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A NEW SYSTEM OF RECEPTION June 21

"BETTER THAN THE SUPER-HETERODYNE"

1924

RADIO WORLD

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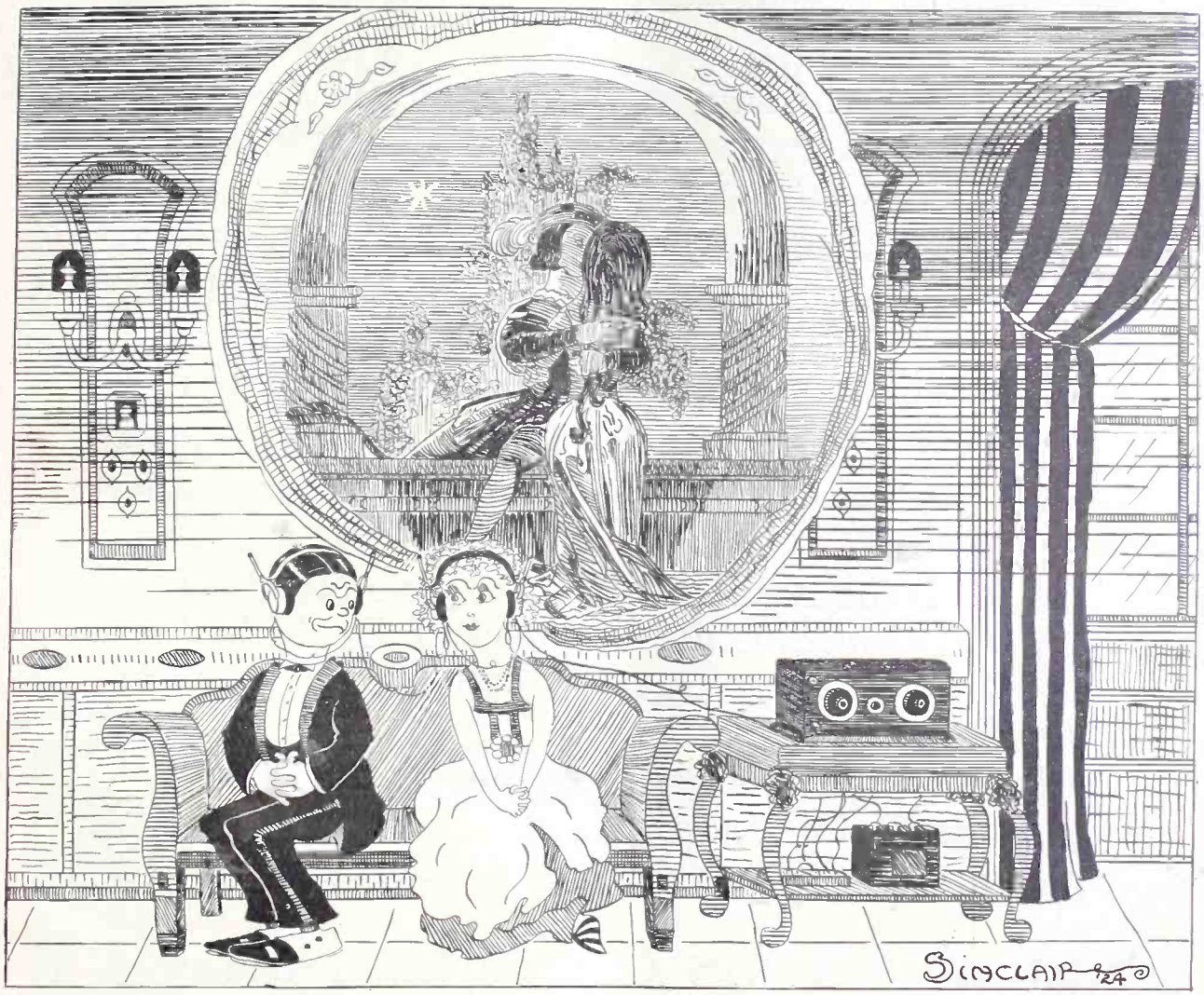

WHEN THEIR MINDS DON'T MEET—Susie's vision is of romance of the balcony scene variety, but Cholly, her suitor, is so much of a radio fan that his whole attention is on the program they're hearing.

