

15c

4-TUBE SUPER-HETERODYNE THAT WORKS A LOUD SPEAKER

June 28

1924

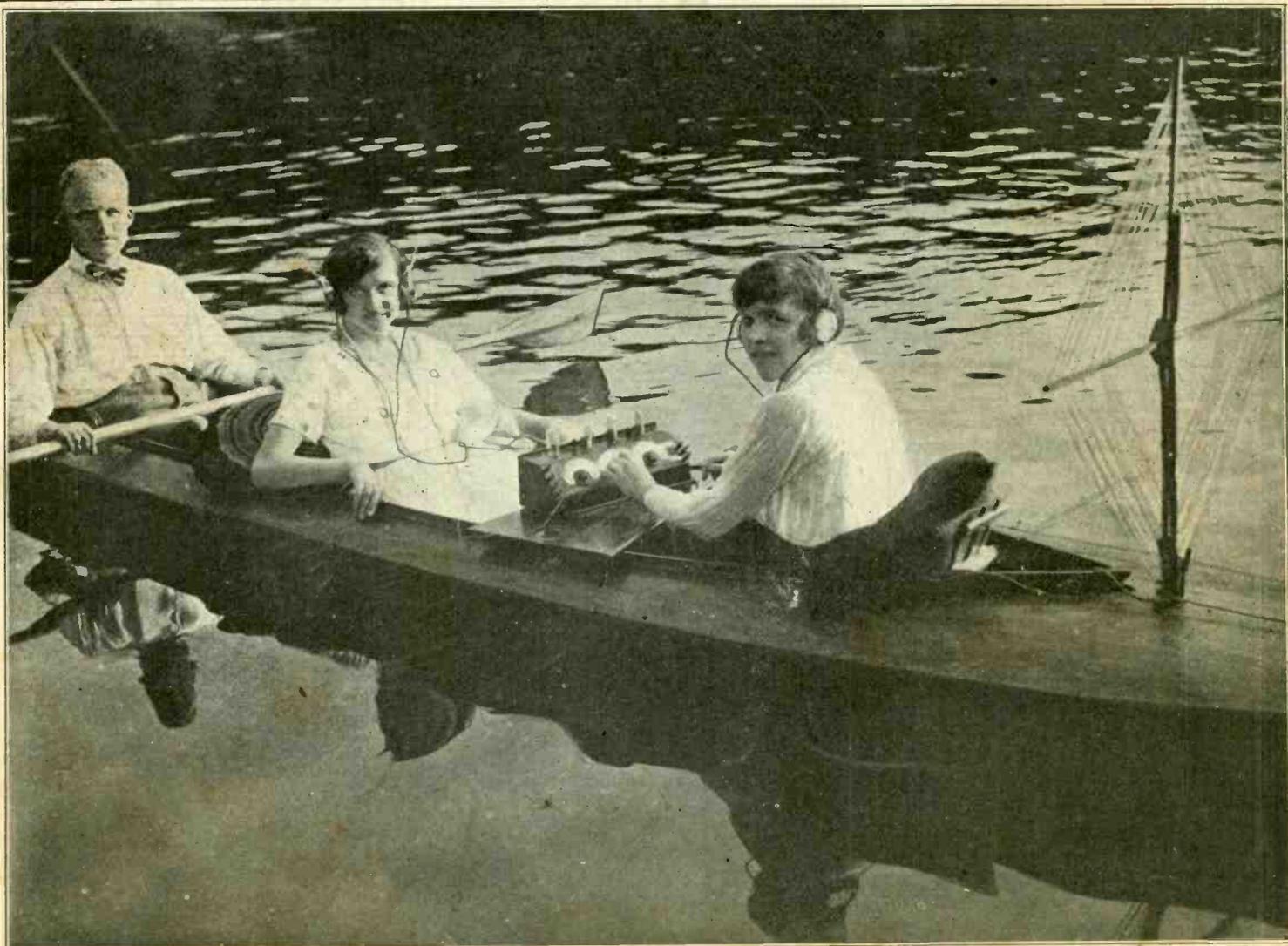
RADIO WORLD

Title Reg. U. S. Pat. Off.

VOL. 5. No. 14.

ILLUSTRATED

EVERY WEEK



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 cuit and wiring diagrams, panel and baseboard lay-
 outs, and drilling templates, so that any amateur
 may build a successful receiver from the directions
 given.

It also includes a discussion on the principles
 underlying each circuit, and shows clearly how to
 test and calibrate the receivers.

In order to help the Workable Radio Set builder,
 who may not be familiar with the conventional sym-
 bols used, in hooking up a set, each of the receiv-
 ing sets is illustrated by a complete full page
 diagrammatic drawing, showing just where to
 attach the wires, location of condensers, rheostats,
 transformers, vacuum tubes, plugs, jacks, etc.

THE COLUMBIA PRINT

1493 BROADWAY NEW YORK CITY

**"Broadcasting"
 Is Dropped for
 "Radiocasting"**

ATLANTIC CITY.

NO more broadcasting! No, indeed,
 the practice isn't going to be dis-
 continued. Rather *not!* But the word
 "broadcasting"—that must stop at once.
 Reason, dictionary doesn't sanction the
 use of the word in the instant sense.
 Instead of "broadcasting" the word
 should be "radiocasting."

The annual convention of the Asso-
 ciated Manufacturers of Electrical Sup-
 plies was held at the Ambassador Hotel
 and a resolution for the substitution of
 "radiocasting" for "broadcasting" was
 adopted.

The change was made on the recom-
 mendation of the Committee on Radio
 Casting after it was found that the dic-
 tionary revealed that broadcasting "has
 to do with sowing of seed or material
 substance," and would not be applica-
 ble to the spreading of sound through the air.

The Associated Manufacturers hopes
 the public will follow their etymological
 path.

There has been a reduction of 41.7 per
 cent. in juvenile court cases in the United
 States in the past year, due to the in-
 fluence and the growing popularity of
 radio, according to Mansel Keith, of New
 York, speaking before the convention
 here of the Associated Manufacturers.

These statistics were obtained from the
 police records, he said. Mr. Keith ex-
 plained that the responsibility for the so-
 called "bad boy" was traceable to a
 superabundance of energy misdirected.
 He said that radio had supplied the
 necessary interest and romance needed
 by the youth and that he was now spend-
 ing his time tuning in or making sets in-
 stead of getting into mischief.

Mr. Keith said he believed that the
 radio was developing the boy's mind so
 rapidly that as an adult he would be much
 more intelligent than his father is now.

The American public can expect not
 only a continuance but an increase in the
 service of entertainment, news and edu-
 cational features now sent broadcast to
 millions of homes by the present system
 of broadcasting stations scattered
 throughout the United States, according
 to the report presented by M. C.
 Rupinski, chairman of the radio broad-
 casting committee, to the convention.

Although the costs of high quality
 broadcasting stations are constantly in-
 creasing economies are resulting through
 the present system of interlining stations
 so that a program originating at a given
 point may be rebroadcast by many sta-
 tions in different parts of the country, the
 report stated. The success of this plan
 was made evident by the Republican
 National Convention at Cleveland, which
 was thoroughly "covered" by radio, it was
 added.

Pierre Boucheron, connected with the
 Radio Corporation of America, revealed
 a plan for the reorganization of broad-
 casting stations. Instead of the approx-
 imately 500 stations now in existence, he
 said, the big electrical and radio com-
 panies had decided to establish ten stations
 of far greater power, which would cover
 the entire country.

For the maintenance of broadcasting
 stations, even now costing about \$100,000
 a year for one of the first class, Mr.
 Boucheron said that the great companies
 which virtually control the manufacture
 of radio supplies were considering setting
 aside 2 per cent. of their gross sales.

E. B. Mallory, of New York, was
 elected chairman of the radio section.
 Other officers are A. U. Howard Dubler,
 New York, secretary, and George Eltz,
 New York, treasurer.

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 \$30.00 3-Tube Portable Set.....23.75
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THE COLUMBIA PRINT

1493 BROADWAY NEW YORK CITY

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 Paper 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. 14. Whole No. 118.

June 28, 1924

15c. per copy, \$6.00 a year

19 Ways to Erect An Antenna

By P. E. Edelman

Electrical Engineer

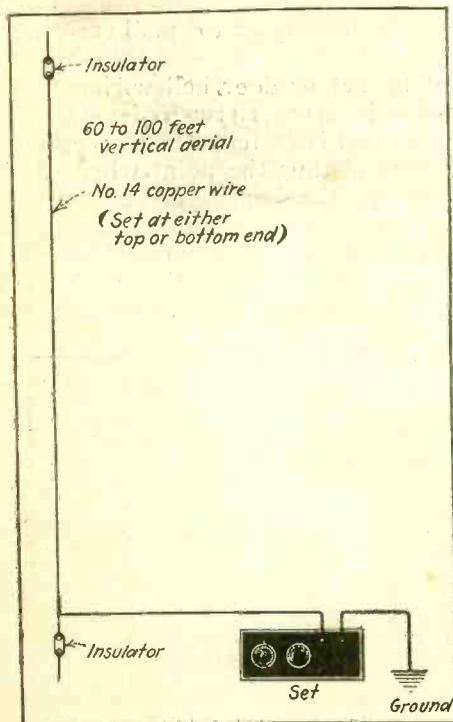
STANDARD aerial for broadcast reception is fine where space is available, and comprises substantially 100 feet of No. 14 copper wire or equal clearly spaced, at least thirty feet high, and running direct to receiving set. But crowded spaces seldom permit ideal broadcasting aerial arrangement. Another tenant may have the best location on an apartment house. Here are a few practical illustrations and hints.

Two different requirements may be noticed: one for use with a crystal set and one in case of a regenerative or radio-frequency tube set. The crystal set requires all the energy used to operate the phones to be intercepted by the aerial and rectified, is a current-operated device, and works best with large, clearly spaced aerial. The tube set of amplifying circuit type is potential operated,

requires only enough input to operate the grid circuit, and can perform with a much shorter and smaller-sized aerial, as the local battery provides the current to operate the phones. An aerial for use with a radio-frequency tube set can be as short as ten feet, and seldom needs to be longer than fifty feet, as a shunt condenser can be used across the input inductance. This shunt capacity can be about .0001 mfd. or simply made by connecting two fixed mica condensers, .00025 each, in series across the input coil, or a seven-plate variable condenser can be used. A short aerial permits sharp tuning and works nicely with tuned radio-frequency tube sets. I mean for long distance reception as well as local operation.

Fig. 1 shows a vertical aerial. It is a good actor. Where no space is suitable for horizontal aerial, run it straight up or down. For temporary use, a kite or

(Continued on next page)



AT LEFT (Fig. 1), the vertical type of antenna. This type is not very convenient to erect in the city, unless the top of a flagpole is used to support the top aerial end. The bottom insulator should be placed about five feet from the ground to avoid absorption.

AT RIGHT—Fig. 2 illustrates the condenser type of antenna, which is, in effect, a sheet of metal bent at right angles so as to intercept the waves coming from any direction. A modification of this is the bed-spring antenna, which works well with multi-tube sets.

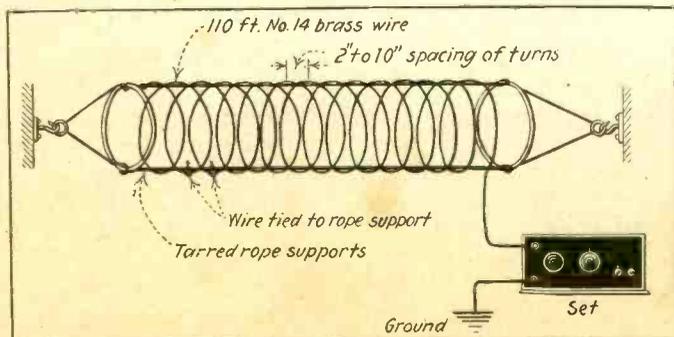
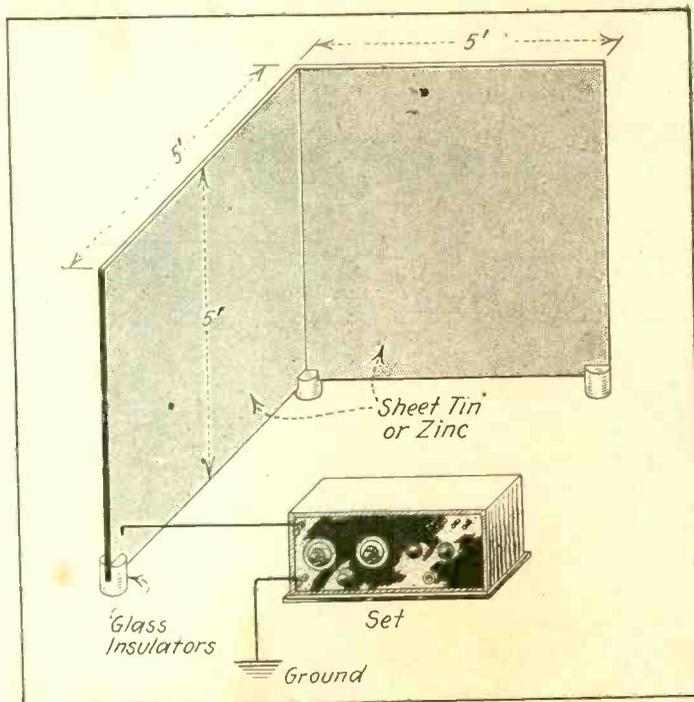


FIG. 3 is the Jeffries spiral antenna, constructed of a large coil of spring wire. This type is used in apartments where it is inconvenient to run wires to the roof. It also is popular with portable set users.

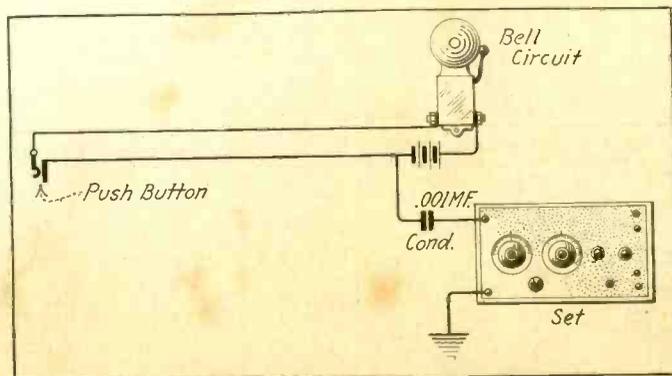


FIG. 4 shows the house bell wiring system used as an indoor antenna. The fixed condenser should always be used here in series with the antenna binding post. It does not matter to which side of the battery the wire is connected.

Condenser Type of Aerial Is Efficient

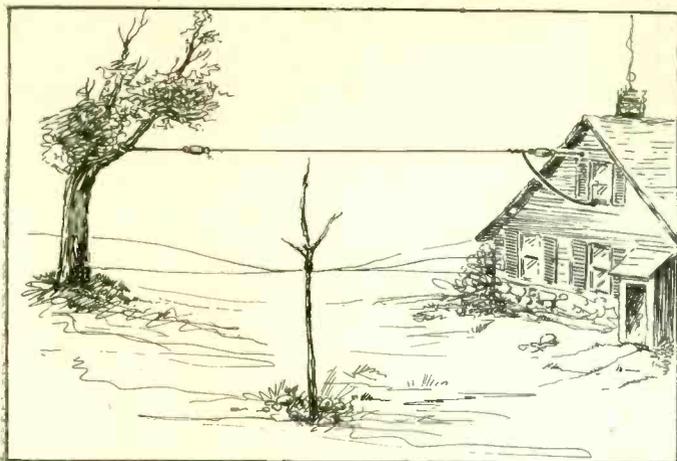


FIG. 5 is the typical type antenna used in the suburbs, running from the attic window to a tree in the back yard. Slack should be allowed for the swinging of the tree in a wind when erecting the aerial.

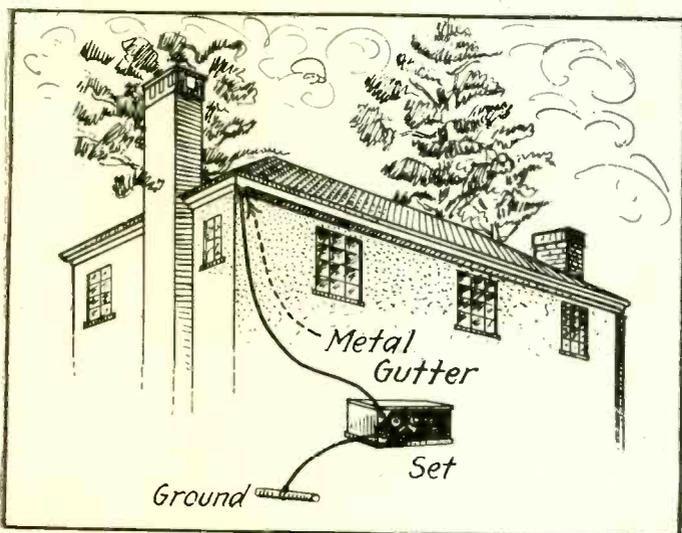


FIG. 6 utilizes the metal rain gutter which is on every house of this type. Care should be taken that the drain spout does not touch the ground, as this would short circuit the gutter antenna.

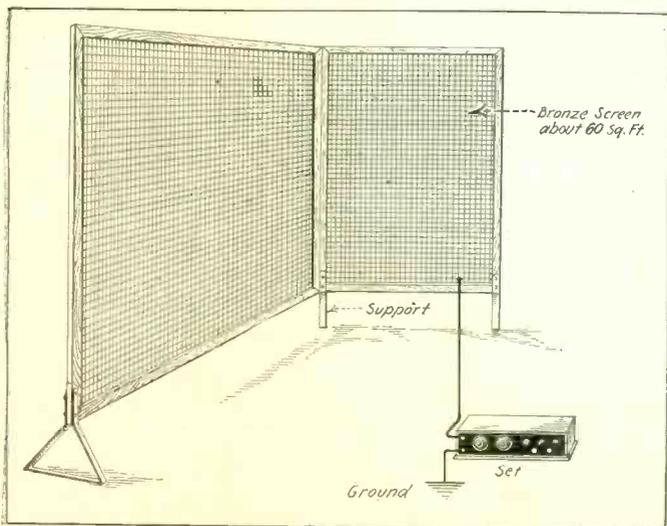


FIG. 7 is another adaptation of the condenser type of antenna. In summer, when screen doors and porches are in use, they may be wired together and connected to the receiving set. This system works very well with almost any type of receiving set.

(Continued from preceding page)

balloon support will do. For an apartment or office building, the simple way is to drop an insulated wire outside a court facing or outside facing window where it will not dangle in anyone's way. Or you can drop a weighted insulated wire down a dumb waiter or ele-

vator shaft if you fasten it away from danger of tangling with other moving parts in the shaft. Be careful in using such makeshifts to avoid wire loosening and tangling with other wires or ropes.

Fig. 2 shows condenser type of aerial. Any metallic surface of equivalent to five cubic feet surface will serve as a good wave collector. Makeshifts are metal bed-springs, office filing metal cabinets, safes, bronze wire window screens, etc. Thousand-mile reception has been accomplished by such makeshifts, used with good tube amplifier set.

Fig. 3 shows the Jeffries spiral antenna, which will pull apart to fit small space and give tolerably good results. It is made by holding No. 14 spring brass wire

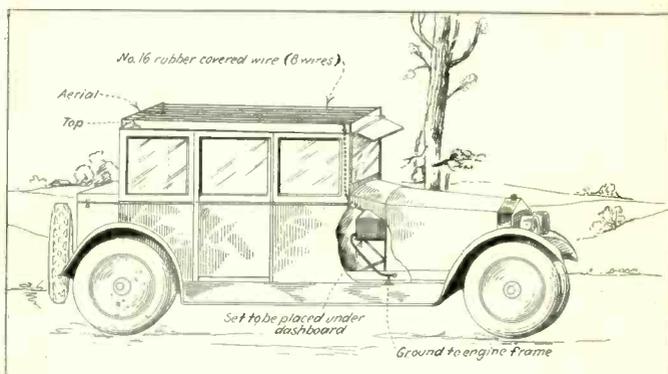


FIG. 8 shows an aerial strung on supporting insulators on the top of an auto. The ground is made to a bolt on the body of the car, which must be scraped clean to insure good contact.

on tarred rope supports, and collapses to small carrying space size.

Fig. 4 shows use of buzzer or door bell wiring.

In Fig. 5 the favorite inverted L type of aerial is shown. In this case one end is fastened to a tree, but note how the insulator (and thus the point where the actual aerial starts toward the house) is kept away from the trunk. Stout rope is excellent for connecting the insulator to the tree, but insulated wire may be used. It would be better to extend the connection with the tree farther out so that the antenna would more easily

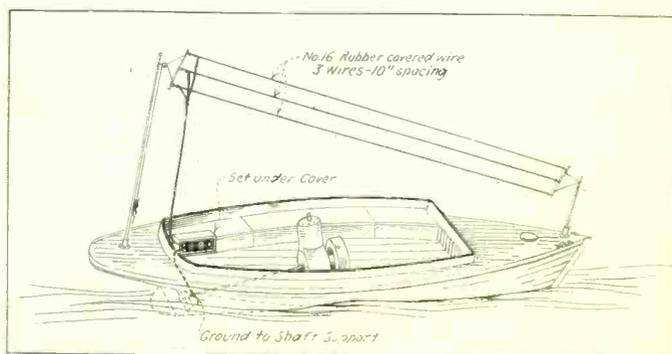


FIG. 9 is an L type of antenna, strung from bow to stern of a motor boat. One end should be at least eight feet above the deck, and the other four feet high. Ground is made to the propeller shaft.

clear all branches. Fig. 6 shows use of metal gutter pipe, sometimes very effective.

Fig. 7 shows use of two bronze metal screens as a small-space aerial. Surprising results may be had from such a collector.

Coming to portable space restrictions, Fig. 8 shows use of aerial on automobile top. Fig. 9 shows use of aerial on small motorboat. In all cases use wires spaced as far from ground as convenient and well insulated

(Concluded on page 6)

Novelties and Standbys In Aerials

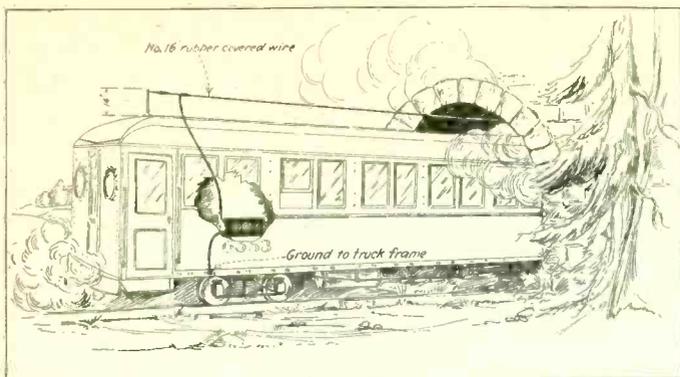


FIG. 10 is an efficient type of antenna, modifications of which are now in use on several railroad systems. Although this type has a pretty high capacity, remarkable results are obtained on sensitive sets.

