functions properly. Test the transformers with a battery and head phones for an open circuit. See that the prongs of the sockets make good contact with the pegs on the tubes. Make sure that your B battery is properly connected, and that it is not dead. There is no reason why the amplifiers should not work if they are properly wired and the parts used electrically and mechanically perfect.

I have constructed the Superdyne receiver described in RADIO WORLD and find it works excellently on short-wave lengths, but not so well on long waves. Where do you think the trouble could be? I have followed the directions specified in the hook-up.—Roy R. Osburn, Newbern, Tenn.

Your trouble seems to be in your antenna circuit. Try lengthening your aerial, so that the set will respond to the higher wave lengths. If this is not possible, make a loading coil of from 20 to 40 turns, tapped, and place it in series with the aerial. The coil should be wound on a 3/4 inch tube.

I built the Superdyne from the description in RADIO WORLD and followed it out to the finest details, but I don't think I am getting the volume that I should. What can you suggest to increase the volume?—John Zimmons, 133 Congress St., Troy, N. Y.

The best way to increase your volume is to add more "B" battery. Bring the plate voltage up to 100 or 120 volts. The signals will then be much louder.

In March 29 issue of RADIO WORLD appears an article written by Edward J. Wiggins describing a set that interests me very much and I have decided to try my luck at it. Would like to find out where to obtain the parts recommended for such a set.—G. L. McClusky, 126 W. Dominick St., Rome, N. Y.

Communicate with the Electrical Research Laboratories, 2515 Michigan Avenue, Chicago, Ill.

I recently built the Superdyne set as described in RADIO WORLD and have had good results. I wish to build a one tube set on the superdyne principle using a crystal detector, if this circuit is possible.—J. Claus, 587 Miller Avenue, Brooklyn.

The diagram published herewith is that of the superdyne circuit with a crystal. The vario-coupler is the ordinary type with the exception that the rotor is rewound with 15 turns of wire. The primary is 5 turns of wire wound directly over the stator of the vario-coupler. The rest of the diagram is self-explanatory (Fig. 4).

One tube with crystal hook-up, using the Superdyne principle. The three coils on the left are all on the vario-coupler. The coil on the right has 60 turns of No. 30 DCC wire.

Where can I obtain detailed instructions regarding the building of a radio set shown in the March 29 issue of RADIO WORLD. Also where could the selectorformer be procured?—R. B. Campbell, Belle Ellen Farm, Branchville, N. J.

Write to the Electrical Research Laboratories, 2515 Michigan Avenue, Chicago, Ill. They also sell the Selectorformer.

In my set using WD11 tubes I get good results, the only objection being that I have to turn the filaments up too bright to get proper oscillation. How may I overcome this?—E. Williamson, 307 Southern Railway Bldg., Atlanta, Ga.

WD11 tubes use one and a half volts on the filament, so that is probably what you use when you have your rheostat on almost full. Try different grid leaks until you strike one that allows oscillation without burning the filament too brightly.

In March 29 issue of RADIO WORLD "A Receiver of Tremendous Power," what plate of "B" battery voltage does the author contemplate using? I intend to use UV201A tubes.—R. E. Pricer, 2900 Cormany Ave., Cincinnati, Ohio.

From 45 to 100 volts may be used in this circuit.

Join RADIO WORLD'S University Club

And Get Full Question and Answer Service for the Coming 52 Weeks.

RADIO WORLD, 1493 Broadway, New York City:

Enclosed find \$6.00 for RADIO WORLD for one year (52 Nos.) and also consider this as an application to join RADIO WORLD'S University Club, which gives me free information in your Radio University Department for the coming year.

Name

Street

City and State.....

In 5 Lessons Expert Gives Tips on Code

By N. N. Bernstein

SOME general instructions for learning the code no doubt are necessary, and the following method is offered for your rule and guide.

Patience and persistence are the two most necessary qualifications. There is no hurry. If you can't understand the signals at first, don't be impatient. A little more practice and application will do the trick.

LESSON 1.—Connect your buzzer, battery and key. Adjust the key spring to an easy tension. Adjust the spacing between the points to a distance of between one thirty-second and one-sixteenth of an inch. Make sure that all nuts and binding posts are firmly fastened. Now comes the position of the hand. Rest the index and middle finger of the right hand lightly on the farthest edge of the knob. Place the thumb on the edge of the knob so that the ball of the thumb will be right on the edge. The wrist is held up slightly higher than the level of the knob. The muscles of the forearm rest upon the table. The key is held firmly but lightly. You are now in the proper position to transmit on the key.

LESSON 2.—A dash is a short buzz. Press down upon the key with the middle and index finger, using the thumb to steady the motion. A dash is about the length of time it takes to say one-two in ordinary conversation. Keep the key depressed for this length of time without straining the wrist. Use just enough pressure to make firm contact. Release the contact without allowing the fingers to leave the knob, again using the thumb to steady the motion. Repeat this, evenly spacing the dashes and the intervals between. Do it slowly so as to get used to the sound of a dash. Try to imitate the time signals as broadcast by NAA and re-broadcast from many radio-telephone stations.

LESSON 3.—A dot is approximately one-third of the size of a dash. After you have mastered the dash, make the dot exactly the same way. Practice the dot carefully, but not too slowly, to accustom your ears to the difference between it and the dash. The wrist will become very tired in a short time. Rest often while practicing. Keep at the dot until you can make a string of ten evenly, rhythmically and without strain.

LESSON 4.—Combine the dot and dash, making four dashes followed by five dots as follows: — — — — — Repeat until you can make this combination evenly and rhythmically. Now try the following: — — — — — This combination is rather difficult for the beginner, but with practice it will come as easy as the rest. Next make four dots followed by one dash: — This is another hard one, but when these three are mastered, the actual letter combinations in the code alphabet will be made with ease.

LESSON 5.—Learning the alphabet is now in order, and should be gone about in much the same manner as you learned your A B C in school. Practice a few letters at a time until you know all twenty-six, after which you will naturally form words and sentences. It is of great importance to learn the figures and standard abbreviations, as they are used extensively in radio communication.

The Radio Primer

How to get more
Fun out of the
Set you now have.

Information and Instruction for the Novice

Learn International Code and Enjoy Interference

MANY newcomers in radio often wonder what those dots and dashes are that they hear occasionally while listening-in on their sets. In fact they find those signals very annoying, and utter all sorts of dire threats about what they will do to that interferer. But, if they could only READ and UNDERSTAND those signals, would they be annoyed? You are right, they would not.

On the contrary, they would strain their ears so as not to miss a dot, especially in the case of distress signals.

Anybody who takes the time and trouble to learn the International Morse Code is repaid a hundred-fold. Much less complaining and letter-writing to radio inspectors would be done if people knew what was going on over the air when these signals they cannot avoid hearing come through the air. No code messages are sent now on broadcasting wave-lengths unless absolutely necessary, and in case of emergency.

All that is required to learn the code is a key, buzzer, and a few dry-cell batteries, costing, all told, about \$4. The code is fully explained herewith. With perseverance, it can be mastered, at a slow rate of speed, in about six weeks.

INTERNATIONAL MORSE CODE AND CONVENTIONAL SIGNALS

To be used for all General Public Service Radio Communication

1. A dash is equal to three dots.
2. The space between parts of the same letter is equal to one dot.
3. The space between two letters is equal to three dots.
4. The space between two words is equal to five dots.

A . —	Period
B — . . .	Semicolon
C — . — .	Comma
D — — .	Colon
E .	Interrogation
F . — . .	Exclamation Point
G — — — .	Apostrophe
H	Hyphen
I . .	Bar indicating fraction
J . — — —	Parenthesis
K — . — .	Inverted Commas
L . — . .	Underline
M — —	Double dash
N — .	Distress Call
O — — —	Attention call to precede every transmission
P . — — .	General inquiry call
Q — — . —	From (dc)
R . — . .	Invitation to transmit (go ahead)
S	Warning—high power
T —	Question (please repeat after)— interrupting long messages
U . . —	Wait
V . . . —	Break (Bk.) (double dash)
W — — —	Understand
X — — . —	Error
Y — . — —	Received (O.K.)
Z — — — .	Position report (to precede all position messages)
Ä (German)	End of each message (cross)
Á or Å (Spanish-Scandinavian)	Transmission finished (end of work) (conclusion of correspondence)
CH (German Spanish)	
É (French)	
Ñ (Spanish)	
Ö (German)	
Ü (German)	
1 . — — — —	
2 . — — — —	
3 . . — — —	
4	
5	
6	
7	
8	
9	
0 — — — — —	

Why Doesn't a Piano Sound Like a Flute?

By Edgar H. Felix



(Keystone)

IT WAS ONLY A DREAM, BUT—Henry F. Worner, of Philadelphia, is shown with his radio set, the Heteroplex. Building a set a short time ago, he tried for weeks to evolve a way to make one that would be easily wired, installed and operated. A few nights ago, a dream came to him showing him just how the set should be made, in minute detail. Now that the set is finished, it has proven that you have to be a good dreamer to get the best out of life.

Radio Decalogue

Tips to the Novice on Purchase of a Set

LITTLE things like picking out a wife, selecting an automobile, or buying a new house, are a cinch compared with deciding which radio set to buy or build.

The multiplicity of types of receiving sets available, the extravagant claims made for many of them, and the inability of a large section of the public to select good sets or parts, make the layman's choice of a set a real problem. Often the selection is just a gamble.

The formula for solving the dilemma consists of the sum of ten important characteristics divided by the cost in dollars and equals satisfaction per dollar. The characteristics are:

- | | |
|----------------------------|--------------------------------------|
| 1. Quality of reproduction | 6. Non-radiating |
| 2. Volume | 7. Sharpness of tuning (selectivity) |
| 3. Range (sensitivity) | 8. Ruggedness |
| 4. Ease of tuning | 9. Small upkeep expense |
| 5. Ease of construction | 10. Low cost |

Some of these characteristics can be rated by one who has never seen or heard a radio set, while others need further explanation.

Quality of reproduction is given first, for without it a radio set is useless for entertainment. With the proper apparatus and loud speaker or head phones the quality of reproduction is assured. More attention should be given to the apparatus used than the demonstration in the dealer's store, for store demonstrations are usually given under the worst of conditions. If radio had depended on store demonstrations

for its growth it would have died of starvation.

The most important piece of apparatus for quality in a radio set, outside of the actual reproducer is the detector. Next in importance is the amplification.

Volume is obtained by audio frequency amplification and depends for its magnitude on the make of transformer used and the number of stages. Never try more than three stages of audio frequency amplification.

If a set has easy tuning the novice can get the most out of it. Women can easily tune in the distant stations loud and clear. Ease of tuning depends directly on the number of controls. For this reason a set using a loop should always be preferred because to tune the set only one adjustment is necessary, namely, the condenser.

The great majority of the sets in this country today were made at home and ease of construction is therefore a very necessary characteristic. Choose a set consisting of standard parts and wire it according to a good diagram, easily followed.

Build a set which won't radiate and annoy your neighbor.

The number of stations you can get on a receiver depends greatly on its selectivity and the amount of interference in your locality. A loop set can't be beat for selectivity and cutting out interference because a loop and a low loss condenser have such low resistance, and a loop has the property of receiving radio in the plane of its direction some hundreds of times easier than in directions at right angles to this plane.

DURING the last year, long distance telephone circuits have occasionally been used in connection with radio broadcasting, a task differing radically from ordinary long distance telephone communication. A much wider range of frequencies must be transmitted.

To the layman, adapting a telephone line to a wide range of frequencies may be a meaningless phrase. Let us consider just what is involved in this task.

Sound is caused by air waves which cause the diaphragm of the ear to vibrate. These vibrations in turn cause the auditory nerves to register an impression upon the brain center of hearing. In speaking, the vibrations to which the ear-drum responds lie between approximately 100 impulses per second and about 10,000.

It has been found that a system which transmits frequencies between 500 and 2,000 reproduces speech sounds which are easily understood, although lacking somewhat in naturalness.

Why They Sound Different

In listening to the music of a symphony orchestra, response to a much wider range of frequencies is necessary. When a musician strikes the "C" one octave above the middle "C" on the piano, the ear drum vibrates 517.31 times per second. When a flutist sounds a note of the same pitch, the ear drum also vibrates at the same frequency of 517.31 vibrations per second. The difference which the hearer notices between the music of the piano and flute lies in the harmonics or overtones. The first harmonic is 1,034.61 vibrations per second; the second is three times the fundamental tone or 1,551.91 times. There is also energy distributed on the third, fourth, fifth and higher harmonics.

The distinguishing character of each instrument is determined by the relative value of its harmonics. For instance, one instrument may radiate 50% of energy on the fundamental, 12% on the first harmonic, 18% on the second, 10% on the third, 3% on the fourth, and 2% on the fifth and the balance on still higher harmonics; another instrument may radiate 45% on the fundamental, 30% on the first harmonic, 12% on the second, 6% on the third, 1% on the fourth, 5% on the fifth and 1% on higher harmonics. Although relatively small energy is present in any one harmonic, to secure accurate reproduction, it is essential that the broadcast transmitter not only broadcast the fundamental tones which give recognizable pitch but also give accurate reproduction of the harmonics. Otherwise, the flute, violin and piano lose much of their naturalness, so that it is difficult for the listener to distinguish between them.