RF ADDED TO REGENERATIVE SET

SELECTIVE THREE-CIRCUIT TUNER

A Statement by GORDON C. SLEEPER

The SLEEPER RADIO CORPORATION will shortly announce the new TYPE 54 MONOTROL.

In my opinion no set ever made so nearly meets the ideas of 28,000 radio dealers in the United States as to what they want to sell and what the public wants to buy.

The TYPE 54 MONOTROL establishes new standards of engineering and mechanical design. It is the supreme development of the GRIMES Inverse Duplex Circuit.

A Cabinet of inlaid African Mahogany with the finish of a Steinway. A panel of etched bronze to please the most discriminating eye.

The new Sleeper DUAL Condenser used in this set allows tuned radio frequency on one dial, and by its sharp-tuned efficiency, points the way to obsolescence of sets with two, three or more tuning dials.

The New Monotrol will operate on loop only, on ground only, or on aerial and ground. It uses either storage battery or dry cell tubes.

The set is the result of an entire year's research by DAVID GRIMES, Chief Engineer of the SLEEPER RADIO CORPORATION, in collaboration with H. C. Doyle.

It incorporates features that are an absolute challenge to the Radio Industry.

The TYPE 54 MONOTROL is worth waiting for.

(Signed) GORDON C. SLEEPER, President

SLEEPER RADIO CORPORATION,
88 PARK PLACE, NEW YORK

VOLUME FIVE OF

RADIO WORLD

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"Better Than the Super-Heterodyne"

THE Metaform System of Reception, designed by Walt S. Thompson, Jr., reduces the wavelength to below that used in the Super-Heterodyne and sometimes below the broadcast wave. Strong, undistorted signals result. "It can't be done," experts told Thompson, but he did it.

A Notable Advance In Reception

[*Herewith* RADIO WORLD *presents a method of reception new to experimenters—the heterodyning of an incoming signal to a given wavelength, lower than that used in the Super-Heterodyne. In the Super-Heterodyne the wavelength is increased, by means of a local oscillator, and all signals finally detected at a fixed number of meters, say, 10,000. In the Metaform System, as the new method is called, the change in frequency is made in another direction, all signals being changed to a given wavelength, in the instant case, about 600 meters (500 kilocycles.) The changed wavelength in the Metaform is above the broadcast wavelengths, but by use of a different oscillator could be brought below the minimum of the broadcast range.*

"It can't be done," experts told Walt S. Thompson, Jr., brilliant expert who successfully designed and constructed the Metaform, which he declares has advantages over the Super-Heterodyne and the Neutrodyne. But Mr. Thompson did it and herewith presents the absorbing story.]

By Walt S. Thompson, Jr.

FOR some time past the writer has felt that there were certain advantages to be gained in the reception of radio signals by using a method differing from those in use today. Having given some thought as to just what changes could be made in the modern methods of reception and having decided upon a means for effecting these changes, there followed a period of development and experimentation after which a receiver was built incorporating the results of these experiments.

WALT. S. THOMPSON, JR.

The purpose of this article is to describe these experiments, the receiver built and its operation and to discuss the theory underlying its operation as well as to name some of the advantages to be gained by its use. For the purpose of discussion, the writer is describing first, the method of reception and second, the manner in which the method is applied.