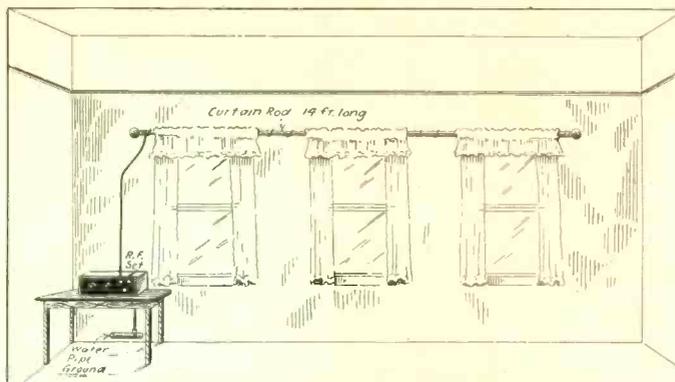


FIG. 11 shows how to use the curtain rods indoors as a substitute antenna. Many tuned radio-frequency sets work very well with only this small collector. Separate rods should be connected.

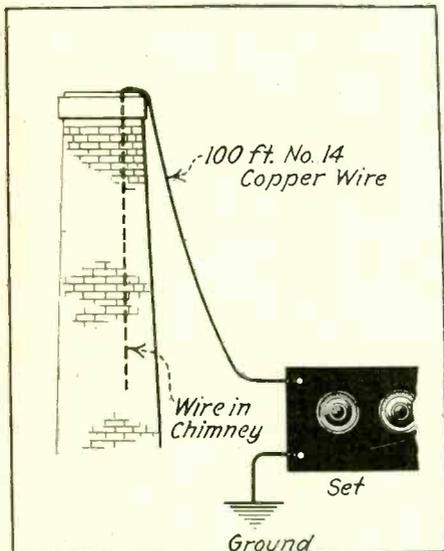


FIG. 12 pictures an arrangement which might be used in an emergency, where a high smokestack is available. This is another modification of the vertical antenna shown in Fig. 1. The top end may also be fastened to the top of the chimney. It is advisable to run the aerial on a slight slant from the top to the ground, so as to keep the wire away from the chimney to avoid absorption or obstruction to the radio waves striking the antenna.

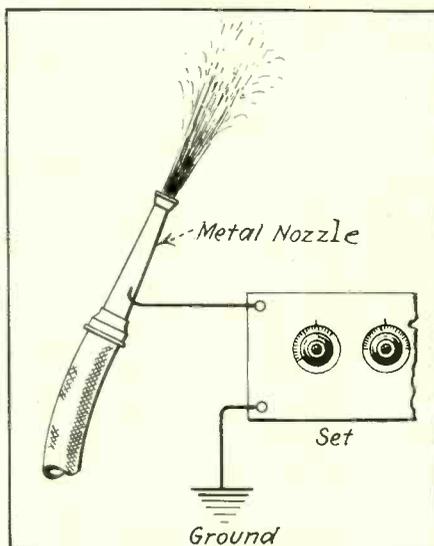


FIG. 13—This far-fetched scheme of utilizing the flowing water in a garden hose for the antenna actually works. The water does not necessarily have to be turned on always, as once the hose is filled, the water will conduct the waves coming through the hose casing. In other words, it is like a liquid insulated wire. The insulation does not hinder the radio waves from coming in contact with the water conductor. This device is attractive because of its novelty and may be a source of delight to the experimentally inclined novice.

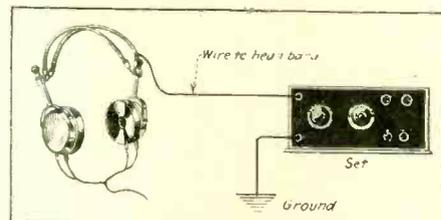


FIG. 16—Flexible wire attached to the metal headband of earphones serves as a capacity antenna. The wire to headband is indicated by the arrow. By this method the human body is used as an antenna.

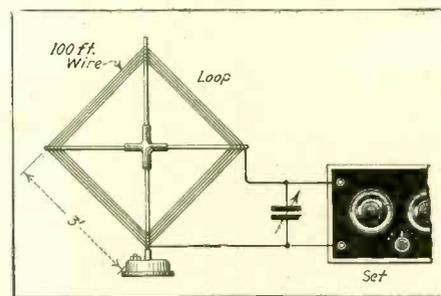


FIG. 17—Regulation 3-foot loop antenna and tuning condenser, which may be added to any regular receiving set. This arrangement works better with multi-tube outfits.

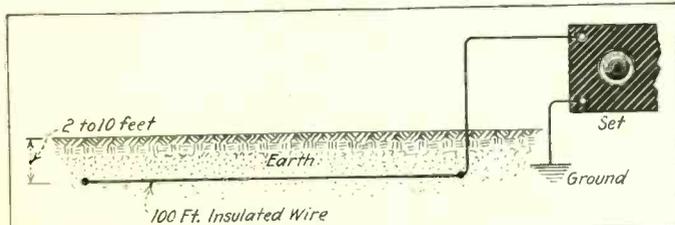


FIG. 14 illustrates a directional underground antenna. A heavily insulated wire is buried in a straight line pointing away from the direction the best broadcasting comes from. Four wires of this type, running to all points of the compass, equipped with a change-over switch, aid greatly in getting best reception.

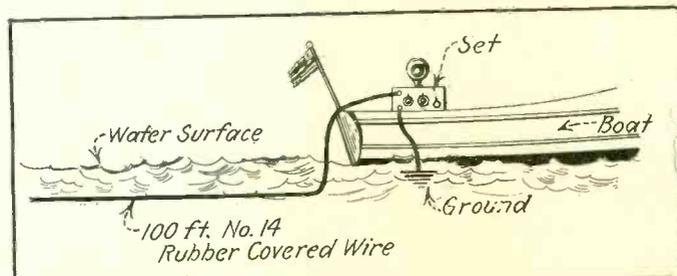
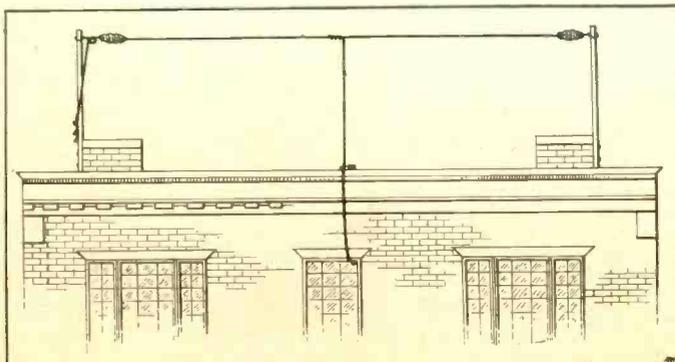
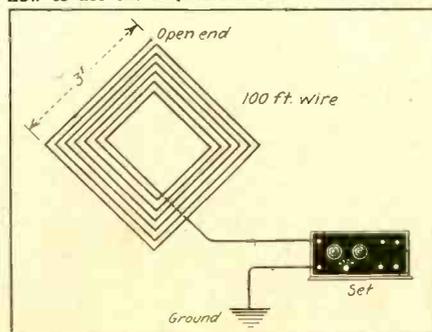


FIG. 15—An underwater aerial intercepts enough of the wave front to operate a radio-frequency set. The aerial wire is insulated water-tight. The water itself is used as a ground!



AT RIGHT—Fig. 18 shows how to use the loop antenna with a ground. The outside end is left free, and the connection to the set taken from the inside end. When used in this manner, the loop is not directional, but serves as a sort of coiled up antenna.



AT LEFT—Fig. 19 is a common T type of antenna used on housetops. This type is directional from both ends when the lead-in is made from the center. The lead-in should be soldered to the aerial to insure good contact.

New Transmitter for Shenandoah

Short-wave apparatus used because of reliability of operating on high frequencies for long-distance work, especially in the daytime.—New set uses 3,000 kilocycles.—Possible North Pole trip still kept in mind.



A MEMBER OF THE CREW of the Shenandoah has just sent in the above photograph showing the wrecked part of the dirigible following the accident in a gale last winter. Note the telephone, at right, of the huge shaft. The ordinary telephone system is inadequate for use on airships, submarines and warships on account of the noise to which the men are subjected. The requirements as specified by the United States Government are that the telephones shall be noise-proof, gas-proof, water-proof and also spark-proof, requirements met by the Magnavox Anti-Noise Telephone shown in photo.

WASHINGTON.

RADIO engineers of the U. S. Naval Research Laboratory were so impressed with their results of recent experiments with short-wave transmission and reception in daylight, that they have designed a new short-wave transmitter for the naval airship Shenandoah, according to Dr. A. H. Taylor, chief of the laboratory.

Through the co-operation of amateurs in over 40 states, NKF, at Bellevue, D. C., has obtained excellent results in two-way communications on 3000 kilocycles or 100 meters, in radio telegraphy and also in radio-telephone transmission tests. The reliability of short waves and their ability to carry for long distances, especially in the daytime, Dr. Taylor points out, has resulted in the construction of a transmitter which will go as low as 80 meters with a steady wave. He believes that short waves do not follow ordinary transmission laws.

The short-wave Shenandoah set just completed, is for use on 3000 k-cs. This set was designed for use if the Shenandoah goes to the North Pole, where it would be in daylight most of the time.

Solving Your Aerial Problems

(Concluded from page 4)

therefrom. Fig. 10 shows aerial supported on railroad car, and to clear bidges, etc., only 16 inches support above roof is usually permissible. Such aeriels collect enough energy to operate a good tube set, even when the train is running through a tunnel.

At farm houses, the old standby is the windmill, but it is also feasible to drop an aerial wire of No. 14 rubber-covered wire down an old dried up and disused well. Sometimes a barbed wire fence works well when a series condenser is put between it and the radio set, usually a small condenser such as .0001 mfd. In stringing aeriels, keep away from power line poles, and avoid running wires over power line lead-ins.

Other standby arrangements are to string wires in the attic between rafters, to run wires behind picture moldings, under rugs, etc. Fig. 11 shows use of curtain rod as short aerial, very neat and effective with a tuned radio-frequency tube set. Using a four-tube set, with Edelman stabilized circuit, this brought in loud speaker reproduction on stations 2,000 miles distant. The curtain rod was fourteen feet long, on three front windows.

Curious aeriels are shown by Figs. 12 and 13. The hot air from a chimney is a fair conductor. The water stream was actually patented as an aerial by J. Hammond.

Fig. 14 shows an underground aerial, introduced by J. Rogers, and it works. Fig. 15 shows an underwater aerial of similar type. These buried aeriels get less static than do exposed aeriels, but intercept enough of the wavefront to operate a radio-frequency tube set.

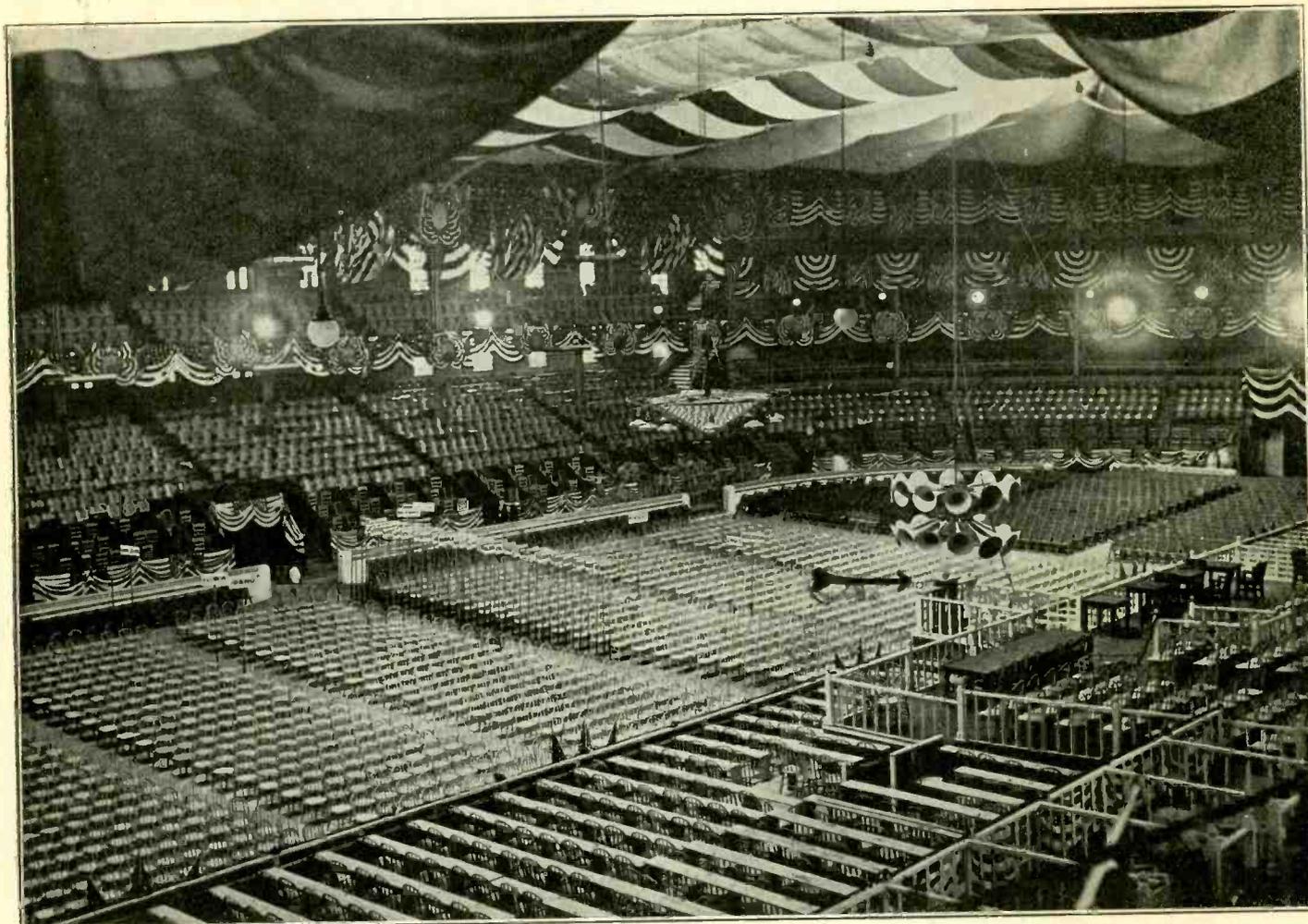
Remember that an aerial wire is used so as to be cut by the advancing wave front. This causes a high-frequency electric current to be induced in the aerial wire, and the object is to get this electric current to the detector via the tuner or radio amplifier of the receiving set. The ground wire is also important, and the whole circuit forms an aerial-to-ground circuit comprised of inductance and capacity. Too large an aerial means that tuning will not be sharp but broad, whereas a very small aerial means that a sensitive receiving circuit will be needed. Many commercial types of receivers are made with different antennae input posts, for short or long aeriels, but others will only perform properly with average-sized aerial, because not stabilized by the use of a very short aerial.

Fig. 16 shows the practical use of a human body harmlessly as an aerial. It is made by connecting the metal headband of a headset to the aerial post of a radio-frequency amplifying tube set, and works very well with several types of sets of this character. The headband connection is not required with Brandes phones, as a grounded wire is given in the cord connector which may be used. Some circuits will not work this way, as the capacity will cause howls, but there are several sets which perform with such a body capacity aerial.

Fig. 17 shows use of loop connected to aerial and ground posts and Fig. 18 shows use of loop as an aerial alone, but this last arrangement is usually not very efficient. Fig. 19 shows the T type of antenna.

DEMOCRATIC CONVENTION ON AIR

Nation Tunes In to Find Out What's Coming Off
Big Installation at Garden



(Kadel & Herbert)

THE EARS OF THE WORLD are tuned in on the microphone under the twenty-two local amplifying horns at the speakers' stand at Madison Square Garden, New York City, where the Democratic National Convention is being held. Arrow indicates the microphones that picked up the speeches. The most elaborate arrangements ever made for broadcasting over the radio and amplifying the speeches for those present were completed a few days before the convention started. The group of power loud speakers located directly over the speakers' rostrum enabled the orators to be heard in every nook of the Garden. The great convention hall was resplendent with American flags and bunting. Note the State signs to aid the delegates to ascertain where they "belong." Experts moved deftly among the delegates and reported to announcers in glass booths some "inside dope" for presentation to radio listeners.

(See Advance Programs, beginning on page 14, for Stations Broadcasting Convention)

FOURTEEN broadcasting stations carried the speeches and music at the opening of the Democratic Presidential Convention from Madison Square Garden, New York City, to millions of listeners all over the United States. Keen interest was displayed. The convention was rated the most absorbing "program" ever broadcast, surpassing in interest the Republican Convention only because of the added element of suspense, since there were several important contenders for first place on the ticket. At Cleveland it was always a foregone conclusion President Coolidge would be nominated, but even the best guessers were diffident when it came to predicting who would be the Democratic choice for President.

The installation at Madison Square Garden was one of the most complete ever made for broadcasting an event. The stations that, up to the eve of the convention, had co-operated to deliver the waves to the listeners-in covered a territory from Buffalo to Atlanta and from Schenectady to Kansas City and St. Louis. It was under consideration also to broadcast for the Southwest from Dallas or Fort Worth, Texas.

Senator P. Harrison delivered the keynote speech as the temporary chairman who opened the convention Tuesday. His voice was carried all over the Garden through local amplifiers. Before him, on the rostrum, was the microphone that brought a Democratic Convention to the homes of the people of the nation for the first time in history.

An agreement was reached whereby the keynote speech was put over from the morning to the evening, as an accommodation to radio fans, so they could enjoy listening in at home.

Among those who listened in were several aspirants for the nomination for President, including William G. McAdoo, former Secretary of the Treasury, who personally conducted his campaign from headquarters in New York; Governor Alfred E. Smith, of New York, and his campaign manager, Franklin D. Roosevelt, of New

(Continued on page 23)

Metaform vs. the Best Receivers

Walt S. Thompson, Jr., Gives the Verdict to the New System of Reception

[In RADIO WORLD, issue of June 21, first and exclusive publication of the new Metaform System was given. This system can be added to any set. It consists mainly of a tuner and frequency changer, which operate on one tube. The detector and audio amplifier of any improved set are all that are necessary in addition to this one-tube wonder. The following concluding instalment compares the Metaform system to the best receivers of today. Walt S. Thompson, Jr., shows how the Metaform eclipses them.]

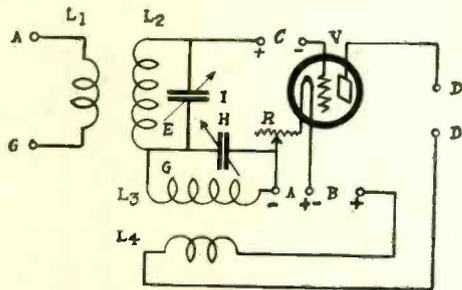
PART II.

By Walt S. Thompson, Jr.

RESULTS of experiments with the Metaform System of reception have led the writer to believe that it has many advantages over other types and that its disadvantages are few. For the purpose of discussion the application of the Metaform system will be treated as it pertains to broadcasting frequencies only.

Assuming that a complete receiver has been constructed, it will be compared to several of the popular sets of today, the first of which will be the Super-Heterodyne.

Radio experimenters know that to use a sharply-



ANY number of stages of tuned radio-frequency can be used with the Metaform System, but the controls always remain only two (Fig. 5).

tuned receiving circuit, the frequency of the carrier wave for radio telephony must be very high, that is, 500 kilocycles or more, corresponding to a wavelength of 600 meters or less. This because the higher voice frequencies will be greatly attenuated if the receiving circuit is sharply tuned and the frequency of the carrier low. In the Super-Heterodyne the frequency of the carrier is changed to a lower frequency, thus increasing the distortion due to the attenuation of the higher voice frequencies. As the intermediate frequency amplifier of the Super-Heterodyne invariably contains a sharply-tuned circuit, it is evident that the Super-heterodyne receiver will cause a distortion of the received signal. This seems to be borne out in practice, except in the cases of sets made by the Radio Corporation of America, in which the tuned circuits have been designed to avoid this distortion.

In the Metaform system the frequency of the carrier is changed to a frequency very nearly the same or to a higher frequency, thus making it possible to avoid the distortion due to the attenuation of the higher voice frequencies. As sharply-tuned circuits are very desirable it is evident that the higher the resultant frequency the less distortion there will be, hence it is desirable to beat the carrier frequency to a much higher frequency.

Again, as the voice frequency wave is always the envelope of the carrier frequency wave, it is apparent that the higher the frequency of the carrier, the more perfectly will the envelope resemble the original voice

wave. Hence again we see the advisability for increasing rather than decreasing the carrier frequency in order to minimize distortion.

It has always been considered that the Super-Heterodyne is the most selective of all the modern sets. The Metaform receiver is still more selective. If a given amount of distortion is to be allowed, it can be seen that the higher the frequency of the carrier wave, the more sharply the circuits may be tuned for this given amount of distortion. As the frequency to which the intermediate frequency amplifier of a Super-Heterodyne receiver is tuned is very low and as the frequency to which the carrier is changed in the Metaform receiver is high, the Metaform must be more selective for a given distortion.

As the oscillator used with Super-Heterodyne receivers always oscillates at a frequency very near that of the incoming carrier wave, such a set will radiate sustained waves, with frequencies within the broadcasting range at all times, and these waves will be modulated with audible beat notes during the tuning of the set, unless some method for preventing this radiation is used. This means that most Super-Heterodyne receivers are interference producers. In the Metaform system the oscillator does not oscillate at a frequency within the broadcasting range, hence the radiated carrier will not interfere with other broadcast listeners and there will be no audible whistles present during tuning. This will be explained by means of a numerical example as follows:

The range of broadcasting frequencies is from 1,360 to 550 kilocycles.

Let the frequency to which the receiver proper is tuned be 1,500 kilocycles.