Difference Explained

This requirement makes very important preparations necessary in order that a line may be suitable for radio broadcasting. In ordinary long distance communication, understandable speech requires that the line be adapted to faithful transmission of a band of frequencies of about 2,000 cycles or more. Because of this fact, we are able to use one single telephone line simultaneously for as many as eight different channels of communication. When the operator connects you with Chicago, you have placed at your disposal a channel of communication, and not as is generally supposed, a single pair of wires. There may be several different telegraph messages and two or three telephone conversations going on over the same wire which do not in any way interfere with your conversation.

When a line is used in connection with radio broadcasting, however, the very wide range of frequencies used makes it necessary to alter the circuits.

The Old Salt Sees a New Light

By G. Harold Porter

Marine Superintendent, Radio Corporation of America

ALTHOUGH fish is a basic and valuable food, the trawling industry has always been an uncertain one. Many trawling companies have gone into bankruptcy in recent years, for the experience of the lone fisherman who shoulders his rod and goes a-fishing was repeated on a vastly larger scale in the trawling industry.

A constant supply of fish must be kept coming into the market, which makes it imperative for fishing boats to adhere to a form of schedule. Thus it has always been necessary to instruct the captain of a trawler exactly how many days he must remain out. At the end of this period—about 9 or 10 days—he must bring his ship into port whether he has caught 25,000 pounds of fish or 125,000 pounds. The financial risk is obvious when it is realized that it costs approximately \$200 a day to operate one of the larger trawlers and the proceeds of a 10-day trip often do not amount to \$2,000.

This was the position in November, 1922, of the Portland Trawling Company, a subsidiary of the Atlantic Coast Fisheries Company of N. Y. C., which operates a fleet of four steamers in deep sea fishing. In December, 1922, the company decided to put radio on all four of their vessels. The sets were rented from the Radio Corporation of America. Operators were supplied by the Radio Corporation.

The change that has since taken place in the trawling industry, perhaps is best described in the words of an official of the Portland Trawling Company:

"You will understand our situation before we installed radio from just one incident. It was a Monday morning in November, 1922. I went down to the dock expecting to find the Sea Gull. Instead there was the Fisher, not due until Wednesday. She was loaded with 100,000 pounds of fish.

"She had sighted the Sea Gull on the banks, and had learned that the Sea Gull had had poor luck, and had only caught 20,000 pounds of fish. If she came into

port on schedule time, it would have meant a great financial loss to the Company. As it was, the Sea Gull appeared Wednesday morning with a catch of 70,000 pounds.

"In the extra two days she had been very fortunate. That set us thinking. Of course, we had to have our loads follow a schedule. We had to have a boat come in regularly every two or three days. It is seldom that two boats meet on the 20,000 square miles of fishing area on the banks. So we could not depend on such physical contact to bring home the boat with the largest catch. There was no way by which we could communicate with them, lacking in radio equipment as they were.

"We decided to add 5% to our expenses and put on radio, and we have had reason to be satisfied with our action. Now, when we send a ship out we do not include a specified date in the captain's sailing orders. We are kept constantly informed of the amount of the catch, and by radio we can order the ship to return to port in six days, or we can keep it out as long as 14 days.

"Because we always know just how many pounds of fish of each kind there are on board, selling is made much easier.

"In order to achieve the maximum of efficiency, it is essential to cut down each vessel's unproductive time to a minimum. The less time a trawler spends in port, the greater the profit that she can make. One of the biggest services that radio renders is to cut down unproductive time as much as possible. Each trawler makes known her port accommodation needs long before she arrives. In one case a message came to us via radio, saying that the Petrel needed new piston rings. Long before the vessel docked, the twenty-four hour job of getting those piston rings ready for installation was completed.

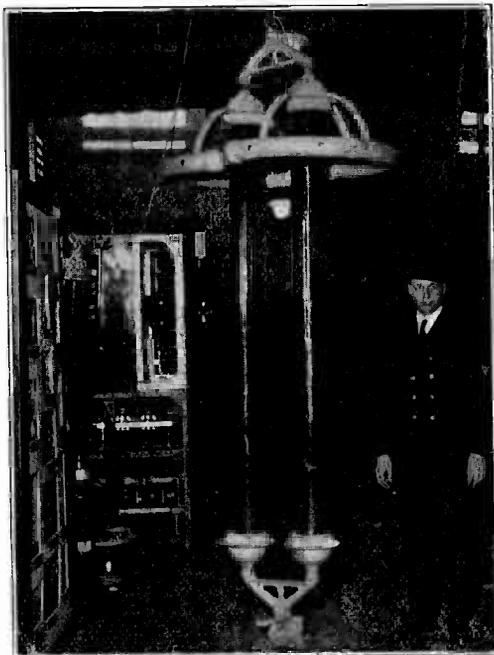
"The Fisher had been out ten days. She had a full catch and was returning to port. The Sea Gull, out only three days, had her fishing gear so badly damaged that it was useless for her to remain on the banks. A radio message from the Sea Gull brought the Fisher hurrying to transfer fishing gear. This message was received at the same time by the Portland Trawling Company. When the Fisher arrived in New York, the Company had new gear ready for her. This effected a saving of three days' time—\$600 for the Sea Gull.

"The second-engineer of the Sea Gull decided to quit at the end of the trip. The captain included that news in his daily radiogram to the Company. Before that ship arrived in port a new second-engineer had been signed up.

"In time of sickness radio renders invaluable service. A ship's captain will hesitate to take it upon himself to go into port with a small catch because one of the men on board is not well. But he decidedly would send a message to port telling the Company of the illness of one of the crew. Frequently, the answer comes back to go into Newport, or other nearby port, for medical aid. At other times a medical officer on shore or on board a passenger vessel will give the necessary method of treatment over the radio.

"Fogs are very dense on the banks. This is especially true in the winter months of the year. Often it is impossible to take the bearings of a vessel for days at a time. A radiogram to shore will bring back a speedy answer that will enable the ship to learn at once just where it is. The direction from the ship to the shore station can be told with unflinching accuracy.

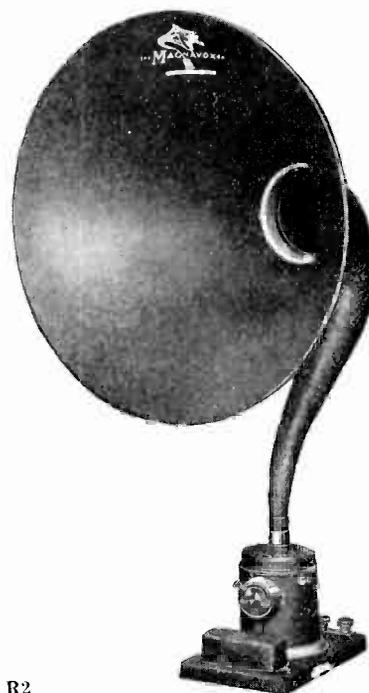
"When two shore stations of known location flash back the direction, the position of the ship can be worked out by triangulation, and much time heretofore lost in cautiously feeling their way or in laying to, is saved. The safety of all vessels is always enhanced by the regular receipt of weather reports."



(Kadel & Herbert)

THIS INSULATOR can stand the strain of 26 tons. Chief Electrician A. H. Johnson, U. S. N., is shown standing alongside a high-power arc tower insulator. Its size can be seen by comparison with the height of Mr. Johnson. This is the type used at the 500 kilo-watt station at Annapolis, Md.

MAGNAVOX Radio Products



R2
New Model \$50.00

MINIMUM current consumption has been combined with perfect volume control in the new model R2 Magnavox Radio Reproducer illustrated above.

The new Volume Control enables the user to reproduce broadcast programs from very soft to very loud, by moving a simple electrical switch, with a corresponding saving in current consumption.

These two new features—Volume Control and reduced current consumption—make the R2 Magnavox the ideal Reproducer.

Magnavox Reproducers

- R2 with 18-inch curvex horn...\$50.00
- R3 with 14-inch curvex horn...\$35.00
- M1 with 14-in. curvex horn. Requires no battery for the field....\$35.00

Magnavox Combination Sets

- A1-R consisting of electro-dynamic Reproducer with 14-inch curvex horn and 1 stage of amplification \$59.00
- A2-R consisting of electro-dynamic Reproducer with 14-inch curvex horn and 2 stages of amplification \$85.00

Magnavox Power Amplifiers

- A1—new 1-stage Power Amplifier \$27.50
- AC-2-C—2-stage Power Amplifier \$50.00
- AC-3-C—3-stage Power Amplifier \$60.00

Magnavox products can be had at Registered Magnavox Dealers everywhere. Write for new 32-page catalogue.

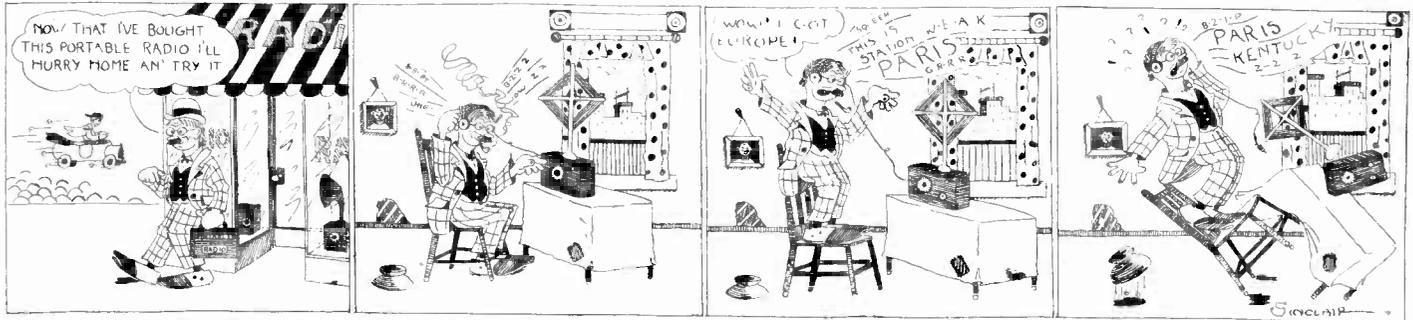
The Magnavox Company
Oakland, California

New York Office: 370 Seventh Avenue
Canadian Distributors:
Perkins Electric Limited
Toronto, Montreal, Winnipeg

MR. D. X. HOUND

Radio's World's Own Artist Creates An
Enjoyable Character

By HAL SINCLAIR



The Radio Trade

Knob of Crystal Can Be Put Through Panel

THE New Freshman Double-Adjustable Crystal Detector, often used in reflex and crystal circuits, differs from other units in having a knob which can be brought through to the panel and, when turned, varies the crystal contact with the loop-whisker.

The crystal is a natural ore which will withstand voltages as high as 130. It is glass-enclosed. The crystals are replaceable by fresh units which are sold mounted in the non-metallic housing.

Speaker Now Equipped With Upright Horn

THE Bristol Baby Audiophone Loud Speaker, manufactured and sold by The Bristol Company, Waterbury, is now being equipped with an upright style of fiber horn, as shown in the accompanying illustration. This is being used in place of the metal flare and goose neck with which it was originally placed on the market. The operating parts of the Loud Speaker have not been changed. The finish of this fiber horn is bronze color to match the handsome bronze finish on the metal base. It is claimed by some that the tone quality of the Loud Speaker is even better than with the former metal horn. This new style of horn does not affect the price.



Better DX Results Being Reported by Fans

FILKOSTAT, a graphite device, taking the place of the usual wire rheostats for filament control, enable finer adjustment, users report to the manufacturers and they say that thereby they can tune in DX better, by reason of sharper tuning.

Another advantage: the filkostat can be more successfully made to control more than one tube at the same time.

Long-Distance Results With Crystals

LONG-DISTANCE results on crystals are reported to Leon Lambert, Wichita, Kansas, by users of his product.

Letters have been received from customers all over the United States.

Prices Distinguished

IN the advertisement of the Essex Radio Service on page 3 of the Anniversary Number of RADIO WORLD (April 5), there appeared two prices, \$15 and \$20 for the "set complete." The Essex Radio Service makes two offers, \$15 for set complete with cabinet and \$20 for set complete with cabinet, tube and all batteries.

COMING EVENTS

April 26 to May 3.—Third Annual Better Homes and Building Exposition, Fifth Regiment Armory, Baltimore, including section set aside for a radio show. Home installations from the viewpoint of interior decoration will be featured.

April 28.—Conference at Bureau of Standards, Washington, to standardize dry cell battery types and specifications.

September 22 to 28.—First Annual International Radio Show, Madison Square Garden, New York.