The receiving system used is illustrated by Fig. 1. The energy collective agency, such as an antenna, is

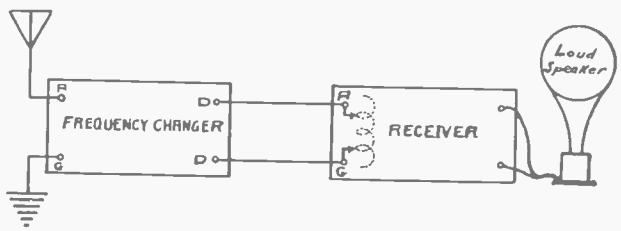

FIG. 6—Schematic arrangement of the frequency changer and the receiver. The signal is first brought down the antenna and the tuner is adjusted properly for the desired station. The frequency changer then alters the wave to about 600 meters. The signal, at this new frequency, is passed to an ordinary receiving set which is always kept tuned to about 500 kilocycles. Any type of receiver may be used.

connected to a tuner made up of the usual resonant circuits. The output of this tuner is fed to a frequency changer which changes the frequency of the incoming radio signal wave to some other frequency above 500 kilocycles per second. After leaving the frequency changer, the signal may go through a radio frequency amplifier to a detector, as shown by Fig. 1, or may go directly to a regenerative detector as shown by Fig. 2. After leaving the detector the signals are amplified at audio frequencies in either case.

Let us assume that we wish to change the frequency of the incoming signal to 500 kilocycles per second. The operator of such a set would first adjust the tuner to the signal being received and would then adjust the frequency changer so that the wave passed to the detector, or radio frequency amplifier, would have the desired frequency of 500 kilocycles. Thus we see that this method consists of a receiver of most any type and a frequency changer. The receiver proper is kept tuned to a given frequency at all times, in this case 500 kilocycles, and the incoming signals are all changed in frequency to that of the receiver. This method the writer has named the Metaform system of reception. "Metaform" means "to change the form of."

As the receiver proper can be of any type, the frequency changer alone will be discussed. This frequency changer uses the heterodyne or beat method for changing frequencies similar to that used in the Super-Heterodyne receiver. The frequency changer used in

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System Works on Any Tuner at All