Then the necessary oscillator frequency range will be from 2,860 to 2,050 kilocycles, or

The wavelength range will be from 105 to 146.5 meters.

This example shows that the radiated carriers do not fall within the broadcasting range, and hence will not interfere with any broadcast listener.

On the other hand, the intermediate frequency amplification in the Super-Heterodyne receiver is greater per tube than that which can be obtained with a Metaform receiver. The Metaform receiver is also slightly more difficult to construct.

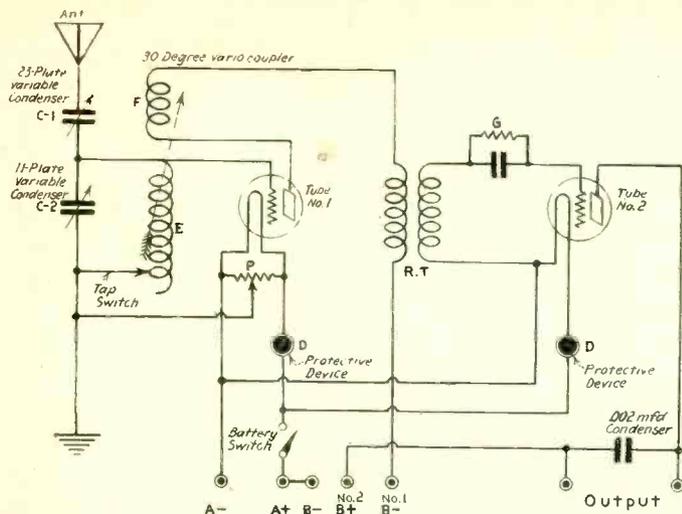
The Metaform receiver has some advantages over the Neutrodyne which are in common with those of the Super-Heterodyne. First, greater amplification can be obtained per stage of radio frequency because the RF amplifier, used with the frequency changer, amplifies signals of only one frequency and does not have to amplify all frequencies within the broadcasting range. For this reason the amplifier can be made much more efficient. This, of course, applies only when the frequency to which the incoming carriers are changed lies within a certain frequency range.

Another advantage in common with the Super-Heterodyne is the simplified control in tuning. With the Metaform system any number of stages of tuned radio frequency amplification can be used but the controls always remain two in number, that is, the two condensers H and I in Fig. 5.

Again the selectivity is greater with two controls than that of the Neutrodyne with three controls. The tuning is characterized by that knife-like sharpness obtained with the Super-Heterodyne. The selectivity obtained is due to the possibility of using more sharply tuned circuits as mentioned above. Distortion caused by the radio frequency amplifier is also less.

A Distance-Getting Two-Tube Set

ONE STAGE OF RF ADDED TO SINGLE CIRCUIT RECEIVER



EXCELLENT DISTANCE is obtainable by this circuit, which precedes a single circuit with one stage of RF, multiplying the amplification six times.

By Charles H. M. White

Consulting Engineer

FEW persons who have not actually tried one stage of radio-frequency amplification realize what a great reaching-out power it can have. If radio engineers could get the same multiple amount of reaching-out power for every additional stage of radio-frequency amplification after the first, marvelous distance would become ordinary. But the degree of amplification greatly falls off per tube after more than one tube is added. For instance, if one stage of radio-frequency amplification gives a multiplication of six, then the second stage will only give 4, and the third 2 and the fourth maybe only 1.1. Experimental work is being conducted continually to make the second and successive stages of short-wave radio-frequency amplification as effective as the first stage, but as yet very little actually has been accomplished. This is one reason why short-wave radio-frequency amplifiers are rarely ever built in more than three stages for average use. As far as volume on local stations is concerned, the single circuit regenerative receiver can not be excelled very much in reference to volume per tube, but such a receiver does not have as good sensitivity as a one-stage RF receiver. A great deal of the efficiency of the single circuit regenerative receiver can be laid to the fact that its tuning circuit is extremely simple, thereby conserving the maximum amount of energy.



C. H. M. WHITE

Many radio fans who now operate single circuit outfits and are anxious to have some other form of receiver can well take advantage of this conversion. The receiver outlined, as far as the circuit with tube No. 1 is concerned, is a regular single circuit regenerative receiver with the condenser C-2 added, a potentiometer P, and, the removal of the ordinary grid leak and condenser to the circuit of tube No. 2. The tuning coils E-F are nothing more than a standard 90-degree coupler using the coil F as the rotor. By so doing we can obtain negative or positive feedback as needed to add stability or sensitivity to the receiver.

Observe that in this receiver the condenser C-2 is an

11-plate variable and does the actual fine tuning, while C-1, which is a 23-plate condenser, becomes a coupling condenser. If the antenna were coupled directly to the grid of tube No. 1 it would be next to impossible to make tube No. 1 oscillate or approach oscillation, since the energy required to maintain the antenna in a period of oscillation would be excessive. Therefore the condenser C-1 proportions this transfer of antenna energy, allowing tube No. 1 to approach oscillation as is necessary to obtain extreme sensitivity. A tube must approach oscillation to be sensitive for radio-frequency amplification.

There are few extra parts to be purchased. The radio-frequency transformer R.T. must be of a good standard make of transformer. There are several excellent ready-made transformers for this type of short-wave amplification. A good fixed grid leak is highly recommended for the grid leak unit. Daven Radio Company resistors are without doubt one of the most accurate forms of noiseless grid leaks that can be manufactured. The switch S is a toggle style switch used to shut off both tubes when the set is inoperative. The units D are Amperite automatic filament current adjusters, which simplify the wiring and add to the efficiency of the receiver. As a matter of personal protection I always recommend that every novice equip his tubes with Radeco Safety fuses, which readily slip on the filament terminal of any standard vacuum tube. The enormous number of tubes lost yearly by radio fans who are just shifting things around is appalling and any reliable device that does not alter the operation of the receiver and prevents this loss is heartily recommended. In experimental work I always use these fuses on my tubes and have saved hundreds of dollars during the past year.

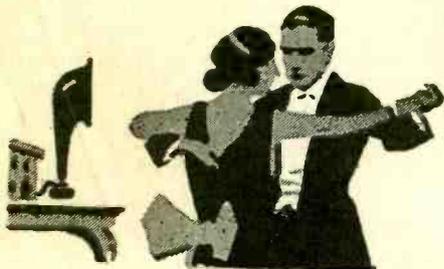
The operation of this receiver is just a little more complex than that of the single circuit regenerative type. As mentioned before do not attempt to use the condenser C-1 for tuning, because it is not so designed. Place this condenser at one setting, put the potentiometer slider as near the negative terminal as possible and still allow adjustment. Then the coil F should be revolved until the tube No. 1 oscillates. After that the potentiometer is moved to stop this oscillation and to control the radio-frequency amplification. To obtain greater selectivity the condenser C-1 should be so moved that its capacity is reduced. When more volume is desired C-1 should be adjusted to more capacity. In this way the operator has as much control of his sensitivity and selectivity as in any loose-coupled circuit. Of course, when C-1 is changed it will be necessary to readjust C-2, F, and P. Several radio fans who have converted their receivers to this form are very enthusiastic over the results obtained at small cost. Dollar for dollar investment, this outfit will favorably compare with any of the present one-stage RF receivers, and rating it in terms of miles range per dollar, it rates among the best. Any good two stage audio-frequency amplifier can be used if loud speaker operation is desired.

FOUR NEW BRAZIL STATIONS

PERMISSION to establish four radio broadcasting stations has been granted by the Ministry of Public Works of Brazil to the Brazilian Radio-Telegraph Company for the purpose of broadcasting information, lectures, concerts, etc. The four stations are to be located at Sao Paulo, Bello Horizonte, Bahia, and Pernambuco.

A Non-Squealing Regenerative Set

One-tube triple circuit of extreme selectivity is used with a modification of the variocoupler rotor



IF TWO STAGES of audio-frequency are added to the one-tube circuit described herewith, some distant stations can be brought in on the loud speaker. Not more than 500 miles on the horn should be expected.

By Herman Bernard

THE usual remedy for taking the one-tube regenerative receiver out of the radiating class is to add an extra tube for a stage of stabilized RF, and that is a good way. This is the age of RF. Anybody who hasn't got RF, and who can spare the slight extra cost, should procure it. But if he wants only a 1-tube set (or a 3-tube set, if two audio stages are used to produce loud speaker volume) and desires to enjoy the advantages of regeneration while being no party to its sins, let him read on.

The curse of the regenerative set is that the tube goes into oscillation, emitting high frequency currents (commonly dubbed squeals) that infest the ether perhaps for hundreds of yards. The tube functions as a sending station, transmitting punishment on neighboring set owners whose only offense is that they so supinely tolerate a common nuisance without protest. If all squealing were relegated to the limbo of deserved damnation, this would be a happier radio world. Therefore let the owner of an offending set go through some easy electrical gymnastics to convert his set into a certificate of membership in the Good Sports' Club.

If you know how to tune a regenerative set, and always tune it the right way, it can be made to behave. "Tune by the voice and not by the whistle." Knowledge is the muzzle you put on your regenerative barker. But why not tame the dog, so that it can't do any harm?

The method of tuning by the voice or music is accomplished by keeping the coupling of the variocoupler low. The voice is not easy to tune in. In fact, it is easier to pass it by unnoticed, due to too rapid turning of the condenser dial. Impatience yields to temptation and—

Squeal, squeal, squeal!

Instead of relying on varying the coupling to keep the feedback from plate to grid circuits under the point inducing oscillation, the feedback can be permanently controlled by reducing the number of windings on the rotor of the variocoupler. Most of the variocouplers on the market have ample number of turns on the rotor for all regenerative needs, and properly so, since couplers for commercial production must be adaptable to all needs—crystal sets included. More than fifty turns are common. However, for use in the present case, this number will be reduced to 32 or less. Just how few turns to use will be found only by experiment with the individual coupler, but the number will not be more than 32, and probably never less than 20. Therefore, the first thing to do is to remove from the rotor

all turns in excess of 32, realizing no magic finality necessarily attaches to this number.

For those who never undraped a rotor, a word of consolation is not amiss. It is very simple. The rotor ball is left attached to the stator, through the shaft, and never moved more than in its normal arc of 90 or 180 degrees. The rotor winding, at the beginning, is already connected by a flexible wire, of the tinsel telephone cord kind, to a lug or binding post on the stator form. This is the connection made to the plate. The end of the rotor winding (that goes to one of the phone terminals) is similarly connected to the stator's tube or form. This is the end you tackle—the end end, so to speak; not the beginning end! Cut the wire where it is soldered to the flexible cord, but leave perhaps $\frac{1}{8}$ " of the stator wire remain on the lug. Soldering to Litzendraught or other such stranded wire is not always easy. Sometimes the strands must be separately scraped to provide enough "rough stuff" to compel the solder to stick tight. Therefore, the $\frac{1}{8}$ " of adventitious growth will afford a handy peg to which to solder the new end of the rotor.

Count off 32 turns from the beginning of the stator. If this proves tedious, use the blunt end of your pocket knife, sliding it slowly over the wire and counting each turn by the impact against the succeeding turn. Be careful, however, not to scrape off the insulation. Leave about 3" of wire to spare, after the thirty-second turn. Then cut the wire. Don't be afraid to do it. Cut it with all the cocksureness of the head of the house carving the roast beef to the admiring gaze of visiting children.

That done, mount the coupler on the panel, keeping in mind the possibility of having to remove it again for further downward revision of the rotor, should the maximum regeneration possible with 32 turns prove non-squealproof.

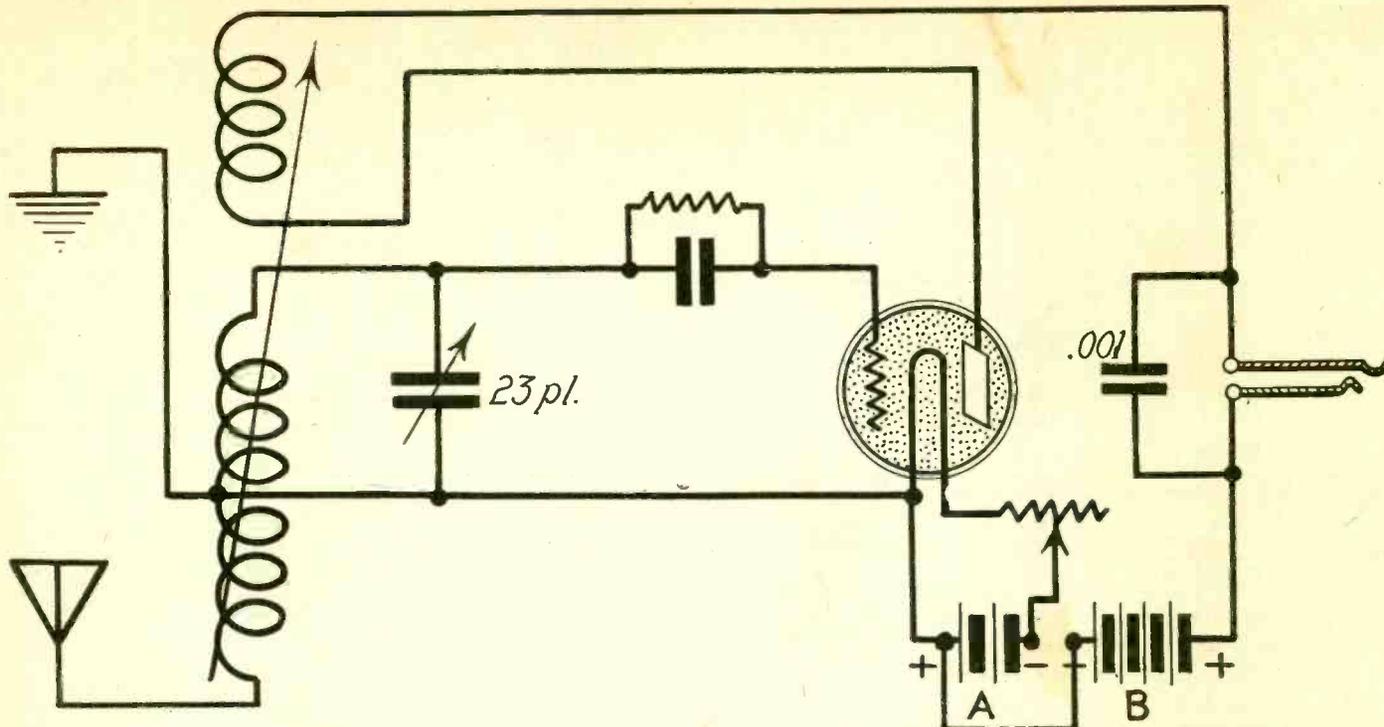
Used in the hookup shown in Fig. 1, this method has proven effective. The diagram is of a regenerative circuit the equivalent of a three-circuit affair. For purposes of simplicity of presentation, the artist drew the aerial and ground out of their accustomed relationship. However, the wiring is along orthodox lines, as follows:

1. Connect the aerial to the beginning of the stator of the variocoupler.
2. Connect the ground as follows: (a) To a tap on the variocoupler, four or more turns away from where the aerial is connected, the best point to be determined by experiment, this completing an aperiodic or untuned primary; (b) to the rotor of the variable condenser; (c) to the A+.
3. Connect the end of the variocoupler stator (a) to the stator plates of the variable condenser and (b) to the fixed grid condenser. The other side of the grid condenser goes to the G post of the socket.
4. Connect the plate of the socket to the beginning of the altered rotor, the end of the rotor going to one of the phone terminals. The end is distinguished from the beginning by noting that, when the coupler is mounted, the end post or lug is higher than the beginning.
5. Connect A+ and B—. Connect B+ to the remaining phone terminal. Shunt a .001 mfd. fixed condenser across the phone terminals.

If a jack is used, decide in advance whether earphone

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Receiver Can Be Built for \$30



IF JUST a single coil is used in a circuit there is no feedback, hence no regeneration. Too much regeneration causes squeals. Hence the idea was conceived of reducing the number of turns on the rotor of a variocoupler to 32 or less, so that the regeneration can be so reduced that even when at maximum no radiation will occur. This is described in the accompanying article, in which the principle is used in conjunction with the above circuit (Fig. 1). This is the equivalent of the three-circuit tuner. The primary is a periodic or untuned and consists of four, or a few more, turns on the variocoupler stator. The remaining turns are shunted by a .005 variable condenser, thus tuning the grid circuit. The plate circuit is subjected to the usual modified form of tuning incurred on the feedback.

operation will suffice, or whether provision should be made for loud speaker operation in the near future. If l. s. o. is on your mind, use a double circuit jack. Such an instrument has four leaves. Connect the phone wires (P and B) to the outside leaves. If a single circuit jack is used (as shown in diagram) it would have to be supplanted when loud speaker ideas begin to materialize. The substitution is troublesome. And buy improved jacks. They're simple and safe.

The circuit now being complete, test out the efficacy of the rotor of the variocoupler. Remember that the object is to keep the maximum regeneration below the squealing point. There will be some sacrifice of volume, compared with full regeneration, but it is on the altar of sportsmanship.

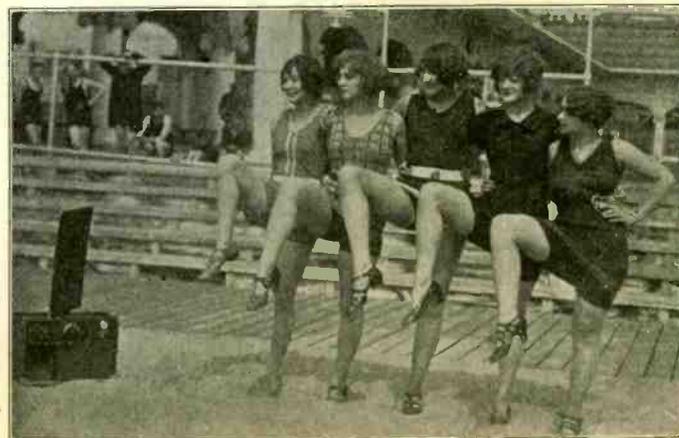
The 32 turns on the rotor may prove just right. Do not remove any more turns unless you're hearing squeals when tuning in at random. Meanwhile, also see if your highest wavelength station comes in near the end of the variable condenser dial. In the author's set WEAF (492 meters) comes in at 70 and WNAC (278 meters) at 10. The condenser-coupler combination covers the whole broadcast range. If you find the high wavelengths come in at the middle of the condenser dial, cut down on the inductance by connecting the aerial, instead of at the beginning of the coupler stator, at the first tap, or second, etc., until you get the best one. That way necessitates moving the ground connection so as to keep it at least four turns away from the aerial. Notice that no tap switch need be used in this circuit, so one source of losses is avoided.

This circuit will work on all couplers, but better on some kinds than on others. If results are not of the best, there is one easy way out. See the lead connecting the ground to the variocoupler stator? Eliminate it entirely and you have a double circuit regenerative set. The circuit (Fig. 1) has untuned primary, tuned

grid and plate feedback, with the modified tuning necessarily involved in the rotor variation. With the aforementioned ground connection to the coupler stator sniped off, you have a tuned primary, with the inductance all in the aerial lead through the entire stator, tuned simultaneously with the ground through the variable condenser. Both circuits work well on dry cell tubes.

LIST OF PARTS

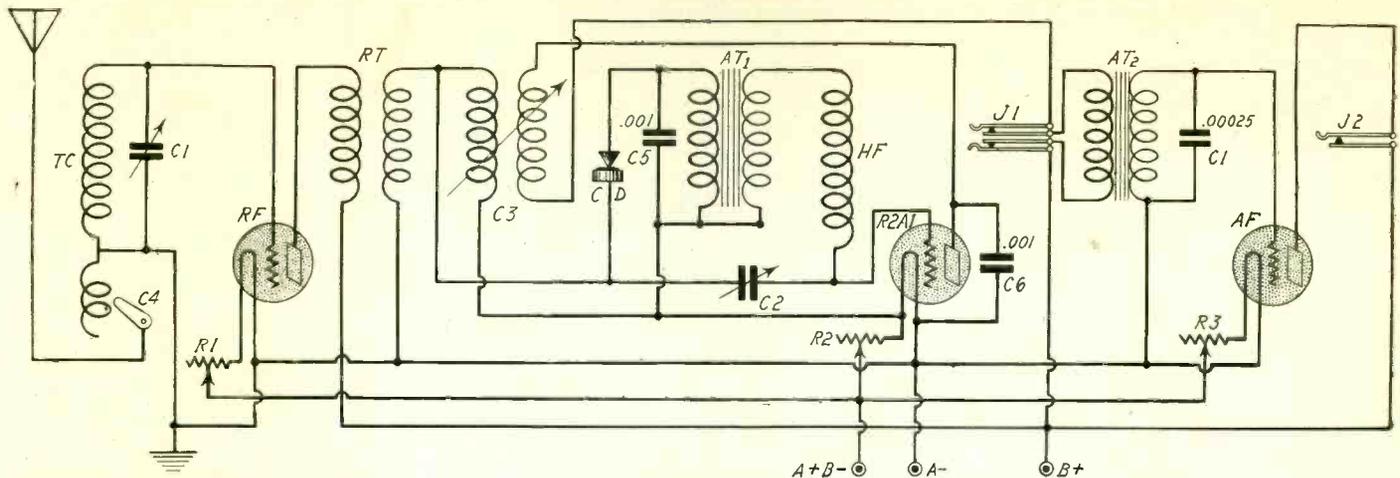
- One variocoupler.
- One .005 variable condenser (23 plates).
- One .00025 grid condenser and leak.
- One jack.
- One plug.
- One .001 fixed condenser.
- One A battery.
- One B battery (22½ v.).
- Panel, 7 x 14".
- Cabinet, 7 x 14".
- One pair of earphones.
- Total cost, not over \$30.



(Kadel & Herbert)

MORNING BEAUTY exercises are taken by Peggy Watts, Ruth Fallows, Margaretta Gollis, Josephine Dunn and Audrey Browning, at Luna Park, Coney Island, to the tune of radioed music. The girls, being beautiful, are exercising to stay so.

The Improved Ultra-Reflex



FINE QUALITY OF TONE and good distance results are attainable by the Improved Ultra Reflex circuit (Fig. 1). The circuit is free from the constructional difficulties present in some reflex hookups. The equivalent of a five-tube result is attained with three tubes and a crystal. The second tube (from the left) is reflexed for RF and AF. The circuit therefore consists of two stages of RF (one of them regenerative), detector and two stages of AF. It has three main controls—two variable condensers and a variocoupler. The designations follow: C1, 23-plate condenser; C2, 11-plate condenser; C3, variocoupler; TC, tuning coil; RT, radio transformer; AT1, audio transformer; AT2, audio transformer; HF, choke coil; RF, socket and tube for first RF stage; R2 and R2A1, socket and reflex tube; AF, socket and AF tube; CD, crystal detector; J1, phone jack; J2, loud speaker jack; R1, rheostat of RF tube; R2, rheostat reflex tube; R3, rheostat AF tube; C4, tap switch; C5, .0001 fixed condenser; C6, .0001 fixed condenser, and C7, .00025 fixed condenser. The use of a battery switch (not shown) is optional.