Readers Ask for Literature

[The names and addresses of readers who welcome literature and catalogues from dealers and manufacturers are published on request. Address Service Editor, RADIO WORLD, 1493 Broadway, New York City.]
Charles S. Cole, 251 State street, Bridgeport, Conn.

A. W. Sharpe, 233 Duke street, West St. John, New Brunswick, Can.

L. E. Tyrrell, 1237 Girard street, N. W., Washington, D. C.

W. B. McNair, 1313 North Third street, Harrisburg, Pa.

W. M. Hawman, 250 East Ross street, Lancaster, Pa.

E. G. Bartlett, Elmer, Mo.

H. R. Farmer, Simplex Electric Phonograph Motor Co., Montreal, Can.

E. G. Bartlett, Atlanta, Macon, Co., Missouri.

F. B. Bernard, 367 Seventy-fifth St., Brooklyn, N. Y.

Senate Gets Protests on Tax on Radio

THE radio industry has been stirred to vigorous protest by the action of the Senate Finance Committee in recommending a 10 per cent. manufacturers' tax on radio sets and parts in the new tax bill before Congress.

Responsible heads of leading radio manufacturing concerns considered the proposal ill-advised and declared that it would put an unjust burden directly on the industry and indirectly on the radio buying public.

New Corporations

Famous Radio Co., New York, \$10,000; M. Kahn, M. Greenstein, N. Casden. (Attorney, P. I. Schick, 1,475 Broadway.)
Seeley Radio Corp., Brooklyn, N. Y., \$5,000; J. W. Weber, Jr., H. B. O'Boyle. (Attorney, H. S. Patten, 25 Church St., New York City.)
Royal Radio Corp., New York City, \$6,000; H. Abramowitz, S. Harnick, G. Diamond. (Attorney, S. Schleimer, 605 Broadway.)
Preferred Radio Products Corp., New York City, \$10,000; S. A. Shapiro, W. and C. Hyman. (Attorney, M. Berkowitz, 291 Broadway.)
Belton Radio Corp., New York City, \$5,000; S. Kaplan, H. L. and E. W. S. Rosenthal. (Attorney, L. A. Sable, 51 Chambers st.)

Business Opportunities Radio and Electrical

Rates: 40c a line; minimum 3 lines

INCH DISPLAY 100 Magazines, Thrice \$8.00. Beck, 5493 Alaska, St. Louis.

WILL PURCHASE RADIO CONTRACTS; any amount. Box 66, Radio World.

MACHINE SHOP, fully equipped for building special machinery and experimental work; we make a specialty of McNeil vacuum pumps and molds for battery grids. M. P. Wilkins, 125 Watt St., cor. Greenwich St., N. Y. City.

RADIO STORE FOR SALE—Excellent location and income; good reason for selling; not a junk shop; moderate investment. Box WW, Radio World.

MAN EXPERIENCED IN RADIO to invest \$3,000-\$5,000 in growing radio business; Times Square section New York City; good opportunity for ambitious man; will stand investigation. Box 222, Radio World.

RADIO JOBBER WANTED. Must be live wire to handle good proposition; big demand for article. Phone Barclay 7226, New York City.



ULTRADYNE

the Improved Super-Heterodyne.
Send 50c for book giving complete details of drilling, assembling, wiring and tuning 8 and 6 tube ULTRADYNE Receivers.

50c

Phoenix Radio Corp., 8-9 Beekman St., N. Y. C.

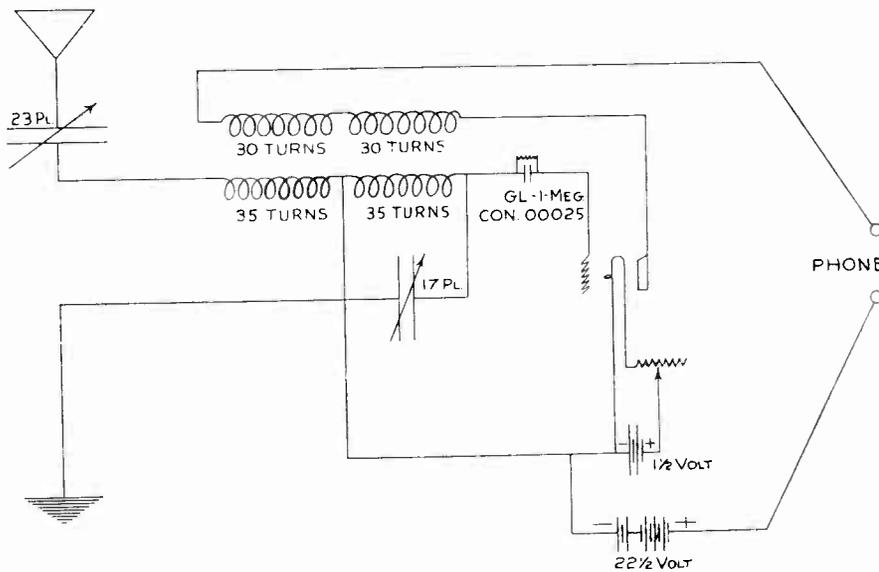
One-Tube Set Can Be Built in an Hour

A SET so simple that a twelve-year-old boy can perform the construction in an hour, is shown in the accompanying Essex Circuit diagram. A special variometer is used, having 70 turns on the stator and 60 turns on the rotor. The stator is split, having 35 turns on a side, and the rotor is connected in series with the plate of the tube and the telephones.

A 23-plate variable condenser is connected in the antenna circuit. A 17-plate variable condenser is shunted across the coil connected with the grid which acts as the secondary coil of the receiver. The parts necessary for the construction of the set are as follows:—

- 1—Panel 7x10 inches
- 1—Special variometer
- 1—23-plate Variable condenser
- 1—17-plate Variable condenser
- 3—Dials
- 4—Binding posts
- 1—Rheostat
- 1—Grid condenser and grid leak
- 1—Vacuum tube socket
- 3—Pieces of bus wire (bar)
- 1—A battery
- 1—22½ volt B battery
- 1—Pair telephones

The actual construction is comparatively easy if the following method is taken as a guide. First mount all the parts on the panel, with the exception of the tube



DETECTOR circuit that can be built in an hour.

socket. Cut the bus bar wiring to the proper lengths, bending them to shape. Start soldering with the wires you wish to run close to the panel. It is suggested that only the ground and negative leads be run near the panel, so as to avoid un-

necessary body capacity. Place the tube on the base board in a position that will allow the shortest grid leads. After all the other leads have been soldered, wire up the socket. Put the grid leak and condenser directly on to the grid binding post of the socket. When a UV201A is used in this circuit, the grid-leak should be from 1 to 2 megohms.

Care should be taken to keep the tube just under the oscillating point. A radio-frequency unit, such as the Thompson Neutrad described in RADIO WORLD for April 12, may be used in conjunction with this outfit.

HOOK-UPS FOR EVERYBODY— Henley's 222 Radio Circuit Designs. Mailed for \$1.00, postpaid. The Columbia Print, 1493 Broadway, N. Y. C.

DEFOREST'S "WIRELESS IN THE HOME"—Mailed on receipt of 15c. The Columbia Print, 1493 Broadway, N. Y. C.

THE ROBERTS "B" BATTERY
Everlasting, rechargeable "B" BATTERY made of Edison elements.
Best for Neutrodynes, Superdynes, Superheterodynes and all high powered circuits. Superior in quality, durability, workmanship and finish. Satisfaction absolutely guaranteed. Insist on your dealer showing you ROBERTS "B" BATTERY before buying any other.

Dealers write for terms.
ROBERTS "B" BATTERY COMPANY
1120 Myrtle Avenue Brooklyn, N. Y.

THORIO
RADIO TUBES
1½-3-6-8-6V. ¼ AMP. DETECTOR.
FIT STANDARD SOCKET & WORK
ON ANY CIRCUIT—MAIL YOUR ORDER TO
HAYDEN-SCALES CO.
JERSEY CITY—N. J.

YOUR "NEUT" WON'T "NEUT"?
If you used good parts, do like scores of others—use same panel, same layout, change around a little wire, take out a few parts, add some—and have a Kladag Coast-to-Coast on Loud Speaker set.
We'll send, prepaid, everything you need—extra part, 22 feet real gold sheath wire, blue print and four pages of "dope" for \$5.00. If you want further details send 10c for data sheet.
KLADAG RADIO LABORATORIES
KLINE BLDG. KENT, OHIO

The Latest in Circuit Designs
HENLEY'S 222 RADIO CIRCUIT DESIGNS

A Complete and Up-to-Date Collection of Modern Receiving and Transmitting Hook Ups

Written and Edited by a Staff of Radio Engineers of Wide Practical Experience and Thorough Theoretical Training.

Editor **JOHN E. ANDERSON, A.B., M.A.** Formerly with the Western Electric Co.
ARTHUR G. O. MILLS, Radio Expert
ELMER H. LEWIS, Assoc. I.R.E., Radio Instructor East Side Y. M. C. A., New York City
Author of "A B C of Vacuum Tubes"

Price \$1.00
258 Pages.
284 Diagrams and Illustrations Specially made for this book.

AN ENTIRELY new and thoroughly practical book on radio circuit designs which will meet the needs of every radio enthusiast, whether novice or expert, amateur or professional. It is replete with correct and trustworthy radio information from which any one can successfully build and operate any of the circuits given. Contains the largest collection of radio circuits and Hook Ups ever published and includes all the standard types and latest developments.

This new book treats the subject in an entirely different and novel way, as it is the only book that illustrates the complete electrical design of the circuits, showing the electrical values of inductances, capacitances and resistances, with the name of each element on the diagram of the circuit.

It surpasses all other books in the scope of its subject matter, in the simplicity and novelty of presentation, and in thoroughness of detail.

SPECIAL Send \$6.00 to **RADIO WORLD** for a yearly subscription (62 nos.) and the publishers will send you a copy of this book, free, postpaid. If already a subscriber, send renewal for a year. This offer is not retroactive and will be withdrawn April 25.

THE COLUMBIA PRINT
1493 BROADWAY NEW YORK CITY

VACUUM TUBES REPAIRED

WD-11, WD-12, UV-201A, UV-199 and others for **\$2.50**

Quick service. All tubes repaired by us guaranteed to work as good as new. Send your dead tubes. All you pay is \$2.50 plus postage to postman.

THOMAS BROWN CO.
511-519 ORANGE ST. NEWARK, N. J.

DX—Thru the Locals

3 Holes to Drill—3 Wires to Connect.

The Globe Unitune is a completely wired tuning unit, employing a new circuit with one knob control. You can replace, in a few minutes, any type of tuning device in your present set with a Unitune, comprising as it does: coupled inductance, variable condenser, grid leak and grid condenser, all wired in one unit.

With a Unitune, Detector and Two Step You Can Build a 3 Tube Set in One Hour

It is possible to get selectivity that surpasses many multi-dial sets. Surprising DX results thru locals. Twenty-two different stations have been heard by gradually rotating the dial from end to end.

\$7.50
C. O. D. PARCEL POST

Globe Radio Equipment Co.
217 WEST 125TH STREET, NEW YORK
Dealers Write

GLOBE UNITUNE
TRADE MARK

KENNEDY TUNER
 Takes the place of—
 3 Honeycomb Coils at \$1.40..... \$4.20
 1 Honeycomb Coil Mounting..... 5.00
 1 23-Plate Vernier Condenser..... 5.00
 \$14.20
INCLUDING GLOBE TROTTER DIAGRAM \$5.00
T. J. KENNEDY
 RADIO GLOBE TROTTER
 470 W. 159th St. NEW YORK, N. Y.

Hungry Heart Appeased by Broadcast Book Review

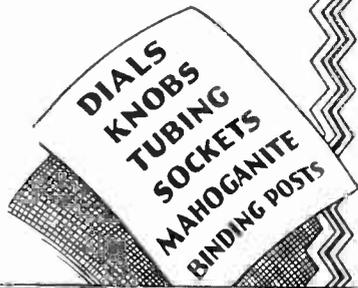
THE average radio broadcast program is made up of a variety of features. In planning this variety the program manager does not expect to please all listeners with all features. His purpose is to provide something worth while and of in-

terest to everyone. Educational talks on a variety of subjects are introduced; information of particular value and interest to the farmer is sent out. afternoon programs with an appeal for women touching on the home, care of children and fashions are offered as well as other features with a specific appeal.

Among the popular features broadcast by WGY, the Schenectady radio station, is a weekly talk on books.

The station received a letter from a farmer living near Tenstrike, Minnesota, who said he was just "hungry for such books and for such friends to tell me about them." He explains that he likes to read but for the past six years has lived in a country that is little more than a wilderness where he and his father and brother have been busy clearing the timber.

RADION PRODUCTS



Mahoganite and Black RADION PANELS

All stock sizes.
 Cut to any special size.

Are you having trouble getting a panel out to your special size? Write the N. Y. Hard Rubber Turning Co. at once,—they are being retained by the biggest hard rubber users in the radio industry, and they can supply you quickly and at low cost. Mail orders promptly filled.

Various sizes of Rods; Special parts made to order.

Inquire Now!