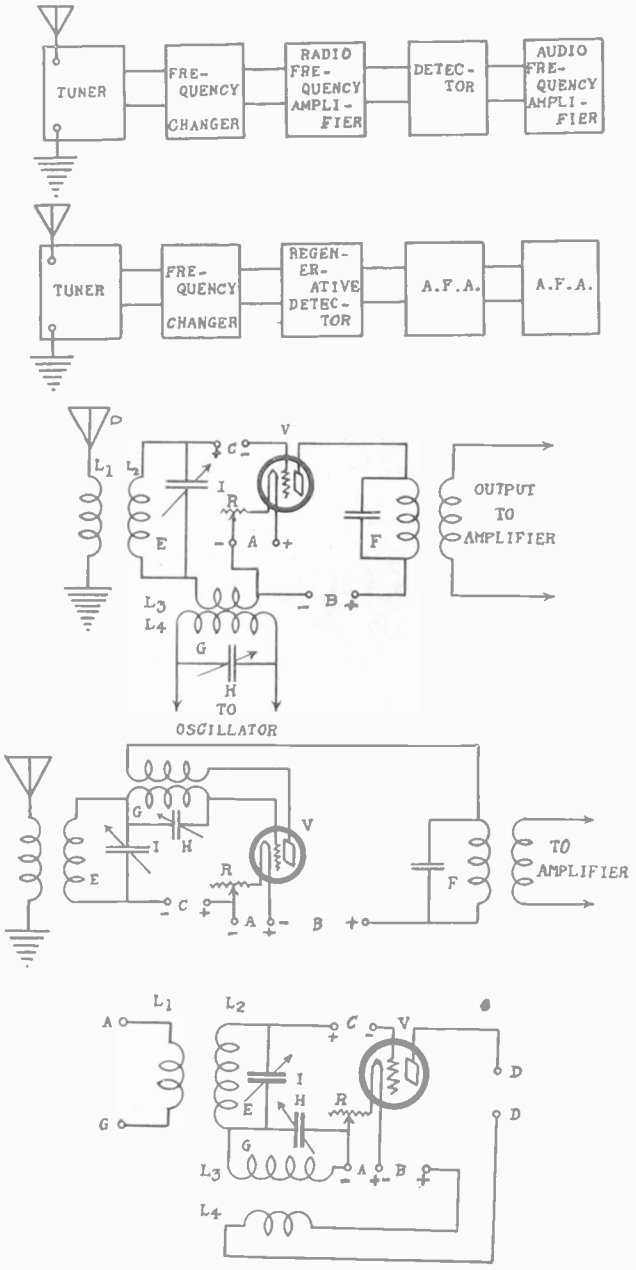

FIG. 1 (top)—Schematic arrangement of units used in the super-heterodyne system.
FIG. 2 (next to top)—Schematic arrangement of units used in the metaform.
FIG. 3 (center)—Metaform frequency changer utilizing separate tube as an oscillator. The output is to the RF amplifier of an existing standard set.
FIG. 4 (second from bottom)—Metaform frequency changer and oscillator utilizing the same tube.
FIG. 5 (bottom)—Metaform frequency changer for broadcast wavelengths, shown so that those desiring to construct a metaform unit may do so. The constants are given in the accompanying text.

(*Continued from preceding page*)

most of the present-day Super-Heterodyne receivers is illustrated schematically by Fig. 3. In this figure the vacuum tube V is connected as a detector with a tuned grid circuit E and a tuned plate circuit F. Coupled to the grid circuit there is the receiving antenna D and the tuned circuit G. The circuit G is part of a vacuum tube oscillator, which can be made to oscillate at any frequency, within a given range by an adjustment of the condenser H.

Let us assume that a signal is being picked up by the antenna and that its frequency is f, and that the frequency of the oscillator circuit G is f′. There will be a current in the plate circuit of the tube V having a frequency equal to the difference of the two original frequencies or (f-f′) and another current having a frequency equal to the sum of the two original frequencies or (f+f′). In addition to these two components of the plate current, there are several others having frequencies of f, f′, 2f, and 2f′.

Of these components of the plate current we are interested in only two, that is, in those having frequencies equal to the sum and to the difference of the two original frequencies f and f′. Using the difference frequency (f-f′), if the frequency of the incoming signal be 750 kilocycles, we can adjust the frequency of the oscillator to 1,250 kilocycles or to 250 kilocycles and get the desired frequency of 500 kilocycles in the plate circuit. If the frequency of the incoming signal be 300 kilocycles we can adjust the oscillator to 800 kilocycles and get 500 kilocycles in the plate circuit or using the sumnation frequency (f+f′), we can adjust the oscillator to 200 kilocycles and again get 500 kilocycles in the plate circuit. For further discussion the difference frequency only will be used.

It is evident from Fig. 3 that two tubes are necessary for that type of frequency changer, as in the case of the majority of Super-Heterodyne receivers. In trying to make one tube serve the purpose of two, a circuit such as illustrated by Fig. 4 was tried out. In this circuit the vacuum tube V was made to oscillate and still act as a detector in much the same way as in the self-heterodyne or Autodyne receiver. The circuit E was tuned to the incoming frequency and the circuit G to the necessary oscillator frequency to give the desired frequency in the circuit F. It has been found that such an arrangement is satisfactory only as long as the two above-mentioned frequencies, f and f′, differ widely. In the case of the Super-Heterodyne, the two frequencies differ only by some 40 kilocycles, hence the two circuits E and G interfere with each other and prevent such an arrangement from being used. In the Metaform receiver, the two frequencies differ by at least 500 kilocycles so that the circuit shown in Fig. 4 proved to be satisfactory in every way and was adopted for our purposes.

The frequency changer unit used by the writer in his experiments with broadcasting frequencies was constructed as shown by Fig. 5, in which each piece of apparatus is lettered to conform to the following list of material used:

MATERIAL USED IN CONSTRUCTING THE FREQUENCY CHANGER

Letter	Material	Size
V	Hard amplifier tube	UV201A
H-I	Variable air condensers	.00035 mfd.
R	Filament rheostat	20 ohms
L_1-L_2	Fixed coupler	L_1—10 turns; L_2—60 turns
L_3-L_4	Fixed coupler	L_3—10-40 turns; L_4— 5-20 turns

The two fixed couplers were mounted about six inches apart and placed perpendicular to each other to eliminate inductive coupling between them. The condensers also were widely spaced and were gear-driven to get a fine vernier effect. A C battery voltage of about three volts for a B battery voltage of 67½ volts was used to keep the operating point on the correct part of the characteristic curve.