By Neal Fitzalan

[The Ultra-Reflex, using one tube for one stage each of RF and AF, and a crystal for detection, was presented in RADIO WORLD, issue of June 7. It had three controls—a variometer, a variocoupler and a variable condenser. Herewith is presented an improvement on that novel circuit. One straight stage of RF is added to the original circuit, and in place of the variometer a stage of A.F. The set becomes a DX-getter, and operates a loud speaker. However, no greater number of controls is required. The condenser C2 is variable; instead of fixed, as formerly.]

SUCH interesting possibilities were offered by the Ultra Reflex brought out by RADIO WORLD that I experimented with the circuit for ten nights and finally developed it into a DX set that operates a loud speaker and is excellent for steady reception, including Summer. The circuit is unique. While it still affords opportunity for improvement—which may be said quite justly about any circuit—it is now brought up to such a stage of development that one may be well satisfied with its clear, reliable performance.

Three tubes are used (Fig. 1). The inviting reflex system as developed in the original circuit is retained "as is." The second tube is used for both RF and AF and I am inclined to think some little detection occurs there, too. However, the crystal is the real detector.

The circuit has two stages of RF and two stages of AF. This set will not radiate, is easy to build, even for a beginner, and many fans already have practically all the parts needed, which are as follows:

- | | |
|--|---|
| One 23-plate condenser. | Three sockets. |
| One 11-plate condenser. | Three rheostats. |
| One variocoupler. | One double and one single jack. |
| One radio-frequency transformer. | One tap switch for the tuning coil. |
| Two audio transformers. | One battery switch. |
| One crystal, either fixed or adjustable, although the latter is preferable. | One tuning coil (Fig. 2). |
| One choke coil. | One 7 x 21 cabinet. |
| 200-turn honeycomb or a 150-turn home-made coil of 22 D. S. C. wire wound on a 3" tube as shown in Fig. 3. | One 7 x 21 panel. |
| Two .001 and one .00025 fixed condensers. | One 7 x 18 baseboard. |
| | Sundries, such as bus bar, binding posts, lugs, flexible wire connections for batteries, etc., etc. |

The batteries and rheostats to be used with this circuit depend on the tubes used. For UV201A or C301A

use 6-ohm rheostats, 6-volt storage battery and 90 to 112 volts on the plate. Do not use the soft detector tubes known as UV200 and C300 in this circuit. If UV199 or C299 tubes are to be used, 30-ohm rheostats are necessary and the current may be supplied by either three standard dry cells or by a so-called C battery of 4½ volts. A plate current of from 45 to 67 volts is best for these tubes, although a voltage up to 90 could be used, which would give a slight increase in volume. The WD11 and WD12, also the C11 and C12 tubes are not the best for this circuit. If any fan has DV2 or DV3 tubes on hand he may use them.

Five-tube performance is obtained, though only three tubes are used, because the crystal takes the place of a tube and the second tube is reflexed.

Looking at Fig. 1 one will notice that the circuit is very simple, with only three controls, aside from the rheostats. The more experienced fan will also notice that this circuit is stable without the use of a potentiometer. Furthermore, the A battery is grounded, which prevents distortion.

The tuning is done with the 23-plate condenser C1 (Fig. 1) in conjunction with the 11-plate condenser C2. The variocoupler C3 is used mainly as a regenerative radio frequency transformer. The tap switch C4 has six stops and is to be adjusted to bring in signals at their maximum strength.

Audio transformer AT1 has posts B and P shunted, whereas AT2 is not so connected. Do not alter this. The choke coil HF is to be connected to the AT1 transformer on post G and also to the grid of socket R2A1. The second audio transformer AT2 is directly connected to the grid of socket A2 without any choke coil. The audio transformer preferably should not exceed the ratio of 5 to 1 for the first stage, nor 4 to 1 for the second stage. Both transformers may be of the same ratio, providing the ratio does not exceed 4½ to 1.

To make the tuning coil, wind 57 turns of 24 double silk covered wire on a 4" tube of either cardboard or bakelite. Tap at the fiftieth, the fifty-third, the fifty-fifth and the fifty-sixth turns. These four taps, as well as the end of the fifty-seventh turn, are to be connected to the five points of the tap switch. The aerial is connected to the center of the movable arm of the tap switch so that, in tuning, the turns of the coil may be

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Assembly Layout for Quality Set

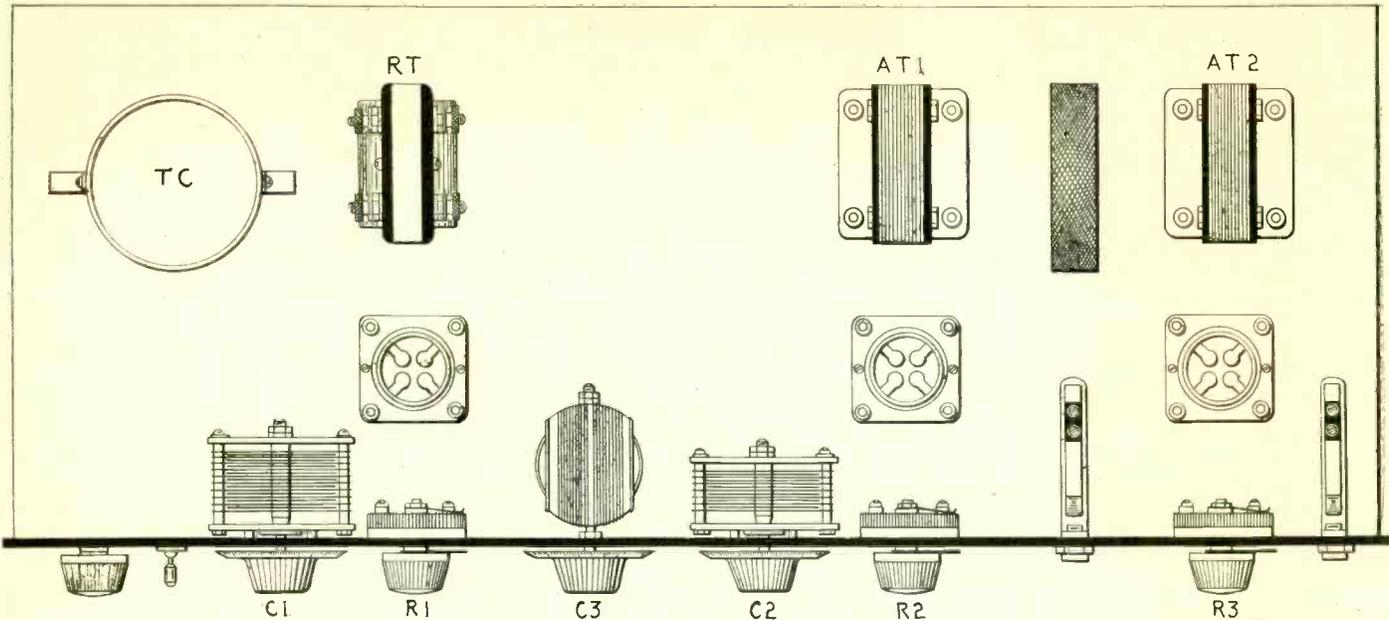


FIG. 5—Constructional layout for the Improved Ultra Reflex. TC is the tuning coil detailed in Fig. 2 (below). The knob at extreme left, on panel, is for the tap switch (C4 in Fig. 1). Next is a battery switch C1, 23-plate variable condenser; C2, 11-plate; C3, variocoupler; AT1 and AT2, audio transformers (separated by the choke coil shown in Fig. 3, below). R1, RF rheostat, for first tube; R2, rheostat for second or reflex tube; R3, rheostat for straight audio, or third tube. The other figures represent the three sockets and two jacks.

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varied at will, allowing the coil to be tapped at 5 different points between the 50th and 57th turns. (Fig. 2).

The choke coil may be either a commercial 200-turn honeycomb or may be made by the fan himself by winding 150 turns of 22 DSC of 22 DSC on a three inch tube of cardboard or bakelite (Fig. 3).

The RF transformer RT may be of any standard make so long as it covers a wave band from about 250 to 550 meters.

It is well not to start wiring and soldering until all the parts needed have been placed on the baseboard and the best position found. You may have to do some slight shifting to space parts most advantageously and to keep the wiring as short as possible. Fans who have constructed sets and have re-wired them three or four times, each time shortening the wiring, have been surprised with the improved results. Therefore do it carefully and right the first time. The energy picked up by even the best aerial is an infinitely small quantity, and should not be dissipated through uselessly long wiring. At first sight it may appear to the builder that he has made the wiring short and he may fully believe so. But after looking into the matter carefully he will

invariably find that he can take off 1 inch wiring here, another 1/2 inch there and still another 1/2 inch elsewhere. Combining all these possible amputations, the builder will find that he can shorten the wiring of his set by a foot or two with increased efficiency.

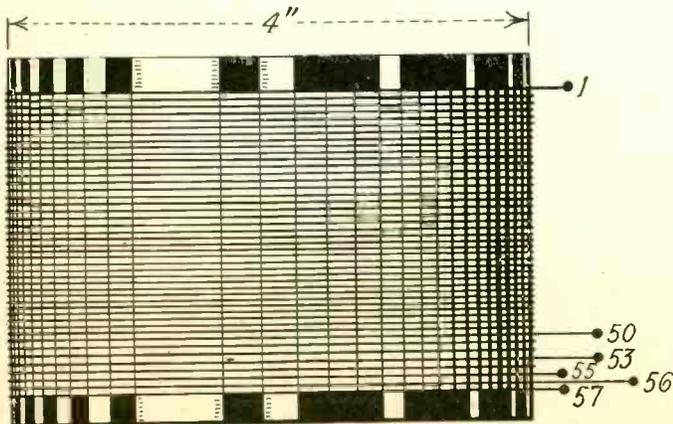


FIG. 2—Tuning coil, consisting of 57 turns of DSC wire wound clockwise on a 4-inch tube. Wind 50 turns, then tap at 50th turn. Tap also at the 53rd, 55th and 56th turns. The aerial must be connected to the binding post of the movable switch lever.

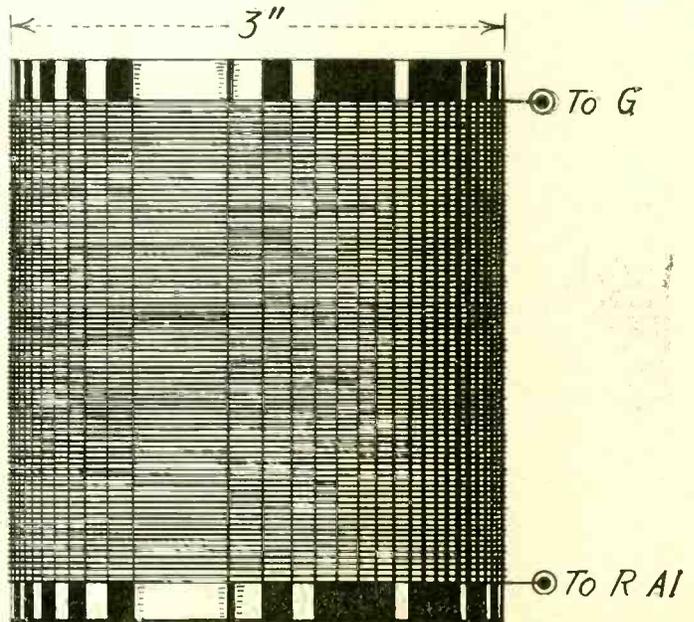
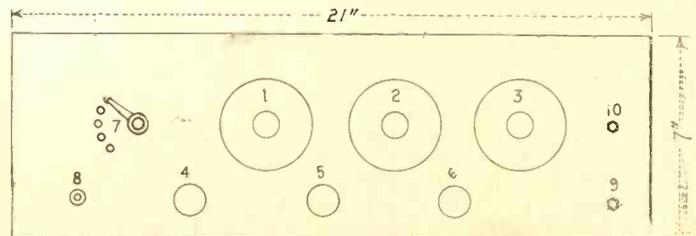


FIG. 3—The choke coil consist of 150 turns of 22 DSC wire, wound clockwise on a 3 inch tube. It is connected, one end to post G of transformer AT1 and the other end to the grid connection of socket RA1 (designated R2A1 in the diagram, Fig. 1.)



PANEL LAYOUT of the Ultra Reflex, keyed as follows: 1, first condenser, 23-plate; 2, variocoupler; 3, second condenser, 11-plate; 4, rheostat for RF tube; 5, rheostat for T2A1 tube; 6, rheostat for A2 tube; 7, tap switch; 8, battery switch; 9, phone jack, and, 10, loud speaker jack. (Fig. 4.)

BROADCAST PROGRAMS

INCLUDING THE CONVENTION

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; m, meters; k kilocycles.

D. S. T.—Daylight Saving Time.
E. S. D. S. T.—Eastern Standard Daylight Saving Time.

How to tune in a desired distant station at just the right time—Choose your station from the big list published herewith. See what time division the station is under (E. S. T., C. S. T., etc.); then consult the table below. Add to or subtract, as directed, from the time as given on the PROGRAM. The result will be the time BY YOUR CLOCK that you should tune in. The

If you are in	And want a station in	Subtract	Add
E. S. T.	C. S. T.		1 hr.
E. S. T.	M. T.		2 hrs.
E. S. T.	P. T.		3 hrs.
C. S. T.	E. S. T.	1 hr.	
C. S. T.	M. T.		1 hr.
C. S. T.	P. T.		2 hrs.
M. T.	E. S. T.	2 hrs.	
M. T.	C. S. T.	1 hr.	
M. T.	P. T.		1 hr.
P. T.	E. S. T.	3 hrs.	
P. T.	C. S. T.	2 hrs.	
P. T.	M. T.	1 hr.	

If you are under Daylight Saving Time, and the station you want is under that time, too, or if both are under Standard Time, the above table will hold.

If you are under Daylight Saving Time, and the station operates under Standard Time, add one hour to the table result.

If the station uses Daylight Saving Time, and you are under Standard Time, subtract one hour from the table result.

Thursday, June 26

WOR, Newark, N. J., 405m (740k), E. S. D. S. T.—6:15 P. M., Albert E. Sonn, Technical Editor, weekly talk on "Radio for the Layman." 6:25 P. M., Resume of the Happenings, National Democratic Convention, by Mrs. Earl Harding. 6:30 P. M., "Music While You Dine," Tom Cooper's Country Club Orchestra. 7:20 P. M., resume of the day's sports.

WDAR, Philadelphia, 395m (760k), E. S. D. S. T.—12 noon, organ recital from Stanley Theatre; features from studio; Arcadia concert orchestra. 2 P. M., Arcadia concert orchestra. 4:30 P. M., recital from studio. 5:30 P. M., educational talk by member of faculty of Peirce School. 5:45 P. M., baseball and sports results. 7:30 P. M., Dream Daddy with the boys and girls; bed time story.

WHN, New York, 360m (830k), E. S. D. S. T.—5 P. M., Buddy Baldwin's Nassau Hotel orchestra. 6 to 7 P. M., at the festive board. 7 P. M., "Sport Period," by Thornton Fisher. 9:30 P. M., All Nation's Ass'n. 10 P. M., Harry Hock and his entertainers. 10:15 P. M., Sara V. Turits, soprano. 10:30 P. M., Hoyer Linger, bass baritone. 10:40 P. M., songwriter's controversy. 10:45 P. M., Roseland dance orchestra. 11:15 P. M., Sylvia Brown, popular songs. 11:25 P. M., Ross Fowler, baritone soloist. 11:30 P. M., original James Boys.

WIP, Philadelphia, 509m (590k), E. S. D. S. T.—3:30 P. M., concert by Comfort's Philharmonic orchestra; Miss Veronica Sweigart, mezzo-soprano. 6 P. M., weather forecast. 6:05 P. M., dinner music, William Smith and his dance orchestra. 6:45 P. M., Agriculture livestock and produce market reports. 7 P. M., Uncle Wip's bedtime stories and roll call for children. 8 P. M., concert by Comfort's Philharmonic orchestra. 8:45 P. M., concert by Vessella's concert band; Miss Margaret Keever, contralto. 11:15 P. M., dance music by LeRoyale orchestra.

WJZ, New York, 455m (660k), E. S. D. S. T.—5:30 P. M., agricultural reports; Farm and Home reports; closing quotations, N. Y. Stock Exchange; foreign exchange quotations; news. 7 P. M., Pershing Square Cafe Savarin ensemble. 7:20 P. M., financial developments of the day. 8 P. M., weekly French lesson. 8:30 P. M., Wanamaker concert from Wanamaker Auditorium. 9:30 P. M., milk fund bout, direct from Yankee Stadium, Tunny vs. Erminio Spalla. J. Andrew White announcing. 10:30 P. M., Hotel Majestic orchestra.

WJY, New York, 405m (740k), E. S. D. S. T.—7:30 P. M., Emma Burkhardt, contralto. 7:45 P. M., Frank Banister, popular songs. 8 P. M., American Museum of Natural History, "Hunting Bee-Hives With a Bird," Dr. James P. Chapin. 8:15 P. M., Ace Brigade and his 14 Virginians.

WGI, Medford, Mass., 360m (830k), E. S. D. S. T.—6:30 P. M., closing stock market reports; aggrograms; Boston police reports. 6:45 P. M., code practice. 7 P. M., meeting, Amrad Big Brother Club. 7:30 P. M., evening program: talk by Geoffrey L. Whalen, "The Radio Movie Man." 7:45 P. M., "Bernie and his Bunch." 8:15 P. M., musicale; weather report and time.

WRC, Washington, 469m (640k), E. S. T.—5:15 P. M., instruction in international code. 6 P. M., children's hour by Peggy Albion. 7:45 P. M., talk on motoring, auspices A. A. A. 8 P. M., xylophone solos by Sam Rosey. 8:15 P. M., Hazen T. Buehler, mezzo-soprano. 8:30 P. M., concert by Columbian artists. 9 P. M., song



THE MACDOWELL SISTERS, known throughout the United States, Canada, Mexico and Cuba as the Sweethearts of the Air, are on their way back to their home town, Dallas, Texas, returning from New York, where they made phonograph records under the personal supervision of Thomas A. Edison. In Dallas they plan to open a music shop, employing only disabled veterans of the World War who are in need of a position. The MacDowell Sisters, who played their way into the hearts of the radio public with their Hawaiian melodies and songs, are great favorites, especially at WFAA, Dallas, where they will probably have their first return engagement over the air July 1.

recital by Helen Virginia Clark, soprano. 9:15 P. M., dance program by Pete Macias' L'Aiglon orchestra. 9:55 P. M., time signals and weather forecasts.

WOO, Philadelphia, 509m (590k), E. S. D. S. T.—12 noon, luncheon music by Tea Room orchestra. 12:55 P. M., time signals. 4:45 P. M., grand organ and trumpets. 7:30 P. M., sports results and police reports. 10:55 P. M., time signals and weather forecast.

WOC, Davenport, Ia., 484m (620k), C. S. T.—11 A. M., weather and river forecast. 11:05 A. M., market quotations. 12 noon, chimes concert. 12:15 P. M., weather forecast. 1 P. M., closing stocks and markets, including weekly report of wool market. 5:45 P. M., chimes concert. 6:30 P. M., Sandman's visit. 6:50 P. M., sport news and weather forecast. 9 P. M., orchestra program.

KSD, St. Louis, 546m (550k), C. S. T.—KSD will broadcast proceedings of the Democratic National Convention, New York, direct from Madison Square Garden. This will be a 24-hour service. Market quotations, etc., will be broadcast at the regular hours, as far as possible. 9:30 P. M., special anniversary program celebrating the second anniversary of KSD station. Address by Mayor Henry W. Kiel. Artist program by leading St. Louis musical artists.

WMAQ, Chicago, 448m (570k), C. S. D. S. T.—There will be no program scheduled for this entire week inasmuch as station WMAQ will be broadcasting the Democratic National Convention in session at New York City during all our regular broadcasting hours. In case of a cessation of activities station WMAQ will be prepared to put on a musical program Thursday, Friday and Saturday. 1:00-3:00, 4:00-7:00, 8:00-10:00 P. M.

WEAF, New York, 492 (610k), E. S. D. S. T.—11:00 A. M., talks to housewives; market and weather reports. 4:00-6:00 P. M., Ernest Cutting and His James Boys' Orchestra; Sara Hammond, soprano, accompanied by William G. Hammond; children's program. 6:00-12:00 P. M., dinner music from Rose Room, Hotel Waldorf-Astoria; Interdenominational services, auspices Greater New York Federation of Churches; Mrs. Thornton Fisher, contralto, accompanied by Virginia Jones; Ralph Reichenthal, pianist; talk by Bank of America; John Alden Spooner, tenor; Emma Morris, soprano; Vincent Lopez and His Orchestra from the Roof Garden, Hotel Pennsylvania.

WNAC, Boston, 278m (1080k), E. S. D. S. T.—10:00 A. M., WNAC Women's Club talks. 11:00 A. M. to 5:00 P. M., broadcast from Madison Square Garden, New York, Democratic National Convention. 6:30 P. M., WNAC dinner dance. 7:30 P. M., broadcast from Madison Square Garden, New York, Democratic National Convention.

WAAM, Newark, N. J., 263m (1140k), E. S. D. S. T.—7:30 P. M., Misses Alice Rincks and Lillian Spitzer, concert pianist and violinist. 8:00 P. M., Walter Storey, current motion pictures. 8:15 P. M., Mademoiselle A. Van Den Brandeler, operatic numbers. 8:45 P. M., Sam Taub, weekly boxing review and predictions. 9:00 P. M., Victor Wilbur, baritone. 9:15 P. M., Rev. Dr. Arthur W. Brooks, scientific astrologist and vocational guidance expert, talk on the "Turn of the Wheel of Events," followed by the reading of horoscopes of members of the radio audience. 9:30 P. M., questions and answers by the radio station WAAM staff and engineering department. 10:00 P. M., Charles J. Sanders Dance Orchestra.