N.Y. HARD RUBBER TURNING CO.
 212 Centre Street, New York City

Tubes Repaired \$2.50
GUARANTEED
 All Standard Types W. D. 11 and 12 U. V. 199 - 200 - 201A
 24-hour service. Mail orders sent Parcel Post C.O.D.
RADIO TUBE SERVICE CO.
 239 Centre St. near Grand St. New York City

BILTMORE REFLEX

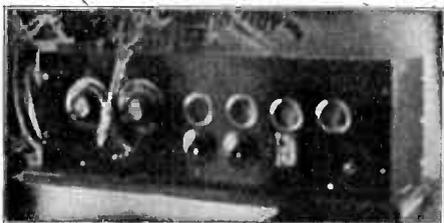
Three thousand miles on the loud speaker, without outdoor antenna, or even a loop! This is what the BILTMORE REFLEX RECEIVER is capable of. But a ground, and a few feet of concealed wire are all that is required. It is undoubtedly the most sensitive receiver made. Actually, the results usually surpass those obtained on the eight tube super-heterodyne.

The quality of the tone is pure, clear and full. Reproduction is perfect, due in large measure to the Erla fixed rectifier which is employed.

In appearance, the receiver is unsurpassed—beautiful Radion Mahoganite panel, heavy hand rubbed mahogany cabinet, heavily nickel-plated metal parts. All connectoins are made to the rear of the cabinet.

The most efficient circuit is used—four tubes, yet equivalent to eight.

The apparatus employed is of the very best—Radion Mahoganite panel, bakelite reflex vario-coupler, moulded bakelite sockets and dials, Frost jacks, Erla rectifier, Dubilier Micadons, Acme Radio Frequency Transformers, and Acme Audio Frequency transformers. We



can obtain no better apparatus.

Extremely selective, it is, nevertheless, easy to tune. You have but to snap the switch to listen to the world. A child can operate it without previous experience.

It is but slightly affected by static. Ideal for summer reception.

It may be operated entirely on dry cells.

And—the price. But \$100. Anyone can afford this wonderful receiver. Should you operate it, see it, and hear it, you would have no other.

And—we assure you of and guarantee you complete satisfaction.

DEALERS! You should handle this most popular receiver. Write us.



BILTMORE RADIO COMPANY
 Dept. W BOSTON 30, MASS.

YOU to hear programs from stations 400 to 1000 Miles Away. I can show you how to get them on **YOUR CRYSTAL SET.** Changes often cost **Less Than One Dollar.** Send self-addressed envelope for picture of my set.
LEON LAMBERT
 562 So. Volusia. Wichita, Kansas

RADIO HORN
 Has clear, natural tone and an exceptionally fine appearance. Your receiver fits in base. Mail a dollar bill for horn like picture, knocked down, prepaid. Easily assembled by anyone. **\$1.00**
FOX MFG. COMPANY, DEPT. C
 247 So. Broadway, Los Angeles, Cal.

THE VICTORY
 A Socket Built on Merit Electrically and Mechanically Perfect

 Genuine Phosphor Bronze Contacts Used for Panel Mounting
 List Price Triple, \$2.75; Single, \$1.00.
 Insist that your dealer supply you with the genuine VICTORY SOCKET. Triple, \$2.75; single, \$1.00. Expert Drillers and Cutters of Genuine Formium Panels and Tubing. Estimates Cheerfully Given.
UNITED RADIO MFG. CO.
 191 Greenwich Street New York City

FILL OUT AND MAIL NOW

SUBSCRIPTION BLANK

RADIO WORLD

RADIO WORLD

1493 Broadway, New York City

Please send me RADIO WORLD for.....months, for which

please find enclosed \$.....

SUBSCRIPTION RATES:

- Single Copy\$.15.....
- Three Months 1.50.....
- Six Months 3.00.....
- One Year, 52 Issues..... 6.00.....
- Add \$1.00 a Year to Foreign Postage; 50c for Canadian Postage.....

Nath. Baldwin Phones with
SHELTONE
 L U D SPEAKER
COMPLETE \$10.00
 Postpaid. Use your headset for 2 purposes—Exceptional combination value—Every pair of phones tested—Guaranteed to give results.
WALTER SCOTT
 1187 E. Broad St. Newark, N. J.

LATEST HOOK-UPS

Blue Prints Show You How to Build Your Own 17" x 27" blue print gives complete instructions, pictures, hook-up, wiring diagram. Shows full size templates for drilling panels. Your choice of these hook-ups.

Reinartz Tuner	5 Tube Neutrodyne
One Tube Reflex	4 Tube Superdyne
Radio & Audion Freq. Amp.	4 Tube Reflex
Honeycomb Receiver	3 Tube Cockaday
Ultra Audion Receiver	2 Stage Amplifier

JACKSON RADIO COMPANY
Dept. 45-B, 639 W. North Ave. Chicago, Ill.

Amateurs:—

Get One of These

WESTERN ELECTRIC MICROPHONES



Talk thru your own set. Two types—one with breast-plate, shoulder-straps, cord and plug; other, larger size for mounting or suspending.



\$1.50

Shipped prepaid anywhere in U. S. Send no Stamps or Checks—Money Orders Only.



Dept. B, 167 West 18th St., N. Y. C.

**Why Not Applaud?
Is Rhymed Plea**

UNDER the caption, "Why Not Applaud," "Keith's News" in Washington, publishes these lines by Congressman William P. Connery, Jr., of Massachusetts, and as they apply to the unseen players and entertainers of radio as well as to those of the regular stage, we pass them on to RADIO WORLD readers:

After all your weary troubles of the day
When you go to spend your evening at the play
If you think the show is pretty
Or the lines are droll and witty
Or some one sings a tuneful ditty
Why not applaud?

For those actor folks are working hard for you,
They try to cheer you up when you are blue.
Applause to them is honey,
And although it may seem funny,
They're not working just for money;
Why not applaud?

And when they've tried their best to please you all
And are waiting for that welcome curtain call,
Though you may think the show immense,
If you sit in silence tense,
You make them feel like thirty cents;
Why not applaud?

It may be interesting now for you to know
That applause can oftimes make or break a show,
For applause makes grim scenes fearful
And it makes the sad scenes tearful
And it makes the glad scenes cheerful;
Why not applaud?

**Earn \$100 a Week
in RADIO!
Easy to
Learn at Home**

\$50 to \$300 a week for fascinating easy work—wonderful future. Hundreds of big paying positions in this huge new industry!



More Money for YOU in Radio

THOUSANDS of Radio Experts are needed to design, repair, maintain, sell radio apparatus, to operate broadcasting stations, as ship and land operators, to go into business; to instruct, demonstrate, superintend and for scores of other big paying radio jobs. No other field offers such amazing opportunities. And now, you can easily become a Radio Expert. Studying at home in spare time, you can quickly qualify for a splendid Radio position. Astonishingly small cost. Famous radio instructors give you individual help by mail. Training GUARANTEED.

We Help You to Big-Pay Positions

Hardly a week goes by without our receiving urgent calls for our graduates. "We need a competent Radio Engineer"—"We want men with executive ability in addition to radio knowledge to become our local managers"—"We require the services of several resident demonstrators"—these are just a few small indications of the great variety of opportunities open to our graduates.

FREE—Receiving Set and Special Parts

Our course of practical instruction includes not only several of our own special patented instruments, but in addition we furnish material and diagrams for building receiving sets, and finally this complete receiving set—all without additional cost!

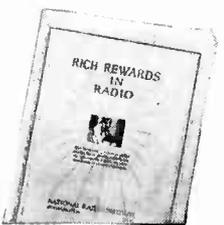
Free Employment Service

Scores of young men who have taken our course are already earning from \$75 to over \$200 a week. Merle Wetzel of Chicago Heights, Ill., advanced from lineman to Radio Engineer, increasing his salary 100% even while taking our course! Emmett Welsh, right after finishing his training started earning \$300 a month and expenses. Another graduate is now an operator of a broadcasting station PWX of Havana, Cuba, and earns \$250 a month. Still another graduate, only 16 years old, is averaging \$70 a week in a radio store. And we help you get positions like these.

Send for FREE BOOK

There's more money for YOU in Radio. Find out what this field has meant to hundreds of our graduates—and how you too can profit in it.

"Rich Rewards in Radio" has just been printed. It is filled with the latest Radio facts, figures and illustrations of tremendous interest to you. Right now—if you are at all ambitious—send for this valuable free book. Fill out the coupon—and mail it now! National Radio Institute, Dept. 78DA, Washington, D. C.



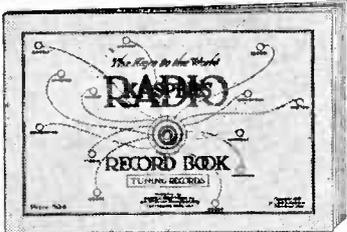
National Radio Institute, Dept. 78DA, Washington, D. C.

Without obligation send me your book "Rich Rewards in Radio," which tells all about the opportunities in Radio, how spare time study at home will qualify me quickly as a Certified Radioician so I can get one of these splendid positions, and how your Employment Service helps me to secure a big pay job.

Name..... Age.....
Street..... Occupation.....
City..... State.....

"SPIKE"

**THE STATIONS YOU RECEIVE
IN A
KASPER RADIO RECORD BOOK**



Then you will know where to set the Dials, Switches and Rheostats to bring them back. This book is endorsed by thousands of professional Radio Fans in all parts of the country because it covers everything on the panel. (Copyrighted.) Can be used with any set. Contains up-to-date list of 1,100 Broadcasting Stations, Time of Principal Cities and instructions How to Record Stations. 24 Pages, Valuable Information. No set complete without one. 50c per Copy, Postpaid. For your convenience send a one dollar bill for two copies, otherwise send Money Order for one or more. No checks nor stamps.

We also furnish Kasper's "APPLAUSE CARDS," printed on stamped Postal Cards—25 mailed anywhere upon receipt of 50c.

KASPER BROTHERS COMPANY

317 Lorain Street Bank Building Cleveland, Ohio, U. S. A.

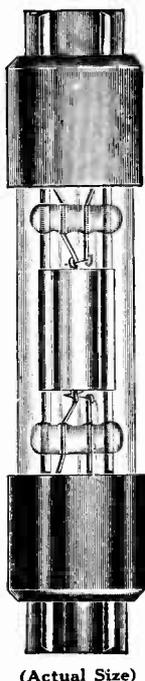
MONTREAL—CALIFORNIA

(More than 2500 miles)

ON ONE MYERS TUBE

Remarkable radio reception is an everyday result with MYERS TUBES. Mr. W. E. Gerrard, 73 Pine Avenue, St. Lambert, Montreal, Canada, with a set designed and constructed by himself, and using only one MYERS TUBE, hears KDZB, Bakersfield, California.

Get distance with clarity. Myers are the only tubes correctly designed for radio without bunched leads. Two types—for dry or storage battery. Insist on MYERS at your dealer's—otherwise send purchase price and be supplied post paid. Write for free circuit diagrams.



(Actual Size)

\$5

EACH Complete with clips ready to mount on your set; no sockets or extra equipment required.

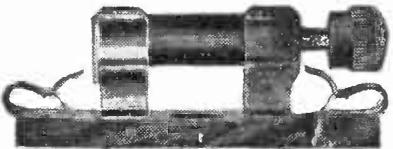
F. B. Myers Co. Ltd.
Radio Vacuum Tubes

240 CRAIG ST. W. MONTREAL CANADA

RUSONITE

FIXED DETECTOR

TONE ADJUSTER - BAKELITE BASE
GUARANTEED—PRICE \$1.25



Rusonite Perfect Radio Crystal Super-sensitive
Price Mounted 50c.
Rusonite 14K Gold Cat Whisker.....Price 25c.
RUSONITE PRODUCTS CORP.
15 PARK ROW NEW YORK

RADIOGRAMS

THE SUIT for infringement of patent brought by the American Telephone and Telegraph Company against Station WHN atop Loew's State Theatre, New York, has been dropped. Under an agreement WHN takes out a license from the telephone company covering the use of

COAST TO COAST

Every Turn **STAR** No
A Tap **COIL** Soldering

SEND FOR LITERATURE
STAR RADIO PRODUCTS CO.
711 S. DEARBORN ST. CHICAGO, ILL.

the radio parts. The license fee was \$2,000, to hold for the life of the patents. The settlement ends a bitter controversy in which WHN had alleged the A. T. & T. was trying to monopolize the air.

GUGLIELMO MARCONI, inventor who has contributed more than any one else to the scientific advance of radio, has been divorced. The plaintiff, who sued in Fiume just before the law against divorce became effective, has remarried. The inventor is said to be about to wed the Marquis Casati of Milan.

RECEPTION of the Kansas City Star's radio station, WDAF, by a listener in Los Andes, Chile, as reported by R. Raven-Hart, in a letter to the station, makes Los Andes the farthest south The Star has been heard. It is 4,500 miles.

MANY small towns of the country are taking up the nighthawk idea en masse. The folks stay up for the special late programs.