The receivers proper which were used in conjunction with the frequency changer were of various types. First a tuned transformer-coupled, radio-frequency amplifier

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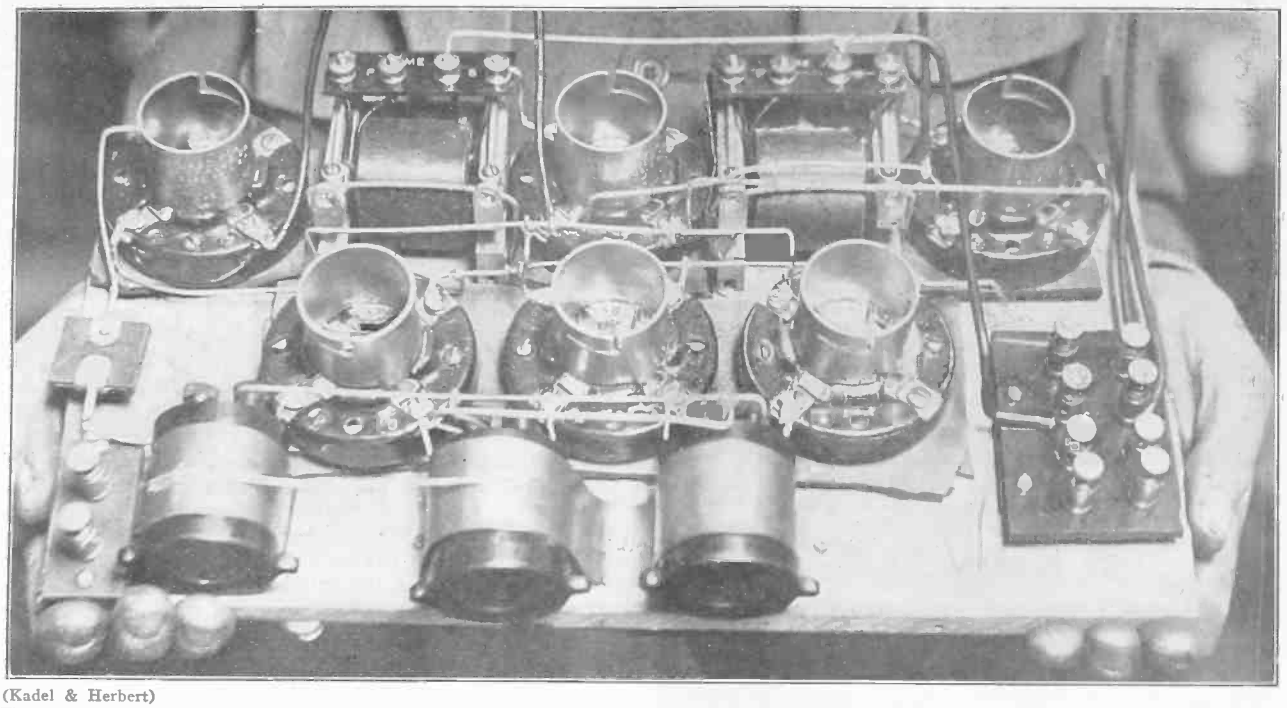
Set in England that Gets WJZ



(Kadel & Herbert)

THIS is an American adaptation of the British Navy circuit, which gives remarkable results. There are three stages of radio-frequency amplification, detector and two stages of audio-frequency amplification. It is assembled and wired in a very compact manner, using a minimum of space, thus making very short leads possible. The six tube sockets, which are of the low-loss porcelain base type, are placed on shock-absorbing rubber cushions, as shown in the photograph. The radio-frequency transformers have a strip of brass placed on the outside and grounded to the negative A battery terminal. This circuit, used in England, has heard many of the United States broadcasting stations consistently, particularly WJZ, New York City. Local stuff comes in great without antenna, loop or ground. Although the radio-frequency tubes cannot be tuned, great volume is obtained over the entire broadcasting wave length range. The whole is mounted on a baseboard with convenient binding post blocks for facilitating battery connections. Evidently this outfit is used as a portable set, as flexible leads are taken off from the filament posts on the sockets and run direct to a battery of proper voltage. The detector tube is the one at the upper left hand corner, to which is connected the grid condenser. No leak is used. An outfit like this, built so compactly, might well be inserted in a phonograph or small handbag for portable use.