KDKA, Pittsburgh, 326m (920k), E. S. D. S. T.—5:30 P. M., dinner concert by the KDKA Little Symphony Orchestra. 6:00 P. M., baseball scores. 6:30 P. M., the children's period, "Old King Cole" with his fiddlers three will give us some jolly tunes. 6:45 P. M., news bulletins. 7:00 P. M., baseball scores; "Your Garden This Summer," Radio Garden editor. 7:15 P. M., program arranged by the national stockman and farmer, including the market reports. 8:00 P. M., baseball scores; concert by the Pitt-Penn Concert Quartet, assisted by violin, cello and piano. 9:55 P. M., time signals; weather forecast; baseball scores. 10:00 P. M., concert.

KYW, Chicago, 536m (560k), C. S. D. S. T.—5:45 P. M., children's bedtime story. 6:00 P. M., dinner concert. 6:35 P. M., talk on "Sports," furnished by Leo Fisher. 6:45 P. M., talk on "Finance and Markets" by Mr. Thos. Hoynes. 7:00 P. M., "Twenty Minutes of Good Reading" by Rev. C. J. Perrin. 7:20 to 9:15 P. M., musical program. 8:15 P. M., "Safety First" talk by Mr. C. Z. Elkin, Chicago Motor Club. 9:00 to 10:30 P. M., late studio program.

WBZ, Springfield, Mass., 337m (890k), E. S. D. S. T.—6:30 P. M., music by Leo Reisman and His Hotel Brunswick Orchestra. 7:00 P. M., results of games, Eastern, American and National Leagues; market reports. 7:05 P. M., letter from New England Homestead; "At the Theatre" with A. L. S. Wood. 7:30 P. M., bedtime story for the kiddies. 9:00 P. M., concert by R. H. White Company's Liberty Chorus. 10:55 P. M., time signals and weather reports.

WCAE, Pittsburgh, 462m (650k), E. S. D. S. T.—12:30 P. M., news; weather reports. 3:30 P. M., baseball scores. 4:30 P. M., stock market reports; "The Sunshine Girl." 6:30 P. M., dinner concert from William Penn Hotel. 7:30 P. M., Uncle Kaybee. 7:45 P. M., baseball scores; vocal selections by Ben Fields, WCAE's own entertainer; Miss Thelma Fields, accompanist. 8:30 P. M., Royal Entertainers and the Royal Four. 11:00 P. M., continuation of 8:30 program.

WWJ, Detroit, 517m (580k), E. S. T.—10:25 A. M., weather forecast. 11:55 A. M., time relayed by the Western Union. 12:00 P. M., Detroit News Orchestra. 3:00 P. M., concert by Schmeman's Concert Band. 3:50 P. M., weather forecast. 3:55 P. M., market reports and baseball scores. 5:00 P. M., baseball scores. 7:00 P. M., Detroit News Orchestra. 7:30 P. M., concert by Schmeman's Concert Band. 10:00 P. M., dance music by Jean Goldkette's Orchestra.

Friday, June 27

WOR, Newark, N. J., 405m (740k), E. S. D. S. T.—6:15 P. M., Agnes Leonard in songs for the children. 6:30 P. M., "Man in the Moon" stories for children. 7 P. M., Gladys C. Doane, soprano; Frances Rittenhouse, pianist, and F. Clyde Doane, tenor. 7:20 P. M., resume of the day's sports.

WDAR, Philadelphia, 395m (760k), E. S. D. S. T.—2 P. M., Arcadia concert orchestra. 4:30 P. M., dance program by Pott's orchestra. 5 P. M., baseball and sports results. 7:30 P. M., Dream Daddy with the boys and girls. 7:50 P. M., book review. 8:30 P. M., recital from studio. 9 P. M., playlet. 10 P. M., recital from the studio, Howard Lanin's orchestra.

WHN, New York, 360m (830k), E. S. D. S. T.—5 P. M., musical program to be announced. 6 to 7 P. M., at the festive board. 7 to 7:15 P. M., "Sport Period," by Thornton Fisher. 9:30 P. M., Chas. Strickland's Palisades Orchestra. 10 P. M., Minnie Eichinger, classical soprano. 10:15 P. M., Fred R. Goodrich, tenor. 10:30 P. M., Roseland dance orchestra. 11 P. M., Ted Barron program. 11:30 P. M., original James Boys.

WIP, Philadelphia, 509m (590k), E. S. D. S. T.—3:30 P. M., Comfort's Philharmonic orchestra; Miss Veronica Sweigart, mezzo-soprano. 6 P. M., weather forecast. 6:05 P. M., dinner music, Jordan Lewis dance orchestra. 6:45 P. M., Agriculture livestock and produce market reports. 7 P. M., Uncle Wip's bedtime stories and roll call for children.

WJZ, New York, 455m (660k), E. S. D. S. T.—5 P. M., Ridge Club orchestra. 5:30 P. M., agricultural reports; Farm and Home reports; closing quotations, N. Y. Stock Exchange; foreign exchange quotations; news. 7:20 P. M., financial developments of the day. 8:10 P. M., Goldman band concert, direct from Mall, Central Park; Schubert program; Waino Kauppi, cornetist. 10:30 P. M., Harold Stern's Hotel Belleclair orchestra.

WJY, New York, 405m (740k), E. S. D. S. T.—8 P. M., looseleaf current topics. 8:30 P. M., time's pop question game. 8:45 P. M., Mierio Ferrari, baritone, accompanied by Keith McLeod. 9:15 P. M., George L. Chesterton, "Australian Poetry."

WOS, Jefferson City, Mo., 441m (680k), C. S. T.—8 P. M., John Ashton, Missouri State Board of Agriculture, "In the Interesting Story of Short-horn Cattle in Missouri Prior to the Civil War." 8:20 P. M., musical program announced.

WGI, Medford, Mass., 360m (830k), E. S. D. S. T.—12 noon, selections on the Ampico in the Chickering; Miss Drew's ten minutes; selections on the Brunswick. 12:40 P. M., weather forecast. 12:45 P. M., farmers produce report. 6:30 P. M., market reports; code practice; Boston police reports. 7 P. M., meeting, Amrad Big Brother Club. 7:30 P. M., evening program, Mr. Charles L. H. Wagner, radio poet. 7:40 P. M., late Ampico releases. 8 P. M., musicale; weather report and time.

WOAW, Omaha, Neb., 526m (570k), C. S. T.—6 P. M., speakers' half-hour. 6:30 P. M., dinner program by Russ Townsend's orchestra. 9 P. M., program by J. E. Brill, violinist.

WRC, Washington, 469m (640k), E. S. T.—3:20 P. M., "Beauty and Personality," by Elsie Pierce. 3:25 P. M., current topics, editor of "The Review of Reviews." 3:35 P. M., piano recital by Ethel Grant. 3:50 P. M., Magazine of Wall Street. 4 P. M., song recital announced. 5:15 P. M., time signals and weather forecasts. 6 P. M., stories and songs for children by Peggy Albion and Mary Frances Glenn.

WOO, Philadelphia, 509m (590k), E. S. D. S. T.
—12 noon, luncheon music by Tea Room orchestra. 12:55 P. M., time signals. 4:45 P. M., grand organ and trumpets. 7:30 P. M., sports results and police reports. 10:55 P. M., time signals and weather forecast.

WOC, Davenport, Ia., 484m (620k), C. S. T.
—11:05 A. M., market quotations. 12 noon, chimes concert. 1 P. M., closing stocks and markets. 5:45 P. M., chimes concert. 6:30 P. M., Sandman's visit. 6:50 P. M., sport news and weather forecast. 8 P. M., musical program; Junior orchestra of the Davenport Woman's Club. 9 P. M., weekly tourists' road bulletin.

KSD, St. Louis, 546m (550k), C. S. T.—KSD will broadcast proceedings of the Democratic National Convention, New York, direct from Madison Square Garden. This will be a 24-hour service. Market quotations, etc., will be broadcast at the regular hours, as far as possible. 8:00 P. M., Silverman's Orchestra concert from Lyric Skydome. Note: This program subject to postponement to 9:30 if there is a night session of the Democratic National Convention.

WEAF, New York, 492m (610k), E. S. D. S. T.
—11:00 A. M., musical program announced; talk, auspices World's Work; talk on flowers by Kenneth Boynton, New York Botanical Gardens; market and weather reports. 4:00-6:00 P. M., Harry Brown, violinist; Marguerite Dingwell, soprano; Lee Terry, pianist; Judith Roth, soprano; children's program. 6:00-10:00 P. M., dinner music from Rose Room, Hotel Waldorf-Astoria, Grace I. Forbes, soprano; Ramos Family Orchestra; bedtime story; The Happiness Boys, Billy Jones and Ernest Hare; Harriet Hubbard, dramatic soprano, accompanied by Mabelanna Corby; B. Fischer's "Astor Coffee" Dance Orchestra.

WNAC, Boston, 278m (1080k), E. S. D. S. T.
—10:00 A. M., WNAC Women's Club talks. 11:00 A. M. to 5:00 P. M., broadcast from Madison Square Garden, New York. Democratic National Convention. 6:00 P. M., children's half hour. 6:30 P. M., WNAC dinner dance, Checker Inn Orchestra. 7:30 P. M., broadcast from Madison Square Garden, New York, Democratic National Convention.

KDKA, Pittsburgh, 326m (920k), E. S. D. S. T.
—5:30 P. M., organ recital by Paul Fleecker from Cameo Motion Picture Theatre. 6:00 P. M., baseball scores. Dinner concert. 6:30 P. M., the children's period. 6:45 P. M., news bulletins. 7:00 P. M., baseball scores. 7:30 P. M., address by the United States Bureau of Mines. 7:40 P. M., National Stockman and Farmer market reports. 8:00 P. M., baseball scores; Harry Greb and Jack Delaney, world's middleweight title at the Yankee Stadium, New York City. 9:55 P. M., time signals; weather forecast; baseball scores.

KYW, Chicago, 536m (560k), C. S. D. S. T.
—5:00 P. M., news, financial and final markets. 5:45 P. M., children's bedtime story. 6:00 to 6:30 P. M., dinner concert from Congress Hotel. 7:20 P. M., talks, auspices American Farm Bureau Federation. 9:00 to 11:30 P. M., Midnight Revue.

WBZ, Springfield, Mass., 337m (890k), E. S. D. S. T.
—7:30 P. M., bedtime story for the kiddies. 10:00 P. M., concert by Jeannette Miller, soprano; Erdine Maddock, contralto; Thomas J. Kelly, baritone; Walter L. Marmand, tenor; Annie Remer, pianist; Robert Livesey, accompanist; Gertrude DeLosey, mezzo soprano. 10:55 P. M., time signals and weather reports. 11:00 P. M., concert by the WBZ Trio, Harry Knight, clarinet; program by the Hawaiian Orchestra.

WCAE, Pittsburgh, 462m (650k), E. S. D. S. T.
—12:30 P. M., news; weather reports. 3:30 P. M., baseball scores. 4:30 P. M., special children's program, conducted by the Sunshine Girl. 6:30 P. M., dinner concert from William Penn Hotel. 7:30 P. M., Uncle Kaybee. 8:00 P. M., baseball scores. 8:30 P. M., musical program by the Pittsburgh Mandolin Orchestra.

WWJ, Detroit, 517m (580k), E. S. T.—10:25 A. M., weather forecast. 11:55 A. M., Arlington time. 12:00 P. M., Detroit News Orchestra. 3:00 P. M., concert by Schmeman's Concert Band. 3:50 P. M., weather forecast. 3:55 P. M., market reports and baseball scores. 5:00 P. M., baseball scores. 7:00 P. M., Detroit News Orchestra. 7:30 P. M., concert by Schmeman's Concert Band.

Saturday, June 28

WOR, Newark, N. J., 405m (740k), E. S. D. S. T.
—6:15 P. M., resume, happenings of National Democratic Convention by Mrs. Earl Harding. 6:20 P. M., "Music While You Dine." Cinderella Georgia Melodians. 7:20 P. M., resume of the day's sports. 8 P. M., Gene Ingraham's Bell Record orchestra, and Bell Record artists. 8:55 P. M., artists of Carroll Vocal Studio New York City. 9:30 P. M., Senator "Pat" Harrison of Missouri and Hon. Herbert Pell, chairman, N. Y. State Democratic Committee. 10 P. M., Ben Friedman entertainers.

WDAR, Philadelphia, 395m (760k), E. S. D. S. T.
—12 noon, organ recital from Stanley Theatre; features from studio; Arcadia concert orchestra. 2 P. M., Arcadia concert orchestra; Esther Cohen, soprano; Francis Linett, accompanist; Emil Fritz, flutist. 4:30 P. M., Bobbie Lee and his Cotton Pickers. 5:45 P. M., baseball and sports results. 7:30 P. M., Dream Daddy with the boys and girls.

WHN, New York, 360m (830k), E. S. D. S. T.
—7:30 P. M., musical program. 8 P. M., Jimmy Flynn, tenor. 8:30 P. M., Ace Brigade and his 14 Virginians. 9 P. M., "Circumstantial Evidence," by Irving Franklin Russell. 9:05 P. M., Iosiah B. Free, baritone. 9:15 P. M., Ellen M. Cross, classical program. 9:30 P. M., Chas. Strickland's Palisades orchestra. 10 P. M., Fitzpatrick Brothers, old time medleys. 10:15 P. M., George Roberts and Jimmy Doyle, popular program. 10:30 P. M., Helen Dowdy, soprano. 10:45 P. M., Jimmy Clarke and his entertainers. 12 P. M., Broadway Jones and his Club Tennessee review.

WIP, Philadelphia, 509m (590k), E. S. D. S. T.
—3:30 P. M., concert by Comfort's Philharmonic or-



Convention Delegates from the Eastern part of the United States will have an opportunity to see their favorite radio impresario in action next week at the Capitol Theatre. S. L. Rothafel announces that he will conduct the Capitol Grand Orchestra for the overture, Elgar's "Pomp and Circumstance," at 9:30 every evening next week. (Kadel & Herbert)

chestra; Miss Veronica Sweigart, mezzo-soprano. 6 P. M., weather forecast. 6:05 P. M., dinner music, William Smith and his dance orchestra. 6:45 P. M., Agriculture, livestock and produce market reports. 7 P. M., Uncle Wip's bedtime stories and roll call for children. 8 P. M., concert by Comfort's Philharmonic orchestra. 8:45 P. M., Vessella's concert band; Miss Margaret Keever, contralto. 10 P. M., organ recital by Karl Bonawitz, broadcast from Germantown Theatre. 10:15 P. M., dance music by Bob Lehman's orchestra.

WJZ, New York, 455m (660k), E. S. D. S. T.
—4 P. M., Paul Specht presents Harold Oxley's Post Lodge orchestra. 5 P. M., Sara V. Tu Rits, soprano. 5:30 P. M., agricultural reports; Farm and Home reports; closing quotations, N. Y. Stock Exchange; foreign exchange quotations; news. 7 P. M., Billy Wynne's Greenwich Village Inn orchestra. 8 P. M., Wirt W. Barnitz, travel talk. 11 P. M., Club Lido Venice orchestra.

WGI, Medford, Mass., 360m (830k), E. S. D. S. T.
—6:30 P. M., code practice; weather forecast; New England crop notes. 7 P. M., meeting, Amrad Big Brother Club. 7:30 P. M., talk on current events by David M. Cheney; musicale; weather report and time.

WOAW, Omaha, Neb., 527m (570k), C. S. T.
—6 P. M., dinner program. 9 P. M., program, auspices of Omaha Printing Co.

WRC, Washington, 469m (640k), E. S. T.
—5:15 P. M., instruction in International Code. 6 P. M., children's hour by Peggy Albion. 6:20 P. M., baseball scores. 7:45 P. M., Bible talk. 8:15 P. M., Dorothy D. Wilson, contralto. 8:30 P. M., "Giving Radio a Permanent Place in the Home," by M. S. Strock, of the Bureau of Standards. 9 P. M., Ruth Peter, soprano. 9:15 P. M., concert by United States Marine band.

WOO, Philadelphia, 509m (590k), E. S. D. S. T.
—12 noon, luncheon music by Tea Room orchestra. 12:55 P. M., time signals. 4:45 P. M., grand organ and trumpets. 7:30 P. M., sports results; police reports; dinner music by A. Candelori and Hotel Adelphia orchestra. 8:30 P. M., concert by the R. C. O. band; Julia Gilbert, contralto. 9:15 P. M., grand organ recital, Mary E. Vogt. 10 P. M., dance program, Hotel Adelphia orchestra.

WOC, Davenport, Ia., 484m (620k), C. S. T.
—11:05 A. M., government bulletins. 11:15 A. M., closing market quotations. 12 noon, chimes concert. 12:15 P. M., weather forecast. 5:45 P. M., chimes concert. 6:30 P. M., Sandman's visit. 6:50 P. M., sport news and weather forecast. 9 P. M., orchestra program, the Palmer School radio orchestra.

KSD, St. Louis, 546m (550k), C. S. T.—KSD will broadcast proceedings of the Democratic National Convention, New York, direct from Madison Square Garden. This will be a 24-hour service. Market quotations, etc., will be broadcast at the regular hours, as far as possible. 8:00 P. M., Missouri Theatre Orchestra and specialties broadcast from Missouri Theatre.

WEAF, New York, 492m (610k), E. S. D. S. T.
—4:00-6:00 P. M., Mount Royal Orchestra; Mary Hopple, contralto; Clara Chalpin, pianist. 6:00-12:00 P. M., dinner dance from the Rose Room, Hotel Waldorf-Astoria; Bud Fischer Happy Players Orchestra; bedtime story; Nancy McCord, soprano; Ruth Friedman, pianist; Harry Hadley Schvde, bass; Vincent Lopez and His Orchestra.

PWX, Havana, 400m (750k), E. S. T.—7:00 P. M., dancing audition at the studio of station PWX by the orchestra of Mr. Antonio Romeu.

CKAC, Montreal, 425m (700k), E. S. D. S. T.
—7:00 P. M., kiddies' stories in French and English. 7:30 P. M., Rex Battle's Concert Orchestra. 8:30 P. M., special entertainment. 10:30 P. M., Mount Royal Hotel Roof Garden dance program, C. Smith and His Orchestra.

WNAC, Boston, 278m (1080k), E. S. D. S. T.
—10:00 A. M., WNAC Women's Club talks. 11:00 A. M. to 5:00 P. M., broadcast from Madison Square Garden, New York. Democratic National Convention. 6:30 P. M., WNAC dinner dance, Shepard Colonial Orchestra. 7:30 P. M., broadcast from Madison Square Garden, New York, Democratic National Convention.

KDKA, Pittsburgh, 326m (920k), E. S. D. S. T.
—5:30 P. M., dinner concert by the Westinghouse Band. 6:00 P. M., baseball scores. 6:30 P. M., the children's period. 7:00 P. M., baseball scores; "Sports Review" by James J. Long, sport writer. 8:00 P. M., concert by the Westinghouse Band. 9:55 P. M., time signals; weather forecast; baseball scores.

KYW, Chicago, 536m (560k), C. S. D. S. T.
—5:02 P. M., news; financial and final markets. 6:00 P. M., dinner concert broadcast from Congress Hotel. 7:00 P. M., musical program. 8:00 P. M., talk by Vivette Gorman, Home Economics Dept. 8:05 P. M., short stories, articles and humorous sketches. 8:15 to 11:30 P. M., late show, broadcast from KYW's studio in Congress Hotel.

WBZ, Springfield, Mass., 337m (890k), E. S. D. S. T.—6:00 P. M., concert by the Leo Reisman Hotel Lenox ensemble. 7:00 P. M., results of games, Eastern, American and National Leagues; market reports. 7:30 P. M., bedtime story for the kiddies. 7:40 P. M., Concert by the Hotel Kimball Trio. 9:00 P. M., concert direct from Hume Music Co., arranged by Minne Stratton-Niccoli, violinist; Ramon Ricaldi, tenor; Frank Watson, Ethel Walcott Ross, soprano; Alleccandra Watson, pianist; Minnie Stratton Watson, accompanist. 10:55 P. M., time signals and weather reports.

WCAE, Pittsburgh, 462m (650k), E. S. D. S. T.
—3:00 P. M., musical program by Billy Zoffer's Music Box Cafe Orchestra and assisting soloists and entertainers; baseball scores. 6:30 P. M., dinner concert, William Penn Hotel. 7:30 P. M., Uncle Kaybee. 7:45 P. M., baseball scores; vocal selection by Lew Kennedy, baritone. 8:30 P. M., musical program, Knights of Columbus Orchestra.

WWJ, Detroit, 517m (580k), E. S. T.—10:25 A. M., weather forecast; 11:55 A. M., Arlington time. 12:00 M., Detroit News Orchestra. 3:00 P. M., concert by Schmeman's Concert Band. 3:50 P. M., weather forecast. 3:55 P. M., market reports and baseball scores. 5:00 P. M., baseball scores. 7:30 P. M., concert by Schmeman's Concert Band.

Sunday, June 29

KGW, Portland, Ore., 492m (610k), P. T.
—6 P. M., church services by Church of Our Father (Unitarian), Rev. W. G. Eliot, Jr. 7 P. M., George Olsen's concert orchestra; dinner program; baseball scores.

WIP, Philadelphia, 509m (590k), E. S. D. S. T.
—11 A. M., morning service from Holy Trinity Church, Rev. Floyd W. Tompkins, D.D., rector. 4:30 P. M., exercises of the convention, National Association for Advancement of Colored People.

WOS, Jefferson City, Mo., 441m (680k), C. S. T.
—8 P. M., Union open air religious services broadcast from the Capitol lawn; music by Missouri State Prison band.

WGI, Medford, Mass., 360m (830k), E. S. D. S. T.
—5 P. M., Twilight program: "Adventure Hour," conducted by Youth's Companion; musicale; talk under auspices of Greater Boston Federation of Churches.

WOAW, Omaha, Neb., 526m (570k), C. S. T.
—9 A. M., chapel service, conducted by Rev. R. Brown. 9 P. M., musical chapel service, courtesy Benson Methodist Episcopal Church, Rev. Arthur H. Adams, pastor; Harold H. Thom, choir director; Roma Roth, organist.

WOO, Philadelphia, 509m (590k), E. S. D. S. T.
—2:25 P. M., musical exercises, Sunday afternoon session, Bethany Sunday school; Bethany Sunday School orchestra. 3:15 P. M., sacred recital on Wanamaker grand organ by Clarence K. Bawden. 7:30 P. M., evening services from Bethany Presbyterian Church; organ recital by Miss Caroline Quigg; chorus choir, direction of Prof. Jerry March; Leman string quartette; sermon by Rev. Dr. A. Gordon MacLennan.