No. 1001
6 1/2 Ohm Rheostat ... \$1.10
25 Ohm Rheostat ... \$1.10
40 Ohm Rheostat ... \$1.10
Patd. 870,042



No. 1003
200 Ohm Potentiometer \$1.50
400 Ohm Potentiometer \$2.00
Patd. 870,042



No. 1004
Multi-Terminal Resistor Plug
Instantaneous connection for as many as six pairs of standard resistor tips
Patd. Aug. 28, 1928

HOWARD

Ask the man at the counter to show you the Howard line of quality Radio Merchandise. Every piece is sold with the guarantee of satisfactory performance.

JOBBERS WRITE FOR DISCOUNTS

Send 2c. Stamp for wiring diagram and folder to Dept. J.



Radio Co. Inc.
4248 NORTH WESTERN AVENUE

GUARANTEED "B" BATTERIES

Large	45 Volt	\$3.00
"	22 1/2 "	1.80
Medium	45 "	2.75
"	22 1/2 "	1.60
Small	22 1/2 "	1.00

All Variable—POSTAGE FREE anywhere in U. S.

Satisfaction Absolutely Guaranteed
S. & H. BATTERY SUPPLY CO.
41 Nevins Street Brooklyn, N. Y.

DO NOT ASK FOR A GRID LEAK

Ask for a

DAVEN RESISTOR



It is Just as Easy and Means a Lot More.

DAVEN RADIO CO.

"Radio Resistor Specialist"
10-12 Campbell Street Newark, N. J.

Big Money and Fast Sales

EVERY OWNER Buys Gold Initials for His Auto—You charge \$1.50, make \$1.44. 10 Orders Daily Easy.

Samples and information Free!
WORLD MONOGRAM COMPANY
Dept. 92 NEWARK, N. J.

NEUTRODYNE

FADA, complete.....\$69.45
BUILT FOR YOU FREE

FADA SEALED KIT.....\$54.75
PERFECTION RADIO CORP.
119 W. 23rd Street 59 Cortlandt Street
118 Nassau Street 78 Cortlandt Street
NEW YORK CITY

SUPER RADIOS

With Super Performance

When you buy a radio receiver you want one that will be permanent—that you can easily operate—that will give a clear, life-like and vivid tone. From every standpoint the new Slagle receiver will surpass your expectations. You can hear all the best musicians and fun makers in the country for less because you buy direct. Write today for FREE catalogue and price list.

SLAGLE RADIO COMPANY
531 Masterson Ave. Fort Wayne, Ind.

ANNOUNCEMENT

NATHANIEL BALDWIN, INC., WISH TO STATE THAT THE RECENT ADVERTISEMENT OF THE RADIO SALES CORP. OF AMERICA ANNOUNCING THAT THEY HAVE BECOME OUR EASTERN SALES REPRESENTATIVES WAS ABSOLUTELY UNFOUNDED.

WE ARE NOT AT THIS TIME PLACING ON THE MARKET A SPEAKER AT \$17.50 AND ARE MAKING NO CHANGES IN OUR PRESENT LINE.

WE BEG TO ANNOUNCE THE OPENING OF OUR EASTERN SALES AND EXPORT OFFICE AT 227 FULTON STREET, NEW YORK CITY.

NATHANIEL BALDWIN, INC.

World's Greatest BATTERY BARGAIN

FREE Written 2-Year Guarantee Your Proof of Performance

Save 50%

Thousands of Radio World Readers will profit by this amazing offer. They will buy the famous 2-year guaranteed World Battery at the lowest price ever quoted. They will get a hydrometer and a "B" Battery FREE. And they get the best battery built.

Compare These Prices

Five Per Cent Discount for Cash with Order	
Special 2 Volt Storage Battery\$5.00	For UV-199 Tubes, Same features as 2 Volt.
For WD-11 and WD-12 Tubes. Will run 200 hours on one charge. Rechargeable. Special 4-v. Storage Battery\$8.00	6 Volt, 60 Amps. \$ 8.50 6 Volt, 80 Amps. 10.00 6 Volt, 100 Amps. 12.50 6 Volt, 120 Amps. 14.50 6 Volt, 140 Amps. 16.00

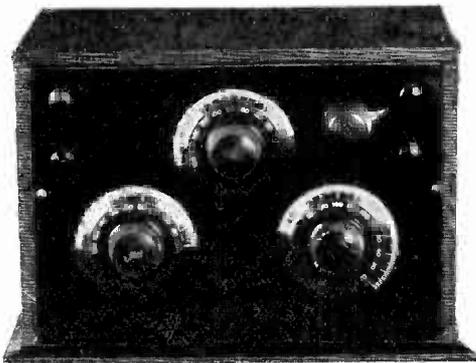
Send No Money. Just clip this ad and mail with your name and address. The battery you specify will be shipped to you the day your order is received. When the battery arrives, inspect it—read our 2-year guarantee before you pay one penny. Get the "B" Battery and hydrometer FREE. Order today.

WORLD BATTERY CO.

"B" Battery and Hydrometer
1210 S. Wabash Ave. Dept. 17 Chicago, Ill.

ESSEX RADIO SPECIAL

The Receiving Set with a Conscience



AS SET LOOKS WHEN COMPLETED

\$15 SET COMPLETE WITH CABINET WITHOUT TUBE & BATTERIES

\$20 SET COMPLETE WITH CABINET TUBE AND BATTERIES

2,000 MILES

Distance is no trick with the SX Radio Special Triple Circuit on one tube. Chicago, Atlanta, Ga., Cuba, Davenport, Fort Worth, Texas, and all other stations of note within 2,000 miles of your location. A complete book of instructions for assembling is furnished with each set so that each individual purchaser is sure of perfect results.

Your satisfaction means our success. You have friends! And we wish to sell your friends an Essex Radio Special. It is therefore our aim to make each set a complete success.

Complete Set Includes

Vario-Coupler, Special Winding, 23 Plate Essex Condenser, 17 Plate Essex Condenser, Leatherette Cabinet, Standard Essex Socket, Rheostat, 6 ohms, will work any tube, 4 Binding Posts, Hard Rubber, 7x10 Hard Rubber Panel, 3-3" Dials, 4 Pieces Bus Wire, 1 Length Spaghetti.

Upon receipt of the price the entire equipment will be mailed promptly, postpaid, or, if you prefer, merely fill out the coupon below and then pay the price to your postman upon delivery.

ESSEX RADIO SERVICE, INC.,
613 West 125th Street, New York City.

- Enclosed find \$15.00, for which please send me one Essex Radio complete, as listed in your advertisement.
- Enclosed please find \$20.00, for which send me one Essex Radio complete, as covered in your advertisement.
- Enclosed please find 50c., for which send me your Essex booklet as referred to in your advertisement, with the understanding that it is to be deducted in the event that I later purchase an Essex Radio.
- I will pay Postman \$15.00 when set is delivered.
- I will pay Postman \$20.00 when set is delivered.

NAME

ADDRESS

Essex Radio Service

613-615 WEST 125TH STREET

NEW YORK CITY

A \$200,000.00 COMPANY STANDS SQUARELY BACK of EVERY PHONE

WEIGHS ONLY 8 OZ



\$295

Plus a few cents postage

SEND NO MONEY

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

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

WORLDS LARGEST HEADSET MAKERS

THE TOWER MFG. CO.

898 BROOKLINE AVE. BOSTON MASS.

WORLDS GREATEST HEADSET VALUE

Five-Day Money-Back Guarantee If Not Fully Satisfied. We Guarantee the Scientific to be

1. One of the finest phones on the market regardless of price.
2. The most comfortable--weight only 8 oz.
3. Perfect tone mates.
4. Made of standard double pole construction (no single pole nonsense to save expense.)
5. Made of the best materials money can buy. Powerful magnets, genuine tinsel cords, aluminum cases.
6. Manufactured under ideal working conditions.

Communications Enjoy New Era, Says Bingham

ONE of the first lectures before the students of the Sheffield Scientific School in Yale's communication course, was on "Naval, National and Inter-

national communications," delivered by Commander D. C. Bingham, U.S.N., assistant chief of Naval Communications. The lecture is one that was of a course established by the electrical department, through the aid of Dr. Lee De Forest, for graduate and advance students.

The Navy recognized the value of radio in 1899, when Marconi came to New York with three radio sets to aid in reporting the yacht races between the Shamrock and the Columbia, Commander Bingham recalled. Naval officers observed the operation of the sets, and a short time later the Battleship Massachusetts, the Cruiser New York and the Torpedo Boat Porter were placed at the disposal of Mr. Marconi and an experimental shore station was established at Highland Lights.

Today the Navy's communication system represents an investment of \$15,000,000 and includes nine high-powered, long range stations, together with 71 medium and low-powered stations, and 45 compass stations, operated by 70 officers and 1,167 men.

Internationally the United States stands for a "Square Deal" in communications, he explained; one according opportunities to other nationals who come to our shores to engage in legitimate business and demanding the same abroad for our nationals. Many conferences have been held in the interests of radio communications since the first at Berlin in 1903, and in this hemisphere, we are on the eve of a Pan-American Conference of Electrical Communications, having in view also another International Conference in Paris in the near future, Commander Bingham declared.

"A new era with regard to our understanding of the dependence of communications has been brought about through recent advances in radio art," he concluded.

The Ultimate Radio Receiver
THE FLEX-O-DYNE CO.
1674 Broadway (At 52nd St.)
New York, N. Y.
Circle 4589

COMPLETE RADIO
RECEIVING OUTFIT
Tube, Phones, Batteries, Aerial,
Lead-In Wire, Insulators All In-
cluded. 1000 Miles Guaranteed.
\$17.50
SEND NO MONEY. PAY THE POSTMAN.
Money Back If You Want It.
NATIONAL RESERVE RADIO CO.
17-19 BRIDGE STREET NEW YORK CITY

RADIO RECORD
Keep a permanently bound record of all stations
you have received and how you received them.
Radio Record 5 1/2" x 14"—600 lines. All broad-
casting stations listed, and indexed with space for
new stations—\$1.00 Postpaid.
THE BEADLE PRINTING CO.
MITCHELL SOUTH DAKOTA
Applause Cards 60 for \$1.00 Postpaid.

For best reception
you need
The Goodman
The nicest short wave
tuner on the market. Great
for present broadcasts, local and DX. Used in all
parts of the world. Certificates of merit from test-
ing laboratories. Pamphlet on request.
L. W. GOODMAN, Mfr., Drexel Hill, Pa.

Have You a
Neutrodyne?
Does it howl? Is it hard to control? Do you
wish to eliminate neutralizing condensers and
double the efficiency of your receiver?
TECHNIFORMERS are so extremely efficient
that the sensitiveness of a receiver incorporating
them is unsurpassed. There is no inductive
coupling between them, and as a result, neutraliz-
ing condensers and potentiometers are not required
to stop oscillation.
Try them out. We assure you of satisfaction.
Price. Set of 3. For substitution in your
neutrodyne. \$8.00.
TECHNIFORMER KIT. 3 Techniformers with
variable condensers. \$18.00.
Dealers: Write for our prices.
Technical Radio Laboratories
Jamaica Plain Boston, Mass.

"KILLS REFLEX TROUBLES"
CRYSTAL IS REMOVABLE & REPLACEABLE
ALL METAL COVER KEEP SUN & DUST OUT
CUP TURNS IS ADJUSTABLE
SOLID GOLD CAT WHISKER
CAT WHISKER TURNS & IS REMOVABLE
EASILY MOUNTED
SPECIALLY ADAPTED FOR REFLEX WORK
"LINCOLN" DETECTOR
Creating tremendous sensation. Enclosed, fixed,
adjustable. New. Brings in distant stations
loud and clear. You need it. Ask your dealer
or write—today. Price only \$2.00. Absolutely
guaranteed for one year.
Jobbers, Dealers: Wire or write. Mention
this ad.
LINCOLN MFG. COMPANY
Dept. S-1 Los Angeles, Calif.

WHAT IS AN INVENTION?
How to obtain a patent and other valuable infor-
mation is supplied in our FREE Booklet.
Write for a copy today.
MANUFACTURERS PATENT CO., Inc.
70 WALL STREET, NEW YORK

For Maximum Amplification Without
Distortion and Tube Noises
use the well known
Como Duplex Transformers
Push-Pull
Send for literature
COMO APPARATUS COMPANY
446 Tremont St. Boston, Mass.

RADIO WORLD
The National Illustrated
Weekly
On April 15 Goes to a
FLAT RATE
\$5 Inch; \$150 Page
On yearly contracts made be-
fore April 15th the rate is \$4
an inch, or \$120 a page.
Radio World, 1493 Bway, New York

USE
EVEREADY
Radio Batteries
—they last longer

CROSLEY
RADIO CATALOG FREE
Describes fully the complete line of radio frequency sets, regener-
ative sets (licensed under Armstrong U. S. Patent
No. 1,113,149) and parts.
Write for Catalog Today
THE CROSLEY RADIO CORPORATION
POWEL CROSLEY Jr., President
2402 Alfred Street Cincinnati, Ohio

Genuine Ken-Rad Radio Tubes
\$3.49
Type 200 or 201A
Every tube absolutely guaranteed.
Write for list of other radio bargains.
Cash or C.O.D.
MARTIN HARDWARE CO.
105 N. Main Street Hamilton, Mo.