Signals Converted to 600 Meters

(*Concluded from preceding page*)

such as the Neutrodyne receiver, was used; second, an untuned transformer-coupled, radio-frequency amplifier was tried and finally a regenerative detector with its tuner was coupled to the frequency changer. In all cases the two output terminals D in Fig. 5 were connected to the primary winding of the receiver imput coupler as illustrated by Fig. 6.

When the frequency changer was being used with the Neutrodyne receiver, the terminals D in Fig 5 were connected to the antenna and ground binding posts of this receiver as in Fig. 6, the ground binding post first having been disconnected from the negative side of the A battery. The Neutrodyne was tuned to a frequency of about 500 kilocycles or 600 meters and left in that adjustment. The condenser I in Fig. 5 was then adjusted to bring the circuit E in tune with some broadcasting station, such as WEAF. The condenser H was next rotated until WEAF was heard in the loud speaker connected to the output of the Neutrodyne.

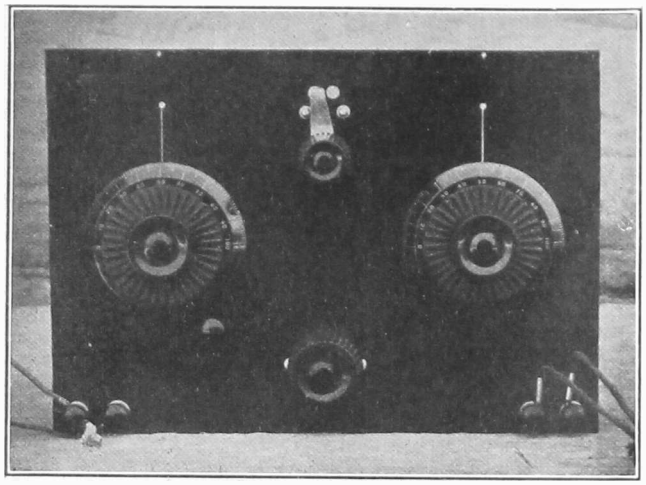
This adjustment of the condenser H brought the frequency of the oscillating tube V to such a value as to beat with the frequency of the incoming wave. In this case the incoming frequency was 610 kilocycles and the oscillator frequency was 1110 kilocycles, resulting in a difference frequency of 500 kilocycles, to which the Neutrodyne receiver was tuned. This was repeated for various broadcasting stations, changing the frequency of each to 500 kilocycles. As the next experiment the Neutrodyne was tuned to a frequency of about 1,500 kilocycles, or 200 meters, and again the frequencies of several of the broadcasting stations were changed to this new frequency. In this case, however, the frequency was increased, instead of decreased as previously, the Super-Heterodyne method thus being used. Assuming that WEAF was being received with a frequency of 610 kilocycles, the circuit G was tuned to 2210 kilocycles, resulting in the frequency of 1500 kilocycles, which is, of course, higher than that of WEAF.

When the frequency changer was being used with a regenerative receiver the receiver was tuned to still higher frequencies. In each case any incoming signal was changed to these higher frequencies, proving that there is no theoretical limit to the resultant beat frequency which can be used.

Experiments also were performed with the lower frequency transmitting stations, the results being the same. Any incoming signal of any frequency can be changed to any other desired frequency by a proper choice of the constants of the circuits E and G in Fig. 5. This applies, of course, only to such cases where the desired frequency is higher than that of the incoming frequency, because the circuits E and G must be tuned to widely differing frequencies.

[*The merits of the Metaform System, as compared with the best existing receivers, will be discussed in* RADIO WORLD, *issue of June* 28.]