WHAS, Louisville, Ky., 400m (750k), C. S. T.
—9:57 A. M., organ music. 10 A. M., church service, auspices Broadway Christian Church, Rev. Dr. W. N. Briney, pastor; Mrs. Harry W. Long, organist and choir director. 4 P. M., sacred concert, direction Mrs. Jack Chase; Miss Margaret Hammerstein, accompanist.

KGO, Oakland, Cal., 312m (960k), P. T.—3:30 P. M., concert by KGO Little Symphony orchestra and soloists.

WBAP, Fort Worth, Tex., 476m (620k), C. S. T.
—11 A. M., complete services, First Methodist Church, Rev. J. W. Bergin, pastor. 7 P. M., sport review. 11 to 12 midnight, popular program.

KFI, Los Angeles, 469m (640k), P. T.—10:00 A. M., L. A. Church Federation service. 4:00 P. M., secular concert. 6:45 P. M., Crosby Sisters and Sigma Pi Trio. 8:00 P. M., Ambassador Hotel Concert Orchestra. 9:00 P. M., Examiner concert. 10:00 P. M., Packard Six Orchestra.

WGY, Schenectady, N. Y., 380m (790k), E. S. T.
—9:30 A. M., service of Emmanuel Baptist Church, Schenectady; sermon by Rev. Dr. A. W. Rogers. 6:30 P. M., service of Emmanuel Baptist Church.

KPO, San Francisco, 423m (710k), P. T.—11:00 A. M., undenominational and non-sectarian church services; soloist, Mrs. C. G. Fries, soprano; organ selections by Theodore J. Irwin. 8:30 P. M., concert by Rudy Seiger's Fairmont Hotel Orchestra.

WDAF, Kansas City, Mo., 411m (730k), C. S. T.
—Note: Broadcasting of the Democratic National Convention from Madison Square Garden, New York, over long distance cables, will start Tuesday, June 24, and will continue daily this week while the convention is in session. The regular schedules will be postponed while the convention is in progress. Baseball scores at 3:30, 4:00, 4:30 and 5:00 o'clock. 4:00 P. M., program broadcast from the Newman Theatre.

KYW, Chicago, 536m (560k), C. S. D. S. T.
—10:00 A. M., Sunday morning service from St. Chrysostom's Episcopal Church, Rev. Norman Hutton, rector. 1:30 P. M., studio chapel service, direction Chicago Church Federation. Speaker to be announced.

WWJ, Detroit, 517m (580k), E. S. T.—7:30 P. M., services at St. Paul's Episcopal Cathedral. 4:00 P. M., concert by Schmeman's Concert Band. 5:00 P. M., Detroit News Orchestra.

KFNF, Shenandoah, Ia., 266m (1130k), C. S. T.
—3:00 P. M., religious services by choir of St. Mary's Church. 6:30 P. M., regular sacred song service.

(Continued on page 18)

A Super-Heterodyne, Using Only Four Tubes, 1

[Bringing the Super-Heterodyne down to the irreducible tube minimum was the task that B. J. Bongart, ingenious radio engineer, carved out for himself. After months of intense experimenting he finally devised the solution—two tubes to deliver the desired signal and two tubes for the two AF stages. No reflexing is done.

A 4-tube Super-Heterodyne! Think of it!

How did he accomplish it? What kind of results does the set produce? What is the difference between the usual 8-tube Super-Heterodyne and this Super-Heterodynettle? Read what Mr. Bongart interestingly says in answer to these questions.]

By B. J. Bongart

FROM the original one-tube type of receiver of the early radio days we have grown by leaps and bounds even up to 13-tube types of receivers. But let us see what can be done, and done well, with a lesser number of tubes and less paraphernalia.

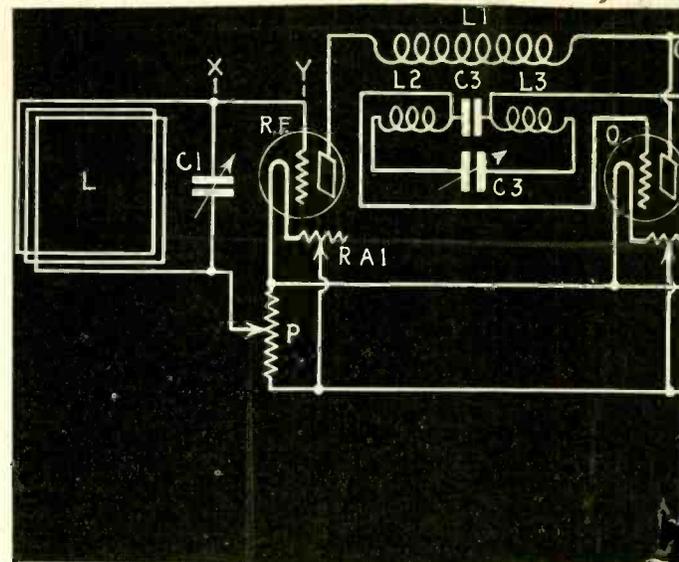
The Super-Heterodyne type of receiver possess qualities not inherent in any other type of receiver and thus has become very popular. The heterodyning of one incoming wave and amplifying this one wave only, to the exclusion of all other waves, provides the apex of radio reception. The Super-Heterodynes thus far advocated have been (with a single exception) of the 8-tube variety, or more, and while the results obtained were creditable, the cost of these multi-tube receivers has prevented many a fan from building one.

The most common fault of the multi-tube receiver is the internal capacity effect, which not only causes losses that cut down the efficiency, but occasions instability. To overcome this fault is not an easy matter.

Numberless are the hookups that have been proposed and tried to make radio-frequency behave, but few have accomplished any worthwhile results. While it is well-known that either RF or regeneration must be used in order that the receiver may pick up distant stations, it is an open question whether the actual results obtained with a multi-stage RF amplifier justify its employment. If radio-frequency in cascaded stages would pick up only what we want, everything would be quite well, but multi-stages of RF habitually picks up everything that is in the air and, to make matters worse, the more stages of RF we couple together the more unstable the circuit becomes. And if we throttle the circuit by the various means proposed, we gain stabilization, but, in my opinion, at the expense of amplification. Since one stage of unthrottled RF may be the equal of two or three stages of throttled RF amplification, it does not seem to me wise to throttle at all. So let us cut down the number of stages rather than muffle them.

Neutralized RF is simple to control and, once balanced, is free from trickiness. But for obvious reasons it cannot be used for more than two stages. Also, thus far at least, nobody has even attempted to construct a Heterodyne using the well-known Neutrodyne principle of radio-frequency amplification. So it would seem best to eliminate RF amplification, except for only one stage. And so we come to the 4-tube Super-Heterodyne!

In the Heterodyne the incoming waves, varying from 230 to more than 500 meters in length, are transformed (heterodyned) into a wave ranging from, say 2,000 to 10,000 meters. Every constructor and manufacturer of Heterodyne transformers has his pet wavelength. For the 2,000-meter outfits the claim of compactness is made, whereas for longer waves, up to the present maximum of 10,000 meters, stability and a certain freedom from internal coupling losses is being claimed. True, both the advocates of the comparatively short 2,-



THE WIRING OF the Four-Tube Super-Heterodyne (Fig. 1), shows the greater distance; C1, 17-plate variable condenser; RF, radio-frequency tube; C3, .001 fixed condenser; O, oscillator tube; R2, RA2, rheostats; AFT, audio-frequency transformer; J1, double

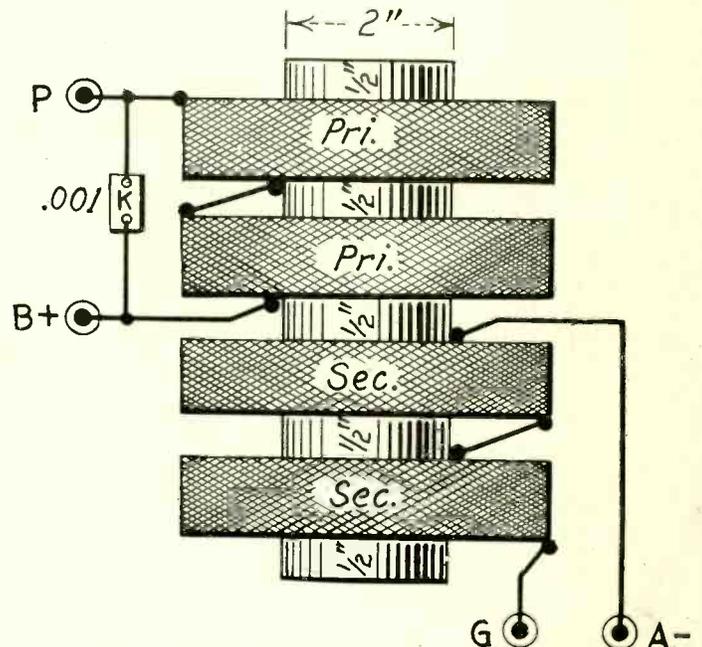
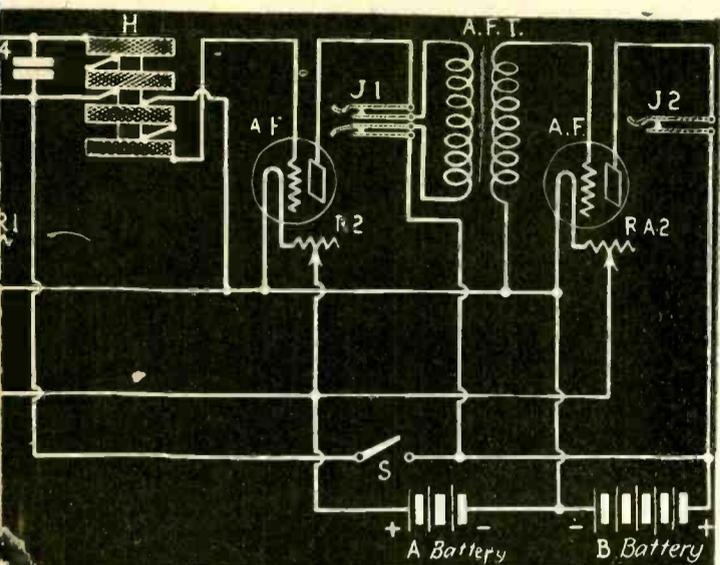


FIG 2—Honeycomb coil for B. J. Bongart's remarkable Super-Heterodyne. It consists of four 1,500-turn HC coils, the two primary coils interconnected and shunted with a .001 fixed condenser. The secondary coils also are connected in series. Each coil is 1/2" from its neighbor. The tube is 2" wide.

000-wave, as well as those of the longer waves reaching up to 10,000 meters, are correct in their statements so far as they go, but they do not go far enough! Why not go a little farther and see what can be accomplished?

A wavelength of 2,000 meters has a frequency of 1,500,000 cycles per second—quite a lot, so to speak—and of course these pulsations are inaudible to the human ear. That these or an even greater number of frequencies are hard to control is readily seen. A 10,000-meter wave corresponds to a frequency of only 30,000 cycles, commonly referred to as 30 keys., meaning 30 kilocycles. There is some gain in stability in using such a comparatively long wave, but even this low frequency is just above audibility! Frequencies from 25,000 cycles per second down are audible to the human ear, hence a wavelength of 12,000 meters and more would provide the means of discarding RF ampli-

What Gets 800 Miles on a Loud Speaker on a Loop



Showing: L, loop; XY, lead, in which optional variometer may be inserted for regeneration; R1, R2, rheostat; P, potentiometer; L1, L2, L3, oscillator coil (see Fig. 3); C1, C2, C3, .001 fixed condensers; H, honeycomb coils (see Fig. 2); AF, audio-frequency amplifier; J1, J2, single-circuit jack; S, battery switch.

amplification is the equal, in volume, to at least two stages of radio amplification, hence simpler. But considering not only the variety of our broadcast programs as to music or speech, but mainly the modulations of the voice, male and female, the diversity of sounds spoken or sung, the variation in frequency pulsating according to whether the music played is jazz or an adagio, and whether rendered pianissimo or fortissimo, make an extremely long wave length necessary in order to "cover" the pulsating frequencies faithfully. We of course bear in mind that no radio amplification is to be used but straight audio only. Thus a wavelength of 50,000 meters is recommended which equals only 6,000 cycles per second. Such "few" pulsating frequencies are distinctly audible and need only to be amplified sufficiently to give loud speaker volume, and for this purpose the simple AF amplification is quite practicable. The Heterodyne can thus be brought down to only four tubes.

The 4-tube Super-Heterodyne—simplicity in itself—is constructed as follows:

1st tube—radio-frequency, sometimes inaccurately called first detector, whereas in reality it is a stage of RF.

2nd tube—oscillator, which changes the incoming wave, whether it be a 230- or a 550-meter wave, or any length in between, to a wave of 50,000 meters.

3rd tube—audio amplifier, building up volume. This stage should suffice for head phones, even loud speaker, on locals.

4th tube—also AF amplifier, building up still more volume for loud speaker rendition.

No, the detector tube was not forgotten! We simply don't need it!

Realizing that the oscillator tube not only oscillates but actually rectifies by virtue of its changing the wave length and thus the frequency cycles to the "audible" range, a detector on this hook-up would be like the fifth wheel on a wagon!

Now, as to performance. This 4-tube "Super-Het" should do at least as good as any other 4-tube receiver so far as distance is concerned. As to volume, few if any 4-tube sets can produce the equal!

In constructing this receiver it will be noted (Fig. 1) that the layout is typically heterodyne fashion, except that all radio-frequency transformers and tubes and the detector tube are omitted. The oscillator tube is directly connected to the honeycomb coil (Fig. 2), which is tuned to pass nothing but 50,000 meter waves of only 6,000 cycles. Such "few" cycles being audible without a detector tube, they are subsequently merely amplified by the following tubes and one audio transformer.

The oscillator coils, L1, L2 and L3 (Fig. 3) can easily be made by anyone. The whole set can be put into a cabinet 7x18. The panel layout is shown in Fig. 4. Those desiring great distance may place an ordinary variometer between X and Y (Fig. 1) to control regeneration. If volume sufficient to bring "down the house" is desired, another tube and one more audio transformer may be added in the conventional way. The first tube (RF) and the last tube (AF) are controlled by amperites for simplicity, but rheostats can be used. The second and third tubes must have rheostats for fine control.

I built this set and it gets Chicago on the loud speaker with easy regularity at my home in Brooklyn.

Use a loud speaker of a good make with this set, as the volume produced would choke a small horn. If headphones are used, be sure that your phone is a 4,000 ohms or over, if you want to keep the phone.

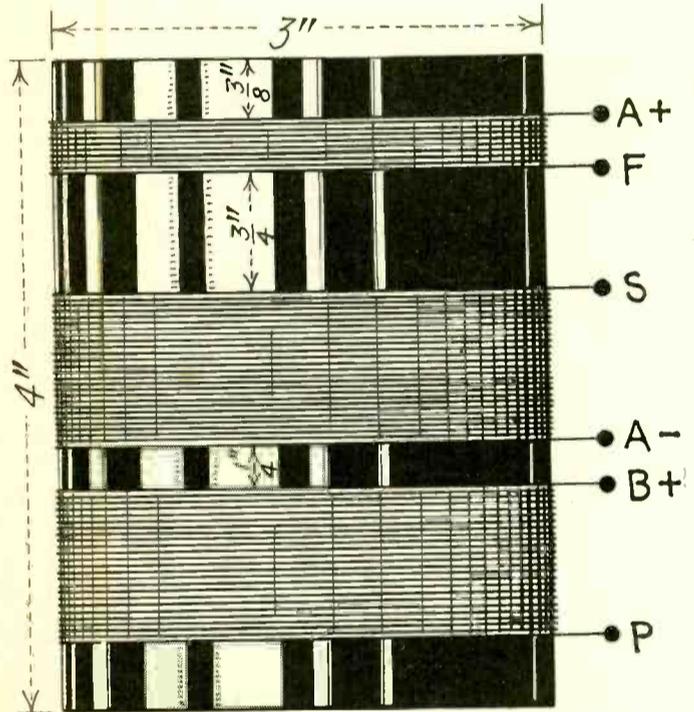


FIG. 3—Oscillator coil. C1 is the pick-up coil, 10 turns double silk-covered No. 24 wire. C2, 35 turns of the same wire spaced 3/4" from pickup coil. C3 also 35 turns of No. 24 wire spaced 1/4" from grid coil C2. The plate coil, C3, must be connected to the B+ and the plate. All coils are wound on the same 3" tube.

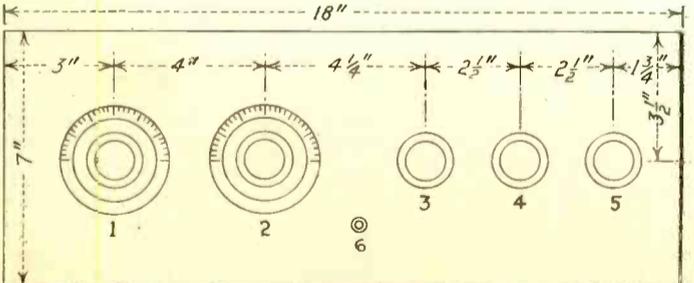


FIG. 4—Panel layout for 4-tube Super-Heterodyne.

amplification and facilitating the use of the more simple and stable AF amplification.

It is generally conceded that one stage of audio

What capacity need condensers have in the secondary of the first and second audio-frequency transformers? 3—Which of the five taps on my variocoupler are to be connected to the switch on the panel? 4—Are switches necessary to be placed on the panel for Cotoco RF variable transformers? 5—I have a .00025 mfd. variable condenser which I would like to use if possible in this circuit. Is there any place it could be used?—W. H. Covell, Room 1308, 75 Public Square, Cleveland, Ohio.

1—The controlling rheostat should have a resistance of 15 ohms. 2—The fixed condensers have a capacity of .001 mfd. in both cases. 3—Five taps are shown on the panel layout, but more may be used. If there are ten taps on your variocoupler, provide for ten more switch points on the panel and use them all. 4—With the RF transformer you mention, no switch need be

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RADIO WORLD
ISSUE OF JUNE 28, 1924

Vol. 5, No. 14. Whole No. 118.

Illustrated

Every Week

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WHAS, Louisville, Ky., 400m (750k), C. S. T.—4:50 P. M., local livestock, produce and grain market reports. 4:55 P. M., baseball scores. 5 P. M., Central Standard time. 7:30 to 9 P. M., agricultural tabloid talk; concert by the ZurSchmiede Harmony Diggers; reading, Mrs. Cordia Greer Petrie; late news bulletins; baseball scores; Central Standard time at 9 o'clock.

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JUNE 28, 1924

Apportion Your Efforts Wisely

TO the experimenter nothing in a set should come ahead of the results in sound. Though appearance is as important as you care to regard it, there is no choice when it comes to audible reckoning, quality of reception—that is the primary requisite!

An expert may make a set that looks awkward inside—but another expert, correctly appraising it, will see it is a good job indeed. Plate and grid wires are kept far apart, never run parallel. The aerial and ground leads are short. In fact, all leads are, and the set works fine. An experimenter of considerable experience may have a dozen or so "stunts" to try out and naturally is not going to put fifty hours of aesthetic touches on each experiment. A novice at radio principles, who is mechanically skilful, may turn out the neatest imaginable job, yet a poorly designed set, if he doesn't watch his goal.

Actual assembly and wiring demand great care. Pains should not be expended on the woodwork, or graining the panel, or making a decoration of wires nobody sees, at the expense of electrical efficiency. Everybody's pride of workmanship should prompt him to turn out an attractive product. But nobody's zeal should lead him to rate eyes first. When a beautiful set won't work it is to laugh.



The
Radio Woman

Her activities at work and at play bring her in contact with the most absorbing phases of life, through her set.



(Gilliams)

Well, it's easy enough to see which set of this pair Milady is going to choose. On the one hand—or in both, literally—she has the home-made crystal set built into a wallet, which she can tote around in her hand bag wherever travel chances to take her. On the other, there is the very expensive gold and ivory creation, which brings in any station desired on the built-in loud speaker. Then there is the personal element to consider. The admirer who presented the bill fold receiver and who, having no bills to fold, has made this sacrifice, might be in the better graces of the recipient, and the cheap set might have a much higher value, intrinsically, than the elaborate affair. As such, the final decision might well be in favor of the crystal set which she could press into service whenever a nice program is broadcast. However, the appeal of the complicated outfit might awaken the natural curiosity inherent in women, and then the temptation would be to forget the simple set. However, it is up to Miss Madge Kennedy, the popular screen artist, to make her own selection.

His Dot-dash Courtship
Proves a Success

GARDNER, MASS.

SADIE LEAWOD, a local telephaph operator, claims the distinction of being the first bride wooed and won by wireless. Three years ago, she met James Cameron, now a wireless operator on the Seiner, in

Boston. Since then the dot-and-dash expressions of Cameron's love have come to her at frequent intervals from the wireless operator as he sailed the seas.

Cameron arrived here recently with the diamond.

RADIO AIDS LONG-RANGE GUNNERY
IN PHILIPPINES

RADIO spotting from army airplanes aided in the annual coast artillery practice at Fort Mills in the Philippines, the average error of the deviation from the target being only 12 yards at a range of 11,000 yards. So successful was the radio spotting that both artillery and aviation officers plan close cooperation in these annual practices.

During the entire practice which occupied over two weeks not a single radio failure was reported, while two-way radio communication functioned at all times. Technical Sergeant David Reeves is given credit for the mechanical operation of the radio sets used, which were always in first-class condition, a report to the Army Air Service states.

AMATEURS TRY EMERGENCY NEWS
GATHERING

MILWAUKEE.

AN experiment to test the value of amateur radio for news gathering is being made by the radio department of the "Milwaukee Journal" in co-operation with Charles S. Polachek of the Milwaukee Radio Amateurs' Club, Inc., and local representatives of the American Radio Relay League.

The newspaper prints a daily column under the heading "News by Radio." Robert E. Knoff, radio editor, originated the idea of having amateurs act as unofficial correspondents. The object is merely to demonstrate the reliability of amateur stations should they be needed in an emergency.

Coolidge Has 9-tube Super-Heterodyne On Cart In White House

It operates from a folding loop, no ground being used—Inductively-tuned outdoor aerial to be erected, so that all broadcasters in the United States, and some abroad, can be heard—President's set even handsomer than King George's.

By Carl Butman

WASHINGTON. PRESIDENT AND MRS. COOLIDGE have a new and unique radio receiving set which some government experts insist is the best broadcast receiver. It surpasses in beauty even the set of King George, recently installed in Buckingham Palace, which was fully described in Radio World, issue of June 14.