NEUTRODYNE PARTS
Full set of Neutroformers, Variable
Condensers with dials, and Neutrodens **\$13.25**
Above parts are Genuine Workrite Neutroformers,
made under Hazeltine patents.
Complete parts for three tube Neutrodyne tuner,
(tubes, batteries, or phones not included), drilled
panel, tube sockets, rheostats, fixed condensers, jack,
binding posts, wire, spaghetti, and blue prints.
COMPLETE FOR \$19.95
Postage additional on all shipments.
Ask for our price list.
Send no money, Order by postcard,
Pay the Postman.
RADIO SURPLUS STORES
HELENA, MONTANA

91 1/2%
of all tubes are
needlessly
destroyed.
RADECO
SAFETY
FUSES
GIVE
COMPLETE PROTECTION
Price
50
cents each
Dealers write for proposition.
Radio Equipment Company
20 Stuart St. Boston, Mass.

RADIO WORLD FOR 1923
FOR YOUR LIBRARY
RADIO WORLD from January 6, 1923,
to December 29 complete, with the excep-
tion of January 13, January 20, January
27, February 24 and March 12, will be sent
postpaid for \$5.00.
Many of these issues are nearly out of
print, and we suggest, therefore, that
orders be sent in early. Any single num-
ber, 15c; or any seven numbers for \$1.00.
Circulation Department,
RADIO WORLD,
1493 Broadway, New York City.

First Reward Offered for Radio Heckler Is \$500

KANSAS CITY.

RADIO heckling is the latest development in political campaigning.

So asserted the Democratic City Central Committee here in announcing a reward of \$500 for information leading to the apprehension of a "radio vandal" alleged to have interfered with broadcasting speeches in the heated city election campaign from Station WOQ.

Officials of the station stated that some person employed an oscillator attached to an antenna in this vicinity, with the result that the program was "hashed up" so as to be rendered unintelligible.

United States Senator Reed was one of the speakers. Because of his great gift

of oratory, and the advertising the event received, the radio fans were "all ears." But the spiteful interloper made things almost unbearable

RADIO HANDBOOK



Only \$1

514 PAGES

Just off the press! The greatest book on Radio ever written. Price only \$1. Filled with sound, practical, tested information for every radio fan, from beginner to hard-boiled owl. Written, compiled, and edited by men of national reputation. Every page tells you something useful—and there are 514 pages. Mail \$1 to-day and get this I. C. S. Radio Handbook before you spend another cent on parts. *Money back if not satisfied*

TEAR OUT HERE

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 8791-B, Scranton, Penna.

I enclose One Dollar. Please send me postpaid—the 514-page I. C. S. Radio Handbook. It is understood that if I am not entirely satisfied I may return this book within five days and you will refund my money.

Name

Address



A SENSATION HIRSCH

Radio World
The Radio News
The Sun-Globe
The Telegram-Mail
The Tribune
The World.

In fact all radio writers are unanimous in their praise of the

HIRSCH \$2.50 VACUUM CRYSTAL TUBE

WHAT IT IS
A fixed crystal mounted inside an ordinary small bulb. The vacuum tube then is simply an unusual method of mounting a fixed crystal.

WHAT IT DOES
Makes it impossible to tamper with adjustment. The rod electrodes provide a spring mounting to protect it from shocks. The vacuum prevents any contamination of the crystal surface.
For Reflex Sets—Nothing Better

Manufacturer's Agents
ELLESS RADIO EXCHANGE, INC.
46 Vesey St., N.Y. Certlandt 0403-6788

S. HAMMER RADIO CO.

303-A Atkins Ave. Brooklyn, N. Y.

New Cockaday Distortionless Amplifier

Complete parts exactly as specified by Mr. Cockaday

List Price	Our Price
\$4.00—4 Na-Aid Sockets	\$2.60
2.00—2 Marco Jacks	1.50
2.50—2 Amso 20 Ohm Rheostats	2.00
2.00—1 Bradleyohm, No. 25	1.80
1.85—1 Bradleyohm	1.70
12.50—1 pr. Como Dup., P. P.	10.00
7.00—1 Amertran, 5 to 1	5.60
3.90—6 N. Y. Coil, .005 Condenser	3.30
2.00—10 Eby Binding Posts	1.80
2.25—1 Panel, 7x12	1.95

List Price, \$40.00

Our Price \$32.00

For above complete parts
The above parts can be bought separately

COCKADAY 4-CIRCUIT TUNER

Genuine complete parts for the IMPROVED Cockaday 4-Circuit Tuner, exactly as specified by Mr. Cockaday. Special.....

\$55.00

Orders Over \$5.00 Shipped Prepaid
Money Orders or C. O. D.—Write for Price List
Not Insured Unless Insurance Charges Included

Ackerman

LOUD SPEAKER, \$9.50

Complete—Ready for Immediate Use
Delivered Anywhere in the U. S. A. A Marvelous Speaker for the price of a headset.

Dealers and Jobbers Write for Discounts
ACKERMAN BROS. CO., Inc.
301 W. 4th St. (Dept. "RW") New York, N. Y.

FAHNESTOCK CLIPS

"Popular Wherever Radio Is Used"

14 Sizes in Beautiful Display Case.

Dealers write for big money-making proposition.

FAHNESTOCK ELECTRIC CO.

Long Island City, L. I.

Lattice Coil Specialties



Variometers
Variocouplers
R.F. Transformers
Micro-Mike
Condensers
Plain Coils
Tapped Coils

ESTRU LATTICE COIL PRODUCTS have been designed so as to produce as nearly as possible **IDEAL INDUCTANCE** in various forms. It was not the intention in designing, to produce Miniature Apparatus, the small size being the result of careful electrical design with no **UNNECESSARY** Mechanical parts which would detract from the electrical efficiency.

YOU will appreciate these facts as set forth in our **COMPLETE DESCRIPTIVE LITERATURE**, which will be sent on request and in reading our **GUARANTEE** which goes with all **ESTRU PRODUCTS**.



2905 WEST MADISON STREET

The Popular Neurodyne!

This receiver is rapidly becoming the "Old Reliable." A five-tube tuned radio-frequency set that any inexperienced fan can operate.

SEE **RADIO WORLD** for March 8, 15, and 22 and get all the details which will enable you to build this reliable and powerful five-tube neurodyne outfit. The three copies for 45c, or sent free if you send \$6.00 for yearly subscription. **NOW!**

RADIO WORLD, 1493 Broadway, N. Y. C.

RADIO WORLD WANTS REPRESENTATIVES in every radio factory on the North American Continent. Represent **RADIO WORLD**, the Live **RADIO WEEKLY**, and make money at the same time.

For particulars address, Circulation Manager, **RADIO WORLD, 1493 Broadway, New York City.**

WHAT STATIONS DID YOU GET LAST NIGHT? ANSWER ON A MINUTE'S NOTICE WITH A LOOSE LEAF-POCKET LOG-DELUXE



The Radio Logs That Beats Them All

For it is complete and long lasting with features that can't be touched. And it can be bought at the low price of \$1.00. Order one today.

DON'T OVERLOOK ITS MANY FEATURES
POCKET SIZE (GENUINE) LEATHER COVER

CONTAINS 585 STATIONS

Use the Coupon →

Do the Radio Fan a favor and sell him what he wants and make a profit for yourself. Write for details.

THE DIRECT SALES CO.

431 SO. DEARBORN ST. CHICAGO

DIRECT SALES CO.
431 So. Dearborn St., Chicago, Ill.

Please find enclosed \$..... for your Radio Log. Kindly mail at once, prepaid. If it is not as represented I can return and you will refund my money.

NAME

ADDRESS

CITYSTATE.....

SLEEPER MONOTROL

Reg. U. S. Pat. Off.

Licensed under the Grimes Inverse Duplex Inventions. No aerial—no ground. Just one dial to turn.

Perfect selectivity—no interference.

The Monotrol will bring in more stations with better reception than any other set you have ever heard.

Booklet "W" on request.

SLEEPER RADIO CORPORATION
25 Park Place New York

Fans who are considerate of the comfort and pleasure of their neighbors and other radio fans in the vicinity should get RADIO WORLD for Dec. 8, Feb. 8, and Feb. 23, and see how they can conquer the squeals in their receivers that are causing so much trouble. 15c. per copy, the three issues for 45c., or start your year's subscription with any one of them. RADIO WORLD, 1483 Broadway, New York City.

Germans Call Import of Our Sets a Peril

BERLIN—"German labor is in peril," cries the Junker organ, the Deutsche Tagezeitung, and proceeds to explain that certain parties have requested the Government to permit the importation of radio apparatus from America and that this request was favorably considered by the German Government.

"This importation may ruin the young German radio industry completely," says the Deutsche Tageszeitung, "because in America radio subscribers number millions; the radio industry has developed to such a point that the minute the German market is opened they can flood it with a tremendous amount of apparatus.

"These may not compare favorably with the German article so far as quality and durability are concerned, but reck-

less merchants will persuade numberless Germans to buy them before their inferiority is found out, and the very fact that they come from America will recommend them to some people."

The Junker organ urges protests.—N. Y. Times.

Send for RADIO BARGAIN CATALOG

10c—Amount refunded on your first order. Book crammed full of money-saving offers of sets, parts, accessories and diagrams. You need it.

WRITE FOR IT TODAY!

HERE ARE A FEW BARGAINS IN RADIO PARTS

Largest stock in New York. Everything brand new and first-class. Satisfaction guaranteed. Orders shipped quickly and carefully. Prices include delivery.

SEND NO MONEY FOR GOODS

Just pay postman or expressman on delivery. Reference: Corn Exchange Bank, Terminal Branch (capital \$10,000,000).

- TRANSFORMERS—All-American, 4-1, 5-1, 10-1; 500,000 in use. List, \$4.75.... **\$3.45**
- TUBES—O-T 2, Silvertone; 4-volt; dry cell; made by De Forest; equal to any. Save 34%. List \$6.00 **3.95**
- TUBES—RCA WD-11 or WD-12, 1½-volt; dry cell. List, \$5.00. Save 16%.. **4.20**
- HEAD PHONES—Little Tattler; none ever returned to us unsatisfactory. List, \$4.00 **2.95**
- HEAD PHONES—Baldwin "C"; double; none better. Save 30%. List, \$12.00.... **8.45**
- COUPLERS—Genuine Capitol, All-Wave, 150-3,000 meters. List, \$7.00..... **5.45**
- VARIOMETERS—Liberty, moulded; 150-600 meters; high grade. List, \$7.00 **2.95**
- LOUD SPEAKERS—Perfectone, adjustable; excellent. List, \$15.00..... **11.45**
- LOUD SPEAKER UNITS—Blue Streak, single; use with any horn. Very satisfactory. List, \$3.45 **2.45**
- NEUTRODYNE KITS—Work-Rite, made under Hazelton patents. High-grade material, fine workmanship. Save 18%. List, \$17.50 **14.25**

FREE With your first order we will send you free a 28 x 38 in. radio station map of the U. S. and a set of 31 Decalcomania name transfers for your panel. Send order today.

LIBERTY M. O. HOUSE
Dept. 681P, 106 Liberty St. - NEW YORK

SAVE 25% WHOLESALE RADIO SERVICE CO.

Buy Direct at Manufacturers' Prices 9 CHURCH STREET, NEW YORK CITY

COMPLETE PARTS FOR FAMOUS

8 TUBE SUPER HETERODYNE

"THE ROLLS-ROYCE OF RADIO RECEPTION"

- 3 Radio Frequency Transformers, 5,000 to 25,000 meters
- 1 ATX Audio Transformer for First Stage
- 1 ATZ Audio Transformer for Second Stage
- 2 mfd By Pass Condensers, Type C-1000
- 1 Tuned Filter Coupler, Type H-34
- 1 Oscillo-Coupler, Type SW-21
- 1 8"x36"x¼ Bakelite Panel, drilled and engraved
- 1 Baseboard
- 1 Terminal Panel, ½"x8½"x1½"
- 1 .001 mfd Cardwell 43 Plate Condenser
- 1 .0005 mfd Cardwell 23 Plate Condenser
- 2 Universal Gearing Dials for Micrometer Control of Condensers
- 1 Frost Double Circuit Jack
- 1 Frost Single Circuit Jack
- 1 Cutler Hammer Battery Switch

- 1 Super Heterodyne Manual—This is a 65 page book containing all information of construction and operations of the Super Heterodyne Receiver.
- 3 General Radio—10 ohm Rheostats for Single Tube
- 2 General Radio—6 ohm Rheostats for Second and Third Tubes
- 1 General Radio Potentiometer—400 ohm Type 214-A
- 3 Dubilier Mica Grid Condensers
- 2 .0025 mfd Fixed Condensers
- 1 .002 mfd Dubilier Fixed Condenser
- 1 .006 mfd Dubilier Fixed Condenser

\$92.50

COCKADAY,

4 CIRCUIT TUNER WITH PUSH-PULL AMPLIFIER

This is the set that Cockaday described as being able to receive over distances of 3,000 miles. You can't build anything better. (Parts are those specified by Cockaday.)