On the new set the Chief Executive and his family listened in on sessions of the Republican Convention, although the White House also had a direct telephone line from the A. T. & T. circuit connected with an amplifier.

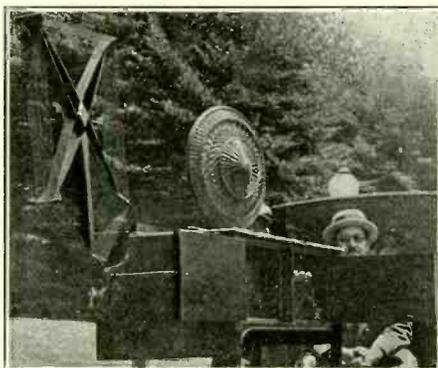
The Executive Mansion set, which is of special construction and mounting, is built on the Super-Heterodyne principle, with a total of nine miniature tubes. The main receiver, which has six tubes, was manufactured for the navy. This is supplemented by a push-pull amplifier of three tubes. No ground is used, and the antenna is a folding affair which also disappears in back of a portable, mahogany table-cabinet. The loud speaking horn, concealed by an attractive circular basket woven screen, sits on the top of the table. The whole set, with the batteries is completely hidden within the table-cabinet, resembles a tea cart. The panels with the dials and controls are behind doors, and the batteries are stored on an invisible shelf.

Selected as the Best

Skilled artificers of the Washington Navy Yard rebuilt a serving table into a radio cabinet, mounted it on wheels, and installed the apparatus, following a design laid out by Lieutenant-Commander E. D. Langworthy, of the Radio Section, Naval Bureau of Engineering. This expert also supervised the work and demonstrated the operation of the set for the Coolidge family at the White House just before the Cleveland Convention started.

Without revealing the name of the manufacturers of the set proper, naval experts say that receiving sets of similar type will be installed on all new first-line naval craft, as soon as they are put on the market. This particular type was selected as the best broadcast receiving set available, after a study and test of practically all sets now on the market or ready for experimental tests. In winter time, the White House apparatus should bring in any broadcaster in the country, and after a special inductively-tuned outside aerial is hooked up for use in the mansion, probably many foreign stations can be picked up just as easily as local ones.

The radio-cart is kept in the second-floor sitting room of the White House, but as it is mounted on wheels, it may be trundled into any room or taken downstairs on the elevator, if the family so desires. In recent experimental tests Commander Langworthy says this set reproduced perfectly all voice frequencies and



(Henry Miller)

THIS LARGE and powerful radio set is the one installed at the White House, especially for President Coolidge. He may listen in on the Democratic National Convention, held in New York this week. The round basketlike object on top of the receiving cabinet is one of the new Western Electric loud speakers. Speech and music from the set is so near to the actual thing that a blind man would not be able to tell the difference, according to reports published. The set is a 9-tube Super-Heterodyne.

all musical notes from the low deep tone of a kettle drum to the high pitched notes of a piccolo.

Has a Set on Yacht

Although the original White House set installed in the study for President Harding by naval experts remains in place, it is believed that the new set will be more popular and far more efficient. It is especially designed for the lower wave lengths, whereas the old naval set was built to be tuned to practically all wave lengths, and was more difficult to operate. The new set is also the property of the Navy, it being assigned to the White House for the use of the Chief Executive and his family.

A Freed-Eiseman Neutrodyne has been completed by the Navy and is now installed aboard the President's yacht Mayflower, so that when on cruises on the Potomac or Chesapeake Bay, the President and his guests may keep in touch with the broadcasters.

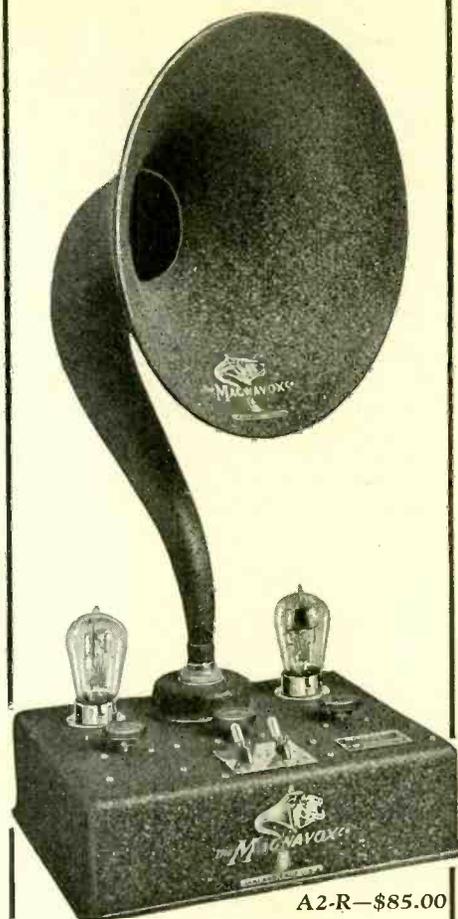
THREE BRAVE NAVY RADIOMEN GET POSTHUMOUS PRAISE

WASHINGTON.

THE four Naval radiomen who stood by with the late Captain Sparrow of the Cruiser Tacoma when she was broken up by heavy seas in January, after grounding near Vera Cruz, Mexico, have all been commended by Secretary Wilbur of the Navy for conspicuous courage, devotion to duty and disregard of personal danger.

Of the four gallant operators, Chief Radioman Joseph V. Cooper, U. S. N., of Buffalo, N. Y., alone remains alive. The three who perished with their Skipper were Solomon Sivin of New York City; Henry H. Lussier, of Bristol, Conn., and Edward T. Herrick, of Framingham, Mass. Their next of kin received the commendation.

MAGNAVOX
Radio Products



A2-R—\$85.00

MAGNAVOX Radio Combination Set A2-R consists of electro-dynamic reproducer and 2-stage Power Amplifier, as illustrated. This instrument insures the utmost in convenient, perfect reproduction with any good receiving set.

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- 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. . . . \$30.00
- M4 also requires no battery. \$25.00

Magnavox Combination Sets

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

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- A1—new 1-stage Power Amplifier \$27.50
- AC-2-C—2-stage Power Amplifier \$50.00
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Magnavox products can be had at Registered Magnavox Dealers everywhere. Write for new 32-page catalogue.

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New York Office: 350 West 31st Street
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MR. D. X. HOUND

Radio World's Own Artist Creates An
Enjoyable Character

By HAL SINCLAIR



The Radio Trade

THREE MILLION MORE RADIOISTS THIS SUMMER

Why the Radio Business for the 1924 Spring and Summer Should Be Better Than That of Any Previous Year.

IT has been estimated—and these figures are based on the statistics compiled for trade purposes—that there are 3,000,000 more radio fans this summer than last year. It is well known that there were more than 1,000,000 sales of sets and parts made around the holidays. This means that through this avenue alone a vast army of new radio fans have joined already the tremendous list of radioists.

Manufacturers, distributors, wholesalers and dealers should go out and cash in on the trade that is bound to come from these enthusiasts during the coming few months. There is only one way to do it—make type appeals to them in such a way that they will buy the goods you advertise.

Don't let the man who knows that there are twelve months in a year get the benefit of this big summer trade that is bound to be the largest in the wholesale radio business.

RADIO EXPORTS INCREASING

RADIO exports from the United States during April amounted to \$299,903, an increase over April of last year and over the total for March, although less than the exports during January and February of this year. During the first four months of 1924 this country shipped abroad \$1,222,685 worth of radio materials, whereas last year's total for this period was \$775,324.

Literature Wanted

IF you want radio literature from dealers, jobbers and manufacturers, send your name and address to Service Editor, RADIO WORLD, 1493 Broadway, New York City.

L. E. Whitney, 727 Lancaster St., Leominster, Mass.
Floyd W. Peters, 1121 No. Dupont St., Minneapolis, Minn.
W. C. Hill, 3221 Columbus Ave., Minneapolis, Minn.
James Woodward, dealer, 46th St. and Killam Ave., Norfolk, Va.
George Fyffe, 3807 N. Irving Ave., Chicago.
Clarence Feller, 505 Cypress St., Massillon, O.
R. A. Snyder, radio doctor, 1707 N. Adams St., Peoria, Ill.
Wholesale Radio Service, 9 Church St., New York City.

New Corporations

Reddock and O'Brien, New York City, electrical supplies, \$10,000; M. D. Reddock, L. P. O'Brien, E. Sager. (Attorney, M. E. Gossett, 212 Fifth Ave., New York.

CAPITAL INCREASES
Spartan Electric Corp., New York City, 100 shares common stock, \$100 each, to 1,000 of which 500 are common, no par value, and 500 preferred \$100 each.

DISSOLUTIONS
Master Battery Products Corp., New York City.

JUDGMENTS
Radio Guild, Inc., Debtor—T. F. Toney, creditor, \$1,568.35.

Westinghouse Enlarging Plant on Coast

C. E. HEISE, San Francisco District Manager of the Westinghouse Electric & Manufacturing Company, announced that a contract has been awarded to the Dinwiddie Construction Company of San Francisco for the construction of a second large building unit on the twelve-acre plot of ground owned by the Westinghouse Company in Emeryville, California. This new plant when completed will cost close to \$50,000,000, and will give employment to a large number of people. The new building will provide accommodations for a large assembling shop, extensive service and repair shops, a zone warehouse and various other facilities designed to render Westinghouse products and service more accessible and efficient to customers in the West.

J. S. Schwartz Named as General Sales Manager



J. M. SCHWARTZ

THE Cosmopolitan Phusiformer Corporation of New York City announced that they had appointed as their general sales manager J. M. Schwartz, formerly head of the Sure Sales Co. of Chicago, an organization of manufacturers' agents, well known in the western field. Before his connection with the Sure Sales Co. Mr. Schwartz was associated with the Radio Stores Corporation of New York City as sales manager handling the national distribution of the Felkostat. Mr. Schwartz, speaking from his wide experience of the radio field, predicts that the next radio craze will be a "phusiformer craze."

A New Compound for Audio Transformers

THE Ford Mica Co., Inc., of New York City, manufacturers of Supertron Audio-Frequency Transformers, have just perfected a new mica compound to be used to insulate core-laminations. This mica compound will eliminate the howling found in some transformers. It will guarantee much smoother reception and amplify distant reception with pleasing clarity.

Bobker Optimistic

H. BOBKER, sales director for the Supertron Tube, 3514 Woolworth Building, New York City, expects a wonderful radio trade for fall. In fact, he says it's already here, despite the myth of "poor summer business." Mr. Bobker says that radio is good all year 'round and that business is always there for the man who goes after it. That this is true, is evidenced, says Mr. Bobker, by sales of Supertrons, the volume running well into the hundred-thousands for the month.

Builders Equip Homes With Uniform Aerials

THE home equipped for radio is winning favor. Announcement is made by the Owners Improvement Corporation, which is headed by Charles L. Fraser and which is completing a number of high class homes on Potter and Walcott Avenues, between Sixth and Ninth Avenues, Astoria, New York City, that they are installing aerials on new houses.

"In planning our homes we gave very careful attention to the demands of modern home buyers," said Mr. Fraser. "We realized that the radio has become almost a necessity in the home today. We felt inclined to add this advantage to our homes just as strongly as we did to include other modern equipment. Then we also included this equipment in the interest of the artistic appearance of our homes. All the aerials on our homes will be uniform in size and design, which will avoid the unsightly effect where each individual home owner erects an aerial according to his own ideas or income."

Coming Events

JULY 7 TO 12—Radio show, Bangor, Me., auspices R. C. A.
JULY 21 TO 28—Radio show, Burlington, Vt., auspices R. C. A.
AUG. 18-21—Radio Exposition, San Francisco, conducted by Pacific Radio Trade Association.
SEPT. 22-28—First Annual International Radio Show, Madison Square Garden, New York City.
OCT. 2-11—Exposition, Grand Central Palace, New York City, under auspices of American Radio Exposition Co.
NOV. 3-8—Third Annual National Radio Show, Grand Central Palace. S. L. Rothafel (Roxey) and "his gang" will broadcast from the convention.

Business Opportunities Radio and Electrical

Rates: 40c a line; Minimum \$ line.
BUSINESS OPPORTUNITIES

RADIO MFG. CORPORATION, well established, selling a nationally advertised product for which there is an increasing demand, desires \$25,000 additional capital for expansion; prefer investor to be active and A1 executive; full particulars at interview; no brokers or agents; principals only; references exchanged before interview. Box AA, Radio World.

FLOURISHING RADIO BUSINESS selling to jobbers and distributors needs services of energetic and experienced sales manager who can invest \$10,000. Box BB, Radio World.

GOOD GOING BATTERY BUSINESS, best section of city. Apply 351 Amsterdam Ave., N. Y. C.

ESTABLISHED IMPORTER of electrical goods would admit partner, \$5,000 to \$10,000; unfilled orders on hand. G. B., Room 5734, Grand Central Terminal Building, N. Y. C.

RADIOPHONE manufacturer desires exclusive representation, commission basis. Eastern, 53 West Grand, Elizabeth, N. J.

HARDWARE DEALERS! ATTENTION!
We have 20,000 Radio hand drills at low prices, 75,000 dozen black wooden handle riveted screw drivers in assorted sizes; useful for household, cabinet and radio purposes; can be turned into a 10c seller with large profits; spot delivery; net cash; also other hardware articles. For particulars, Box CC, Radio World.

Under the Spooky Spell

By Carl H. Butman

Of many cases reported to the Department of Commerce, there is none so striking as the "Strange Case of Operator Blank," on which there is a thick file of papers.

Nearly four years ago a sea-going radio operator of twenty years' experience reported to the supervisor of a coastal district that he was the object of radio persecutions in the form of radio telephonic messages transmitted to him continually by virtue of wired-wireless when he was ashore. Three unprincipled young operators, he asserted, kept a surveillance over his every move, reading his thoughts, and at times "neutralizing" his brain action.

These three persecutors relieved each other but kept up their vocal messages day and night, no matter where he was. Their sinister influence, he felt sure, was affecting his young daughter when she was near him, and practically broke up his home. He appealed to scientists, doctors, radio experts, the Government and police without benefit, as the source of the radio emanations could not be traced. They seemed to come from a coastal point.

Even while on an automobile trip across the continent and into Canada, the "phantom" radiophone or photophone messages pursued him. The messages were transmitted on various frequencies and were impossible to ignore. Operator Blank believed the young men had invented an ultra-modern transmitting set of which no one knew the circuit. He said the boys told him it was a "wired wireless psychometer" effecting the transmission of speech by a "therapeutic oscillator," and received by "triplex phantoming attunement." He couldn't get away from the messages, and he was certain that the boys kept a log of his thoughts.

Later on, when he was again at sea, the messages pursued him, evidently through the medium of radio. In the Atlantic or Pacific the effect was the same and the operator came to believe that the "primary phonetic" effect kept his head aching, continually; sometimes he was driven from his radio shack. He was certain his death could be caused by these boys if they desired.

He again took up the matter of locating the station with authorities in New York, San Francisco and Washington, but no one was able to aid him nor locate the unknown station. Unofficial and unsigned messages continued to follow him causing interference with his regular traffic, his

sleep and his mental stability. Investigations showed him to be in good physical and mental state, but although pronounced sound in his mind and body and only about 42 years old, he was literally driven from the sea and his profession.

Following up some of his suggestions, radio officials, report that spiritualists have been affected in a similar way, and from New York came information that complaints of this character were increasing—in fact becoming quite common. Department of Commerce radio officials say the full moon induces such stories.



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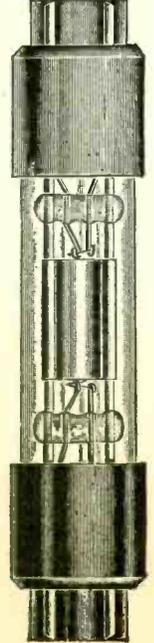
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(practically unbreakable) give you distance with clarity. They add 50% to the efficiency of any set by reducing interference.

See that you get the New Improved Myers. Others are not guaranteed. Insist on Myers at your dealers'—otherwise send purchase price and be supplied postpaid.

Two types: Dry Battery and Universal (for storage battery). Write for free circuit diagrams.

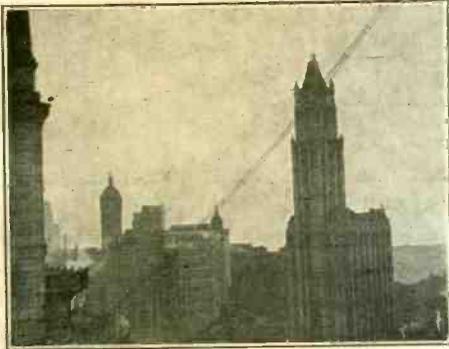
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(Actual Size)

New York City's Station On Air as Convention Speeches Are Radioed



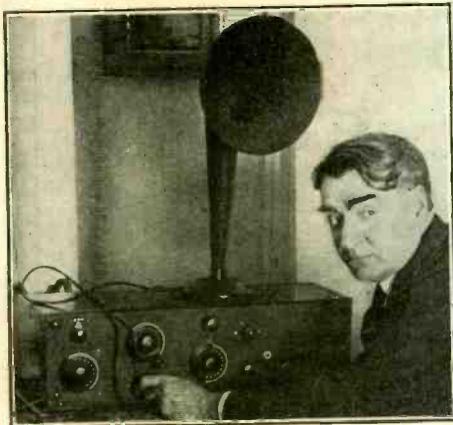
(Kadel & Herbert)

NEW YORK'S new Municipal broadcasting station WCNK which started transmission on the day the Democratic Convention opened. Using one kilowatt of power, it will rank as one of the most powerful in the country. The station, situated in the Municipal Building, runs its aerial from a ledge to the peak of the tower. The aerial is of the latest cage type consisting of a number of stranded wires held in spherical shape by metal supports.



(Kadel & Herbert)

GRAHAM McNAMEE, sports reporter, did the announcing from WEAJ for the doings at the Convention at Madison Square Garden. Millions of radio fans throughout the nation listened. Fourteen stations broadcast simultaneously from the microphone at the Garden.



(Fotograms)

SENATOR ROYAL S. COPELAND, of New York, who came out for Governor Smith for President, but will attend by proxy over his radio.



(International Newsreel)

SENATOR PAT HARRISON, Temporary Chairman of the Democratic National Convention made the keynote speech which was broadcast.

(Concluded from page 23)

wanted a wavelength above 492 (the one used by WEAJ) to avoid sharing with anybody.

THOUSANDS find it profitable to buy from us direct by mail. Build your set, using standard parts at the lowest New York prices.

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Like their name, significant of quality. Durable and powerful. Bring in distance with a maximum of volume and clearness.

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ALL TYPES

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EVERY TUBE GUARANTEED to work in Radio Frequency. Especially adapted for Neutrodyne, Reflex and Super Heterodyne Sets.
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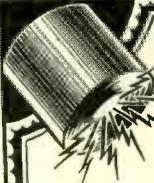
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Latest Developments in the SUPERDYNE CIRCUIT In Text and Diagrams

RADIO WORLD dated May 17, 24 and 31 contains a series of three articles covering all the angles of the famous Superdyne Circuit. The original Superdyne Circuit articles appeared in Radio World last December, and the three issues in which they appeared are now completely out of print. That is the reason why we have published the Superdyne series in the May 17, 24 and 31 issues. 15c. per copy, three for 45c., or start your subscription with any number.

SPECIAL SUBSCRIPTION: Send \$6.00 for one year's subscription and we will send you our issues of May 17, 24 and 31 as a premium.

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SCRATCHES AND SQUEALING

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At your dealers—otherwise send purchase price and you will be supplied postpaid. Write for Reflex circuit 107.

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The Popular Neutrodyne!

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

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A. B. C. Editor, RADIO WORLD,
1493 Broadway, New York City.

Please enroll me as a member of the American Broadcast Club.

Name

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State

Programs

Wednesday, July 2 (concluded from page 18)

W. Metzger, soprano. 10 P. M., George Olsen's Metropolitan orchestra; solos by Avis Olson; Armstrong and Clarence Hartman, pianists.

WHAS, Louisville, Ky., 400m (750k), C. S. T.—4 to 5 P. M., selections by Alamo Theatre orchestra; police bulletins; weather forecast for Kentucky, Indiana and Tennessee; "Just Among Home Folks"; selections by Walnut Theatre orchestra; late news bulletins. 4:50 P. M., local livestock, produce and grain market reports. 4:55 P. M., baseball scores. 5 P. M., Central Standard time announced. 7:30 to 9 P. M., agricultural tab-

loid talk; concert, direction of Mrs. Jane W. Murrell; late news bulletins; baseball scores; Central Standard time at 9 o'clock.

KGO, Oakland, Cal., 312m (960k), P. T.—1:30 P. M., N. Y. Stock Exchange and weather reports. 3 P. M., musical program; address, "The Possibilities of Collaborative Writing," by Louis L. de Jean. 4 to 5:30 P. M., concert orchestra of Hotel St. Francis. 6:45 P. M., stock exchange and weather reports; news items.

WBAP, Fort Worth, Tex., 476m (620k), C. S. T.—9:30 to 10:45 P. M., concert by the old-time fiddle band of Krum, Texas.

KFI, Los Angeles, 469m (640k), P. T.—5 P. M. Evening Herald news bulletin. 5:30 P. M., Examiner news bulletins. 6:45 P. M., Nick Harris detective stories and concert. 8 P. M., Evening Herald concert. 9 P. M., Examiner concert. 10 P. M., Hollywoodland orchestra. 11 P. M., Ambassador Coconut Grove orchestra.

WGY, Schenectady, N. Y., 380m (790k), E. S. T.—11:30 A. M., stock market report. 11:40 A. M., produce market report. 11:45 A. M., weather report. 11:55 A. M., time signals. 5 P. M., produce and stock market quotations; news bulletins; baseball results. 5:30 P. M., "Adventure Story."

KPO, San Francisco, 423m (710k), P. T.—1 P. M., Rudy Seiger's Fairmont Hotel orchestra. 2:30 P. M., Jack Fait's Entella Cafe orchestra. 4:30 P. M., Rudy Seiger's Fairmont Hotel orchestra. 5:30 P. M., children's hour stories by Big Brother. 7 P. M., Rudy Seiger's Fairmont Hotel orchestra. 8 P. M., Bradfield's versatile band.

WDAF, Kansas City, Mo., 411m (730k), C. S. T.—5:50 P. M., marketgram, weather forecast, time signal and road report. 6 P. M., address, weekly health talk given under the auspices of the Health Conservation Association. The Tell-Me-a-Story Lady. Carl Nordberg's Plantation Players. 8 P. M., program by Miss Amy E. Winning. 11:45 P. M. (Nighthawk Frolic), The Plantation Players.

CKAC, Montreal, 425m (700k), E. S. D. S. T.—1:45 P. M., Mount Royal Hotel concert orchestra. 4 P. M., weather, stock, news, music.

WFAA, Dallas, Tex., 476m (630k), C. S. T.—12:30 P. M., musical program, Amateur Day.

KFNF, Shenandoah, Ia., 266m (1130k), C. S. T.—7:30 P. M., Welsh musical program from Wales, Iowa.

WLAG, Minneapolis, Minn., 417m (720k), C. S. T.—2:10 P. M., Woman's Club Hour—beauty talk by Maude Hart. 4 P. M., magazine reading. 6 P. M., baseball scores and sport hour. 7:30 P. M., farm lectures. 8:15 P. M., concert, Francis Rosenthal, bass. 9:30 P. M., business message. 11 P. M., program, Geo. Osborn's Nicollet Hotel concert.

JAPANESE EXTEND USE OF RADIO FOR SHIPS

THE Japanese Department of Communications has authorized the use of broadcast wireless telegrams in communicating with vessels at sea, the State Department has been advised.

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July 5, 1924

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casting station of the General Electric Company, on Tuesdays and Thursdays at 10:20 A.M., and radio loud speakers installed in twenty schools in the city, reproduce what is said. Teachers and pupils assemble in class rooms in the regular manner with not more than two classes in any one place. Tests already made indicate that classes will average seventy pupils each. The program is developed by a special committee working under the direction of Dr. Virgil Dickson of the Oakland public schools.

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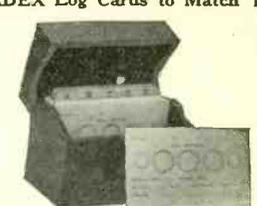
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By M. C. Rypinski
Chairman, Broadcasting Committee, Associated Manufacturers of Electrical Supplies
RADIO has ceased to be a stunt; it has now become a service. Formerly the zest of radio reception consisted largely in the fun of listing as many stations as possible. The radio enthusiast was more likely to say "I got San Francisco last night," than to take pleasure in the fact that he heard a good concert from a station nearby, or a vivid description of a boxing match broadcast from his own city. Today radio is valued for what it gives. The intelligent radio fan this summer will not strive so much for distance. He will determine the type and character of the program he wants and tune in on the nearest station that will bring him the entertainment or service that is nearest his heart.

By Bertram Reinitz
General Manager, American Cloak and Suit Review
ONE of the outstanding joys of radio is that it affords opportunity for getting an almost unlimited number of distant stations. Quality is enjoyable, of course, but the imagination is thrilled by the experience of reaching one's radio ear across a vast continent and hearing some orchestra play supper music at a time when (by your own clock) you should be asleep. Why the Neutrodyne and the Super-Heterodyne if there is no magic charm in getting distance?

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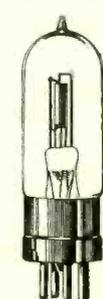
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Circle 4569

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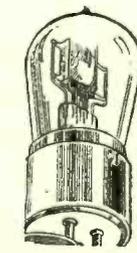
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THE COLUMBIA PRINT
1493 Broadway New York City

Radio Audiences Superior to Theatre's, Says Hager

MAJORITY PREFER BETTER-CLASS MUSIC TO JAZZ, ANNOUNCER ASSERTS

By Kolin Hager

Chief Announcer, WGY, Schenectady, N. Y.

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WGY's correspondence will shortly approach a quarter of a million communications of one kind or other, cablegrams, telegrams, letters and post cards. Doesn't it seem logical that if the people want the better music, they also want other features of a high quality?

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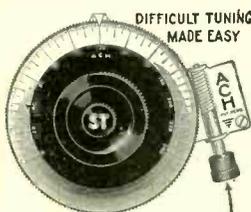
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RADIO SURPLUS STORES
HELENA, MONTANA

Tube Standards Under Scrutiny of U. S. Board

THE Interdepartmental Radio Advisory Committee is seeking data on radio transmitting and receiving tubes and transmitting sets operated by the government, in an effort to complete a study of the different types of tubes and their length of service. Ultimately the committee plans to standardize Government tube requirements, so as to avoid unnecessary types and sizes. The Government purchases annually over 100,000 tubes of different types, most of which are used by the Navy and Army, and it is desired to simplify the specifications and the varieties of tubes used. This will make for both a saving in money and speed up delivery and replacements.

The manufacturers already have offered to cooperate in the simplification of tubes as they have also in battery standards, but it was found that further details as to use and service was necessary. The report sheets just sent to all Government-owned or operated stations by the committee request information as to the causes of failure of tubes, the type, age, manufacturer, tests, serial number and other detailed specific data. Another request requires a daily report on transmitting sets with details as to type, make, instrument, readings, etc.

Civil Service

NAUTICAL ASSISTANT

THE examination will be held throughout the country on July 9 and 10. It is to fill vacancies in the Hydrographic Office, Navy Department, for duty in Washington, D. C., Los Angeles, San Juan, P. R., or elsewhere, and vacancies in positions requiring similar qualifications.

Under the classification act of March 4, 1923, the entrance salary for this position in the District of Columbia, beginning July 1, 1924, will be \$1,680 a year. Advancement in pay may be made without change in assignment up to \$2,040 a year. For appointment outside of Washington, D. C., it is possible that this same rate of pay may be applicable after June 30, 1924, but if not, the salary will range from \$1,000 to \$1,800 a year, with the addition of a bonus of \$20 a month.

Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., or the secretary of the board of U. S. Civil Service Examiners at the post office or customhouse in any city.

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EVEREADY Radio Batteries

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ULTRADYNE

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

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\$15 Set Gets 2,000 Miles

The Essex Radio Special, the receiving set with a condenser, gets you more distant stations clearer and sweeter than sets costing ten times its price. \$15 Set complete with cabinet, without tube or batteries. \$20 Set complete with cabinet, tube and batteries.

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A CIRCUIT WELL WORTH WHILE!
Build a two-tube set, one stage of R. F., using neutrodyne principle, and detector. Full details in Radio World, issue April 12. Send 15 cents.

David Killoch Company

Dodge Building, 45 West Broadway
Corner Park Place, New York City

The Weekly Rebus

CAN you decipher this Rebus? Send your answer to Rebus Editor, RADIO WORLD, 1493 Broadway, New York City, and mention Rebus No. 7. The names and

addresses of those sending in the correct answer will be published, so be sure to write your full name and address very plainly. A list of the correct answers of Rebus drawings will be published in RADIO WORLD soon after the twelfth Rebus has been printed. At that time a list will be compiled of all those who correctly answered all the Rebus



THE YANKS ARE COMING

"The Ace of Independent Tubes." A Uniform, Clear Tone, Long Service Tube.

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DUTCH RADIO VALVE

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.25 Amp. 5-6 Volts

Detector-Amplifier
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MISSOURI—ST. LOUIS RADIO TUBE LABORATORY

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43 Queen St., East Toronto, Ontario



puzzles, and their names will be enrolled on the Rebus Honor Roll. The Rebuses previous to No. 7 were published May 17, May 24, May 31, June 7, June 14 and June 21.

REBUS NO. 4

C. J. Minder, R. R. 6, Muscatine, Ia.
J. R. Wallace, 152 East 84th St., New York City.
Frank J. Capone, 515 La Salle St., Berwick, Pa.
John E. Hagstrom, 3011 Euclid Ave., Berwyn, Ill.

C. Homewood, 7025 Glenloch St., Philadelphia.

REBUS NO. 5

C. Homewood, 7025 Glenloch St., Philadelphia.
H. V. Petric, Box 357, Hazelton, Kan.
Joseph Landry, 37 Spencer Ave., Chelsea, Mass.
Florence Kenney, 383 Chauncey St., Brooklyn, N. Y.
Frank Fitzharris, 425 East 5th St., Cincinnati.
H. G. Bergman, 5217 Ellis Ave., Chicago.
B. J. Killen, 34 Indiana St., Wheeling, W. Va.
Wm. R. King, 408 Erie St., Wheeling, W. Va.

HAS A DISCARDED TRANSMITTER

EDITOR RADIO WORLD:

NOTICED in your issue of Feb. 23 a subscriber requests information on a discarded broadcast equipment. I have a 100-watt phone transmitter in a floor type model after the types used in general broadcasting stations today. This set has a 600-watt, single unit, separately excited field Robbins Meyers Motor Generator and adequate filtering system and on test on an amateur antenna has been heard in Chicago, Detroit, etc. This transmitter is in a steel frame and stands about 6 ft. high. Has the Hartley inductive coupled circuit and best material throughout.

DAVID COOPER (3ATB),
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M. B. SLEEPER RADIO DESIGN & CONSTRUCTION FOR EXPERIMENTERS, REFLEX & RADIO FREQUENCY, \$1.00. The Columbia Print, 1493 Broadway, N. Y. C.

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Large scale map of U. S. Lists over 700 Broadcasting stations with wave lengths. Space for recording date, hour, and dial readings. Size 28 x 34. Price 25 cents postpaid. If not satisfied, return map and money will be refunded.

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Radio Teleg. and Telephone Receivers for Beginners \$0.75
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Commercial Type Radio Apparatus—M. B. Sleeper75
A B C of Vacuum Tubes—Lewis 1.00
Operation of Wireless Telegraph Apparatus35
Lessons in Wireless Telegraphy35
Radio Hookups—M. B. Sleeper75
Construction of New Type Trans-Atlantic Receiving Sets—M. B. Sleeper75
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Radio Tel. & Tel. 1.00
How to Pass Government Examinations50
How to Make a Standard C W Set.... .35
How to Conduct a Radio Club50

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THE BABY PORTABLE, \$10.50—1,000 miles! Small and compact. Guaranteed. Cash with order. Be our demonstrator. Big money. B Radio Products, 123 B Street, S. E., Washington, D. C.

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HOW TO KILL RADIATION—See RADIO WORLD, February 23, March 1, 8, 22, April 12, 1924. 15c a copy. RADIO WORLD, 1493 Broadway, New York City.

PATENTS—SEND DRAWING OR MODEL FOR EXAMINATION AND OPINION. Booklet free. WATSON E. COLEMAN, Patent Lawyer, 644 G Street, Washington, D. C.

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

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FULL LIST OF BROADCASTING STATIONS in Radio World dated May 17th, 1924, mailed on receipt of 15c or start your subscription with that number. RADIO WORLD, 1493 BROADWAY, NEW YORK CITY.

GET THOSE SUPERDYNE COPIES THE Superdyne Circuit, brought up to date in diagrams and text, in RADIO WORLD for May 17, 24, 31. Per copy, 15c; the three copies, 45c, or start your subscription with the first number. RADIO WORLD, 1493 Broadway, New York City.

MAGNAVOX R3—Latest standard models with modulator. Factory sealed cartons. Regular price, \$35.00. My price, \$24.50. Models M1 same price. C. Schantz, Dept. W., Wymore, Nebr.

HOOK-UPS FOR EVERYBODY—"Henley's 222 Radio-Circuit Designs." Mailed for \$1.00 postpaid. The Columbia Print, 1493 Broadway, New York City.

WHAT'S WRONG HERE?

STUDY this Wrong Diagram. Send in what you think is the correct solution. Address Wrong Diagram Editor, Radio World, 1493 Broadway, New York City. Specify Wrong Diagram No. 8. The names and addresses of those sending in correct answers will be published. The following were among those who sent in correct answers:

WRONG DIAGRAM NO. 4

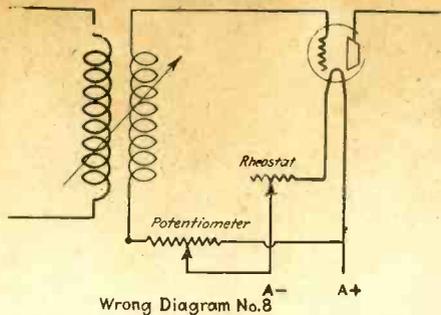
- Wm. G. Wheat, 2607 Benton Blvd., Kansas City, Mo.
- M. L. Lujan, Hotel Belmont, San Diego, Cal.
- R. M. Allen, 319 N. Oregon St., El Paso, Tex.
- Arthur Rand, Oakland, Me.

WRONG DIAGRAM NO. 5

- M. L. Lujan, Hotel Belmont, San Diego, Cal.
- Wm. G. Wheat, 2607 Benton Blvd., Kansas City, Mo.
- Herbert Eisenhart, 392 Wheatfield St., York, Pa.
- C. J. Binder, R. R. No. 6, Muscatine, Ia.
- F. J. Capone, 51 LaSalle St., Berwick, Pa.
- J. A. Rose, 190 West End Ave., New York City.
- George McNamara, 639 Paupack St., Hawley, Pa.

WRONG DIAGRAM NO. 6

- Herbert Eisenhart, 392 Wheatfield St., York, Pa.
- John A. Rose, 32 West 40th St., New York City.
- Christopher Albach, Jr., 469 East 136th St., New York City.
- LaVerne Auchue, 37 N. Sibley St., Fond du Lac, Wis.
- M. Aronowitz, 412 Knickerbocker Ave., Brooklyn, N. Y.
- Rollin Jenney, 414 Jackson Ave., Endicott, N. Y.
- M. Reubenfeld, 1382 Greene Ave., Brooklyn, N. Y.



Wrong Diagram No. 8

University

(Concluded from page 19)
the amplifier because of the close wiring necessary. This tubing will prevent a short circuit. You may also use it in the tuner if the wires run close together.

RADIO WORLD'S Broadcast University

QUESTIONS and answers
broadcast every Wednesday evening from WLS, the Sears-Roebuck station in Chicago, by Mat H. Friedman, RADIO WORLD'S Chicago Representative.

I have a 4-tube set but cannot receive over 40 miles. What can I do to receive distant stations? pected to equal those of a 6-tube Super-Heterodyne—D. W. Cheney, 704 Morgan St., Joliet, Ill.
Something must be radically wrong. Suggest that you have some experienced man go over your outfit carefully. With four tubes you should be able to get most of the stations in a 1,000-mile radius.

Could you tell me what is wrong with my ultra-audion set? In tuning for the first two or three minutes I must keep turning up on the rheostat.—Henry Van Weinen, Thayer, Ind.
The trouble lies in your A battery, which evidently is run down. Either have it charged, or, if you use dry-cells, install new ones.

I have made a Super-Heterodyne according to specifications, but find that the tuning is very broad. What can be the trouble?—F. J. Boener, 3704 Monticello Ave., Chicago.
Possibly the set tunes broad because the intermediate frequency transformers are not properly matched or adjusted. You should readjust those transformers until the tuning is sharp.

Referring to the Transcontinental Reflex by Byrt C. Caldwell, what tubes do you think are best for this circuit? Will 90 volts on the plates of all three tubes be all right, or should one of them have 22½ volts?—W. H. Covell, Room 1308, 75 Public Square, Cleveland, O.
Use UV-201A tubes or equal throughout. Ninety volts will be satisfactory for all three tubes. A tap of 22½ volts is not required.

IMPROVE YOUR 5 TUBE "NEUT"

If it isn't just right and you used GOOD parts, you can use same Panel, same layout and, in a few hours' easy work, turn it into a Kladaq Coast-to-Coast On Loud Speaker Receiver that takes its hat off to nothing. Scores have done this.
We'll send you complete, simple instructions, hook-up, extra part and enuf real gold sheathed bus wire, prepaid, for \$5.00. Descriptive sheet only—10c. Radio list for stamp. We accept U. S. stamps same as cash.
KLADAG RADIO LABORATORIES, KENT, OHIO

SUPER-HETERODYNE FOR YOU!

An improved Super-Heterodyne at a low price, complete, with map, complete wiring hook-up, schematic assembly of parts, wave length calibration chart, accurate panel specifications, detail of intermediate frequency transformer construction, how to wind all the coils, and complete constructional information so that anyone can build the outfit, in RADIO WORLD for May 31, June 7, 14, and 21. 15c a copy. The four copies for 60 cents, or start your subscription with May 31.

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

PEIRCE SCHOOL

of Business Administration



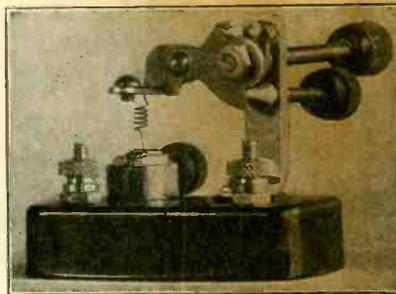
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Pine Street, West of Broad Philadelphia

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Improved Ultra Reflex

THIS MARVELOUS CRYSTAL DETECTOR BEATS 'EM ALL



The leading radio experts of the day are loud in their praise after giving this AMBROSE VERNIER CRYSTAL DETECTOR the most thorough test.

You want to get the best results from your Crystal or Reflex Set; therefore, use the AMBROSE CRYSTAL DETECTOR, and you will be more than surprised at the wonderful results.

Every Detector is guaranteed to be 100% perfect, and is thoroughly tested before leaving our factory.

If your Dealer cannot supply you, send cash, money order or check for \$2.00 and we will supply you direct.

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SOMETHING NEW

Green Radio Applause Cards Bound in Book Form

with stubs on which records of Radio Artist are kept after card is detached and sent, a Log Book and Card combined, all for 1c. 25 CARDS 25c. Sent by mail postpaid. No stamps. Address
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PLATTSBURGH, N. Y.

DEALERS: Write for sample and terms.

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PARTS ACCESSORIES MAIL ORDERS

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NEW YORK CITY



Some Good Service Articles in 1924

Back Numbers of Radio World

Neutrodyne Article

By R. L. Dougherty, March 15, 22, 29

Construction of a Battery Charger

By Walt S. Thompson, March 29, April 5

Spider Web Neutrodyne

By Byrt C. Caldwell, April 12

Amplidyne

By Thomas W. Benson, April 19

Camper's Portable Set

By J. E. Anderson, April 26

Power-Amplification

By Chas. H. M. White, April 28

Neutrad Radio Frequency Unit

By Walt S. Thompson, May 2

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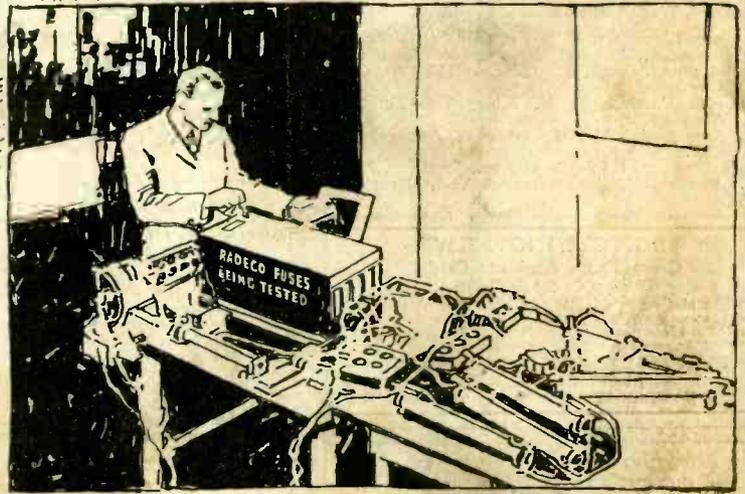
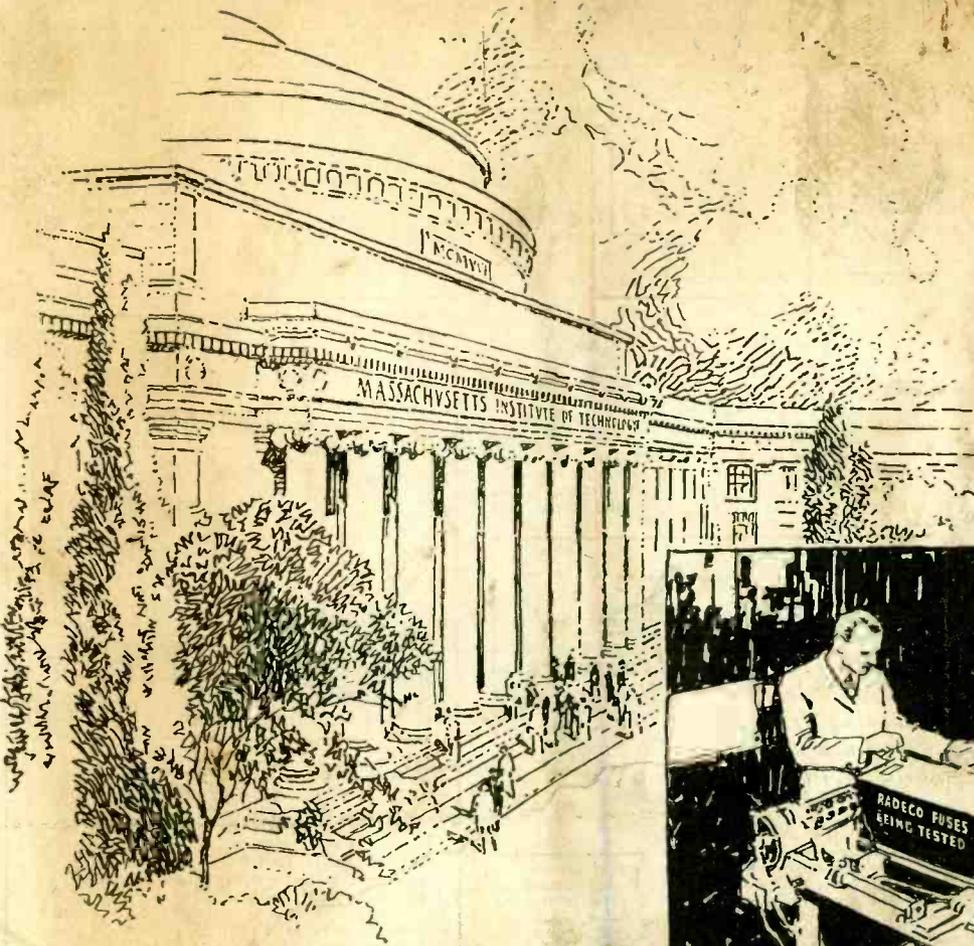
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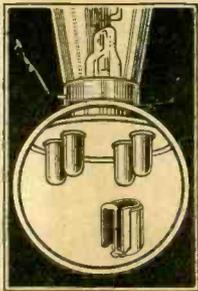
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