- 1 Cockaday Improved Bakelite Coil
- 2 Amsco 26 Plate Ver. Condensers
- 2 Amplex Gridensers
- 1 Bradyleak
- 5 Melco Sockets
- 1 Amsco 6 ohm Rho.
- 3 Amsco 20 ohm Rhoes.
- 1 Patent Single Jack
- 2 Patent Dble. Jacks
- 2 Amertran Trans.
- 1 Como Push-Pull Input
- 1 Como Push-Pull Output
- 2 Switch Levers
- 1 Switch Points
- 2 Switch Stops
- 1 Dubilier Cond.
- 1 .0005

- 1 Dubilier Cond. .0025
- 1 Durham Var. Leak
- 3 Lavite Resistances, 48,000
- 1 Amsco 400 ohm Potentiometer
- 1 7x24 Panel
- 1 3x2½ Sub-Panel
- 1 12x12 Panel
- 1 7x24 Baseboard

\$52.50

- FREED-EISEMANN 5 TUBE NEUTRODYNE, NR-5, LIST PRICE, \$150.00—OUR PRICE, \$125.00.
- FREED-EISEMANN 5 TUBE KNOCKDOWN, Model KD-50, LIST PRICE, \$80.00—OUR PRICE, \$62.50.
- FADA 5 TUBE KNOCKDOWN, LIST PRICE, \$65.00—OUR PRICE, \$49.50.
- THE WRS—FAMOUS 5 TUBE NEUTRODYNE BUILT OF LICENSED HAZELTINE PARTS IN A BEAUTIFUL MAHOGANY CABINET READY TO OPERATE—WITHOUT TUBES OR BATTERIES—\$59.50.
- FADA—5 TUBE NEUTRODYNE BUILT OUT OF GENUINE FADA PARTS IN A BEAUTIFUL MAHOGANY CABINET READY TO OPERATE—WITHOUT TUBES OR BATTERIES—\$72.50.
- GENUINE RCA TUBES, UV-200, UV-201A, UV-199, WD-11, WD-12..... **\$4.25**

Write us as to what you need and let us surprise you with our low prices. Send Money Order, or pay the Postman. Money back if not satisfied. Postage paid on all orders over \$5.00.

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

FOR SALE—Radiola Sr. and Amplifier. Brand new. Complete with tubes and headset. \$65.00. Earl Wright, Cole Camp, Mo.

FOR SALE—My single tube set equipped with Peerless Long Distance Coil that easily logs 1,000 miles. Complete with RCA Tube, Batteries and directions ready to operate. Sent on receipt of first money order for \$25.00. R. A. Harris, Lambertville, N. J.

MAGNAVOX R3. Latest nationally advertised reproducers; concert modulator. List, \$35.00. Introductory, \$25.00. The factory sealed carton is your guarantee. Radio Central, Dept. W, Abilene, Kansas.

AUTO OWNERS!—Get your tires Free! Be our Factory Agent! Big spare time money-maker! Sample tires furnished. No capital or experience needed. Write to-day. Armour Tire & Rubber Co., Desk 782, Dayton, Ohio.

15%-20% (per cent) DISCOUNT on all Standard Receivers. Freed-Eisemann Neutrodyne, \$125.00; New Radiolas, Crosley XJ, \$47.00. Write, Thomas Radio Co., 111 Dix Street, Muncie, Ind.

PATENTS PROCURED. Send sketch or model today for examination, prompt report and advice. No charge for preliminary advice. Write for free Booklet and blank form on which to disclose your idea. Highest references. Promptness assured. Clarence A. O'Brien, Registered Patent Lawyer, 201-B, Security Bank Building. Directly across the street from Patent Office, Washington, D. C.

FORCED TO SACRIFICE—My four-tube super-dyne, beautiful black panel case, natural brass trim, finest standard parts, complete speaker, storage, tubes, everything ready to work, \$85.00, or set only, \$45.00. All new, guaranteed, less than wholesale cost of parts. Unsurpassed. Get them even in daylight. First money order takes it. Will properly pack and ship. H. G. Pauer, 152 Dewitt, Buffalo, N. Y.

PATENTS—SEND DRAWING OR MODEL FOR EXAMINATION AND OPINION. Booklet free. Watson E. Coleman, Patent Lawyer, 644 G St., Washington, D. C.

PATENTS—Write for free Guide Books and Record of Invention Blank before disclosing inventions. Send model or sketch of your invention for our prompt Examination and Instructions. No charge for the above information. Radio, Electrical, Chemical, Mechanical and Trademark experts. Victor J. Evans & Co., 924 Ninth, Washington, D. C.

MODEL "C" Super-heterodyne and model "J" Two stage tuned radio frequency amplifier unit for sale cheap to quick buyer. These are complete units built up by expert radio engineers. A real ten tube DX receiver. E. E. GIBBONEY, Everett, Pa.

RENEW DRY CELLS—Process 10c. Universal 650 Centre, Waukegan, Illinois.

(Concluded from page 17)

Station WKAQ, San Juan, P. R.
360 Meters (830 Kcys.) E. S. T.—Broadcasts two concerts weekly as follows: Wednesdays, 7 to 9 P. M.; Fridays, 7 to 9 P. M. Announcements are made in Spanish and English.

Station WOS, Jefferson City, Mo.
441 meters (680 Kcys.). C. S. T. Apr. 18.—8:00 P. M.—Program of addresses, vocal solos and quartet numbers and concert by the Jefferson City Rotary Club Boys' Band. The entire program will be under the auspices of the Jefferson City Rotary Club.

Apr. 19.—11:00 P. M.—Special program by the Glee Club of Westminster College, of Fulton, Mo.
Apr. 20.—7:30 P. M.—Entire religious service of the First Christian Church of Jefferson City, Rev. Robert M. Talbert, Pastor; Prof. Siebert Price, organist; Mrs. Fred Reagle, violinist, and robed choir of twenty-four voices.

Station KGO, Oakland, Calif.
312 Meters (960 Kcys.) P. T. Apr. 16.—1:30 P. M.—New York stock exchange quotations and weather report. 3:00 P. M.—Short musical program. 6:45 P. M.—Final stock exchange quotations and weather report, news items.

Apr. 17.—1:30 P. M.—New York stock exchange quotations and weather report. 6:45 P. M.—Final stock exchange quotations, weather report and news items. 8:00 P. M.—Concert by Bohemian Trio; East Bay Srenaders.

Apr. 18.—1:30 P. M.—New York stock exchange quotations and weather report. 3:00 P. M.—Short musical program. 6:45 P. M.—Closing stock exchange quotations, weather report and news items.

Apr. 19.—12:30 P. M.—New York stock exchange and U. S. weather reports. 8:00 P. M.—Three-act drama, "The Piper," by KGO Players; music by Arion Trio. 10:00 P. M.—1:00 A. M.—Dance music by orchestra in St. Francis Hotel Ballroom, San Francisco, Calif.

Station WJY, New York

405 Meters (740 Kcys.). E. S. T. Apr. 17.—7:30 P. M.—"Food Supply and Distribution to Greater New York," by Wm. T. Donnelly. 7:45 P. M.—Josephine Evans, soprano. 8:20 P. M.—Sterling Male Quartet. 8:45 P. M.—American Museum of Natural History, "South American Jungles at Night." 9:00 P. M.—The White Way Trio. 9:30 P. M.—Opera Recital on "Pagliacci." 10:00 P. M.—Montague Newman, violinist; Mrs. J. W. Anderson, soprano. 10:40 P. M.—J. Vincent Moore Entertainers.

Apr. 18.—7:30 P. M.—Rebecca Rosen, pianist. 7:50 P. M.—Frank Shivit, "Income Taxes." 8:00 P. M.—"Olivet to Calvary," direct Cantata by choir of the Church of the Heavenly Rest.

Station WHAS, Louisville, Ky.

400 Meters (750 Kcys.). C. S. T. Apr. 17.—4:00 P. M.—Selections by the Walnut Theatre Orchestra. 4:00 P. M.—Local livestock, produce and grain market reports. 5:00 P. M.—Official Central Standard time announced. 7:30 P. M.—One-hour concert.

Apr. 18.—4:00 P. M.—Selections by the Walnut Theatre Orchestra. 4:50 P. M.—Local livestock, produce and grain market reports. 5:00 P. M.—Official Central Standard time announced. 7:30 P. M.—Concert under the auspices of George T. Piggott.

Apr. 19.—4:00 P. M.—Selections by the Walnut Theatre Orchestra. Police bulletins. Weather forecast for Kentucky, Indiana and Tennessee. Late important news bulletins. 4:50 P. M.—Local livestock, produce and grain market reports. 5:00 P. M.—Official Central Standard time announced. 7:30 P. M.—Concert.

NOVEL RADIO SET



SIZE OF A SAFETY RAZOR BOX
CLEAR RECEPTION

For Local Stations.

NO BATTERIES NEEDED

Very Compact—Neat Leatherette covered Wood case. Ready to Connect to your phones and aerial at once.

"Pal" Set With Phones—\$4.50

HAVE YOU A TUBE SET?

Then use a PAL for local reception and SAVE your tubes and batteries for distant stations. IT PAYS.

You'll Be Surprised and Well Satisfied or Money Refunded within 10 Days upon receipt of price or C. O. D.

Pal Radio Corp., 106 New Maine Street, Yonkers, N. Y.

Distributors and Agents wanted.

RADIO

SEND FOR OUR COMPLETE MONEY SAVING CATALOG

TIMES SQ. AUTO SUPPLY CO. INC.

MAIL ORDER DEPT.

1745 BROADWAY AT 54th STREET
NEW YORK, N. Y.

Watch Your Batteries

Get a **PERFECTION HYDROMETER** today and test your storage batteries regularly if you want perfect reception. Beware of imitations. Insist on the genuine "Perfection"



Perfection Hydrometers are nationally known and used. The only Hydrometer with the 3-point test accurate float. Approved by the Radio News Laboratories.

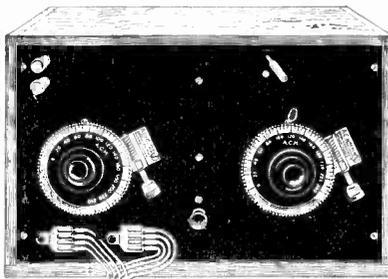
\$1.00

At All Good Radio Stores.

Manufactured by Bemco Mfg. Co., New York City
RADIO PANEL & PARTS CORP.
61 Warren Street New York
Eastern Distributors

Perfection HYDROMETER

A C H LONG DISTANCE ONE-TUBE SET



\$17.50 Mail Orders Only

Price includes Case and Parts, all mounted, ready to wire. No Solder. For Dry Cell Tube.

Including

2 A. C. H. Sharp Tuners.....\$5.00

2 A. C. H. 4-Phone Connectors. .25

NOTE—\$2.00 must be sent with C. O. D. Orders.

YES—Use the Wonderful A C H Sharp Tuners.

A. C. Hayden Radio & Research Co.
Brockton, Mass., U. S. A.

SEE SUNBEAM FOR SERVICE



SUNBEAM

Our Coast-to-Coast Circuit, the Famous Super SEVEN-TUBE SET, prices and information on request. SUPERDYNE and SUPERHETRODYNE SETS built to order—get our prices.

13 Years in the Same Spot! Direct From Wholesaler!

Headquarters for Super 5-Tube Neutrodyne. Built to order with licensed parts and best workmanship. \$50.00 up
Knockdown Neutrodyne Sets with Drilled Bakelite Panel and Cabinet\$39.50

Also a full line of Neutrodyne Parts. All parts (best quality) for the famous Journal One-Knob Set, with drilled Bakelite Panel (guaranteed 1500-mile range)\$5.95

Satisfaction and quality absolutely guaranteed

"ANYTHING IN RADIO"

EVERYTHING ELECTRICAL
SUNBEAM ELECTRIC CO., 71 Third Avenue, New York City

"Write to Third Avenue and Save a Third"

The Twitchell Auxiliary Tuner

Patents Pending. Name Registered.

MORE THAN A WAVE TRAP

A TWITCHELL AUXILIARY TUNER connected to any make of tube receiving set will positively cut out any local broadcasting or code stations so you may tune in all long distance stations any time regardless of local conditions.

Unlike any wave trap, THE TWITCHELL AUXILIARY TUNER does not ever decrease but in many cases increases the volume from distant stations.

These TUNERS are in daily use within 400 feet of large broadcasting stations and enable their owners to easily and completely cut out the local station and bring in distant stations at any time on a loud speaker.

This instrument will also enable you to bring in programs sent out on longer waves than you can tune in without it, thus bringing all the broadcasting stations within the wave length range of the many sets of limited range now in use.

Copyrighted diagram of this tuner, 50c, or with all parts, \$9.00. Complete instrument in walnut cabinet, ready to use, \$15.00.

A New and Wonderfully Efficient Coil for the Reinartz circuit for those who want the best. Price \$4.00, or with blueprint for either one or three tubes, \$4.50.

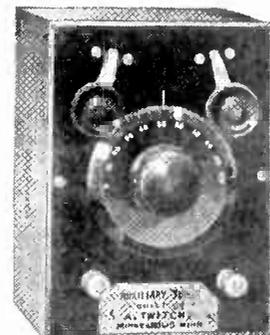
This circuit brings in both coasts loud and clear and is the most successful Reinartz modification yet produced.

All goods prepaid. These instruments are easy to build, easy to operate. Everything clearly shown

1930 WESTERN AVENUE

S. A. TWITCHELL

MINNEAPOLIS, MINN.



BRISTOL AUDIOPHONE

MORE THAN A LOUD SPEAKER

Bristol Audiophone, Sr., 15-in. Horn..\$30.00
 Bristol Audiophone, Jr., 11-in. Horn..\$22.50
 Bristol Single Stage Power Amplifier.\$25.00

Write for Bulletin 3006-W
The Bristol Company
 Waterbury, Conn.

\$25 for \$10

FAMOUS BEL-CANTO
 LOUD SPEAKER

PRICE

DELIVERED FREE
 TO YOUR DOOR

\$10

Money Back Any Time Within Ten Days
 If Dissatisfied

BEL-CANTO MFG. CO.

BENSEL-BONIS CO., Inc.

417-421 East 34th Street New York City
 Tel. Vanderbilt 8959

**Whatever
 Your
 Question**



Be it the pronunciation of **vitamin or soviet, or marquisette**, the spelling of a puzzling word—the meaning of **overhead, novocaine, etc.**, this **Supreme Authority—**

**WEBSTER'S
 NEW INTERNATIONAL
 DICTIONARY**

contains an accurate, final answer. 407,000 Words, 2,700 Pages. 6,000 Illustrations. Regular and India-Paper Editions.

G. & C. Merriam Co., Springfield, Mass.

Write for specimen pages, prices, etc., and FREE Pocket Maps if you name Radio World.

RADIO WORLD, the only radio paper that keeps right up to the minute on all radio news—it's NEWS when you see it in RADIO WORLD.

Hammond Sails to Untie Italy's Broadcast Knot

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

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

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

It all depends on how the scheme works out. Should Mr. Hammond be able to perfect a system that is really practical, one that will prevent any receiving station from picking up the broadcast programs, the broadcasting stations may have a pretty hard time of it financially. We know that in the United States such a system is impractical, but how the Italian radio fans will respond to the idea is entirely a matter of chance and experiment.

**THERE IS A BRAND-NEW
 CRAM'S RADIO MAP**

(New Edition)

Just issued with all the very latest broadcasting stations and information.

**ALL THE STATIONS OF THE
 UNITED STATES AND CANADA**

Scale 100 miles to the Inch
 in two colors—Size 34x28"

PRINTED ON HIGH-GRADE MAP PAPER
 UP-TO-THE-MINUTE INFORMATION
 INDICATING ALL AMATEUR AND STAND-
 ARD BROADCASTING STATIONS
 WITH COMPLETE INDEX OF STATIONS
 35c (POSTPAID)

THE COLUMBIA PRINT

1493 BROADWAY NEW YORK CITY



**WE REPAIR
 RADIO TUBES**

WD-11 ... \$3.00	DV-2 ... \$3.00
WD-12 ... 3.00	DV-6A ... 5.00
UV-200 ... 2.75	UV-199 ... 3.00
UV-201 ... 3.00	C-299 ... 3.00
C-300 ... 2.75	UV-201A ... 3.00
C-301 ... 5.00	C-301A ... 3.00
DV-6 ... 3.00	Marconi ... 3.00
DV-1 ... 3.00	Moorhead ... 3.00
6 v. Plain Detector ... 2.75	
6 v. Plain Amplifier ... 3.00	

Mail orders solicited and promptly attended to.
 Dealers and agents write for special discounts.

H. & H. RADIO CO.

P. O. Box 22-B

Clinton-Hill Station

Newark, N. J.

FOR RELIABLE UP-TO-DATE

RADIO MAILING LISTS

Use Our Card Catalog Directory
 In Use Now With Over 200
 Radio Manufacturers and Jobbers
 Your ENVELOPES ADDRESSED

At \$2.50 per 1,000

Write for Particulars
Sydell's Radio Trade Directory
 410 W. 31st St., New York. Chickering 9848

That Superdyne Receiver!

The receiver every fan has been looking for. The Four-Tube Receiver that is more powerful than a six-tube Naval Receiver. The Receiver which does not require a laboratory expert to build or operate. The Receiver that accomplishes anything any other will—and then more.

SEE RADIO WORLD

for Dec. 15, 22 and 29, and get all the details which will enable you to build this marvelous four-tube wonder. The 3 copies for 45c, or sent free if you send \$4.00 for yearly subscription. NOW!

BUILD a "S-U-P-E-R-D-Y-N-E"
 RADIO WORLD, 1493 Broadway, N. Y. C.

**THIS SPECIAL SUBSCRIPTION OFFER
 FOR NEW SUBSCRIBERS ONLY**

**RADIO WORLD AND OTHER POPULAR RADIO PUBLICATIONS FOR THE
 PRICE OF SUBSCRIPTION FOR RADIO WORLD ALONE**

Radio World has made arrangements

- by which it is possible
- to offer a year's subscription for
- any one of the following publications
- with one year's subscription for
- RADIO WORLD;
- RADIO NEWS or
- POPULAR RADIO or
- RADIO BROADCAST or
- WIRELESS AGE or
- RADIO DEALER or
- RADIO (San Francisco).

This is the way to get two publications

- for the price of one;
- Send \$4.00 today for RADIO WORLD
- for one year (regular price
- for 52 numbers)
- and select any one of the other
- six publications for twelve months—
- Add \$1.00 a year extra for
- Canadian or Foreign postage.
- This offer good only up to and
- including April 1, 1924.
- Present RADIO WORLD subscribers
- can take advantage of this offer by
- extending subscriptions one year NOW.
- Or order thru your newsdealer.

RADIO WORLD'S SPECIAL TWO-FOR-PRICE-OF-ONE SUBSCRIPTION BLANK

RADIO WORLD, 1493 Broadway, New York City.

Enclosed find \$6.00, for which send me RADIO WORLD for twelve months (52 numbers, beginning and also without additional cost, Radio News, or Popular Radio, or Radio Broadcast, or Wireless Age, or Radio Dealer, or Radio for twelve months, beginning Put a circle around the other publication you want.

This Offer Good
 Until
 April 25, 1924

Name

Street Address

City and State

Greece to Lift Ban on Sets

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

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

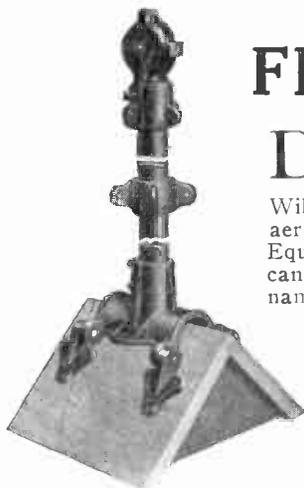
"Tickets to the Air" Offered for Sale

A Kansas City broadcasting station has broadcast an invitation to those with head-sets to buy tickets for the "invisible theater" with voluntary contributions of from \$1 to \$10. "We are more than willing to spend money to operate the station," the manager said, "but it is only fair for those sharing the pleasure to pay a portion of the expenses."

A SURE—SAFE—SIGHTLY AERIAL

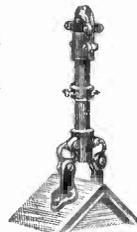
With

FREIDAG AERIAL MAST PIPE FIXTURES



No. 60
\$3.50 per Set

DESIGNED to take the place of unsightly, poorly erected wood poles and towers used in the erecting of aerials. Will allow the erection of any height or length aerial. Uses 1/2 and 1 inch standard pipe. Equipped with Guy Wires. If your dealer cannot supply them, write us, giving his name.



No. 70
Price \$1.00 Per Set

NOTICE

DEALERS: The fan has learned the importance of a perfect aerial.
JOBBER: Sell them Perfect Aerial Fittings.
Write today for discounts and descriptive booklet.

DIRECT SALES COMPANY

431 SO. DEARBORN STREET CHICAGO, ILL.

"You have solved the Reflex problem!"

- SAID EDITOR OF
N.Y. EVE. WORLD'S RADIO MAGAZINE



"The new Freshman 'double adjustable' crystal detector 'stayed put,' even when the set was deliberately shaken, and stood up to 130 volts on the plate circuit without noise or distortion," wrote editor in article March 29th, 1924. And in a review he continued:

"This detector meets every requirement of the reflex circuit.

"It is enclosed and provided with two adjustments, one varying the position of the crystal, and the other regulating the brush contact adjustment.

"The crystal is a pure natural ore and is embedded in an insulated housing, thus eliminating short circuits and consequent loud noises resulting from the cat whisker touching the metal housing.

"The Freshman detector can be panel mounted with only a small knob showing. All around, it is the best crystal detector unit found for reflex work."

World's Most Efficient Crystal

Every experimenter can feel confident that when the radio authority of one of the greatest newspapers in America says the Freshman is the best detector—it must be true!

Note These Exclusive Features:

- Loop-end contact!
- Non-metallic housing!
- Double-adjustable!
- Mounts neatly on panel!
- Stays set when adjusted!
- Withstands high voltages!

FRESHMAN \$1.50
Double adjustable Crystal Detector for Panel or Base use, complete with crystal.

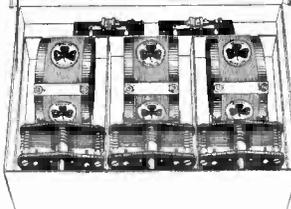
Freshman Special Crystal with Non-metallic Housing 50c.

No more searching for the sensitive spot. Merely turn the knob as you would a dial.

Write for free diagrams of Neutrodyne, Polydyne, Tri-Flex, Super-Heterodyne and other popular circuits.

Chas. Freshman Co. Inc.
Radio Condenser Products
106 Seventh Ave. New York City

At your dealers, otherwise send purchase price and you will be supplied postpaid.



3000 miles on a loud speaker with the Shamrock Circuit

RADIO fans are hanging up remarkable distance records with our circuit—built with the Shamrock Kit.

These revolutionary kits contain two of our new balancing condensers—and three Shamrock air core transformers mounted and properly balanced on U. S. Tool condensers, made expressly for Shamrock.

Inspect this kit at your dealer's today. If your dealer hasn't the kit in stock, send us the coupon below.

List Price, \$20

SHAMROCK MANUFACTURING COMPANY

Dept. 6, Market St. Newark, N. J.

SHAMROCK MFG. CO., Dept. 6, Market St., Newark, N. J.

Gentlemen: Send me detailed information on the Shamrock circuit and kit.

Name
Address
Dealer's Name

FIVE TUBE **GENUINE** RECEIVER NEUTRODYNE

**ON A
TEN DAY
TRIAL**



\$47.50

BUILT FOR YOU FREE

The most beautiful and efficient receiver in the world for only \$47.50.

Buy the parts from us for this genuine five-tube NEUTRODYNE RECEIVER, and we will build it for you absolutely free.

If after a ten-day trial you are not satisfied with the set, we will cheerfully refund your money.

We guarantee this set to equal, in efficiency, the highest priced Neutrodyne Set offered to the public.

The parts you buy

- | | |
|---|-------------------------------|
| 2 Improved Jacks | 20 Ft. Bus Bar Wire |
| 3 Genuine Neutroformers on Quality Condensers | 1 .00025 Fresh Grid Condenser |
| 2 Genuine Neutrodons | 1 Set Engraved Binding Posts |
| 5 Sockets | 1 .002 Freshman Condenser |
| 1 6 Ohm Rheostat | 1 .006 Freshman Condenser |
| 1 30 Ohm Rheostat | 3 4-Inch Dials (Bakelite) |
| 2 Supertran Transformers | 1 Mahogany Cabinet and Panel |

SPECIAL! The first fifty orders receive two large 45-volt "B" Batteries Free!

Note: Specify where you want terminals.

Catalogue of Batteries and parts on request.



RADIO CO.

25 West Mt. Eden Avenue,
New York, New York

SIDBENEL RADIO CO., 25 West Mt. Eden Avenue, New York.
Enclosed please find my remittance for \$47.50 for which please build for me, absolutely **FREE**, one guaranteed genuine NEUTRODYNE RECEIVER from the parts listed. It is thoroughly understood that if I am not satisfied, after a ten-day trial, I will return the set and you will refund my money.

NAME

ADDRESS

CITY

STATE