A Double Range Three-Circuit Tuner



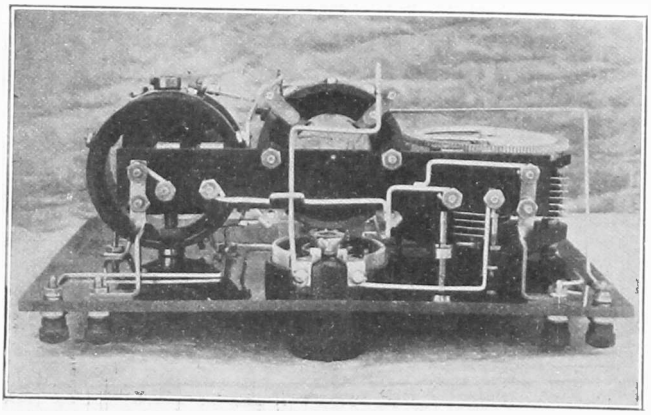
TUNING is done with the left-hand dial and regeneration is controlled by the right (Fig. 1). The panel was specially made for the three-circuit tuner.

By Brainard Foote

A GOOD many suggestions have come forward recently for slightly altering the single circuit tuner so that it will not only be modified as radiator of "whistles," but so that it may be as selective as more complicated circuits. By far the most satisfactory of all of these schemes is the addition of another circuit, not tuned, however, but merely in the form of an extra coil for coupling the antenna to the grid circuit. Such devices involve the addition of an antenna coupling coil having about 15 turns, a secondary of about 50 turns and a movable tickler.

Good as these coils are in their selective tuning, there remains yet an improvement which makes them of even greater value. Operators of any circuit where the broadcast band is covered completely by a single condenser and a fixed coil have found that the adjustment for a weak low wave station is exceedingly difficult, broadcasters seeming to overlap and run into one another. This, however, is more the fault of the tuning device in use, for the assigned wave lengths are separated by as great a frequency difference on low as on high waves. In other words, the tuning range of the variable condenser ought to be more "spread out" to facilitate reception on waves below 360.

Any single circuit receiver may be converted to the coupled 3-circuit arrangement very handily and with scarcely any expense. The alteration will not mean a reduction in volume at all, but will open one's eyes in the way of sharpness. Did you ever try to get WHAS, Louisville, while WOR or WJY was on the air? With a single ciruit this is a physical impossibility, for there is only 5 meters difference in wave length. Yet with the coupled circuit, it is possible to hear WHAS quite well and not be disturbed very greatly by WOR except on an unusually strong note or "blast" of jazz.



HOW TO PLACE the coupling coil (Fig. 2) just inside the grid end of the variocoupler winding of the three-circuit tuner.

Similarly, have you ever attempted to tune in KGO, Oakland, Cal., on 312 meters? A single circuit will scarcely perform this seeming miracle with WLW or WSAI on 309 meters banging away. But with the coupled circuit, KGO comes through once in a while, even with no more than one tube. So it will pay any single circuit user to try the modification, for it costs practically nothing and a new radio world of reception awaits him.

The photos illustrate a coupled circuit receiver built especially for this purpose. Any single circuit owner may note what few changes are needed for his own receiver.

Deviation from the makes listed below is, of course, possible so long as the number of turns and capacities are kept the same. The type of coupler chosen was used because it is already prepared for use with only two taps. Any standard coupler may be employed with a similar tapping arrangement.

.00025 mfds. Dubilier grid condenser.
2 megohm grid leak and mounting.
General Radio Type 268 variocoupler.
Tube socket.
General Radio Type 247-M vernier condenser .00025 mfds.
Federal "split-Rheo," 16 ohms.
Radion panel 7 x 10 inches.
2 Radion dials, 3 inches diameter.
4 Eby binding posts.
Switch lever, 2 switch points, 2 stop points.
4 Fahnestock clips.
4 lengths bus-bar for connections.

Fig. 1 gives the front panel view. Mahoganite panel and dials were employed for the sake of appearance, with rheostat knobs to match for the rheostat and the switch lever, these replacing the knobs supplied with the instruments. Tuning is done with the left hand dial and regeneration is controlled by the right. The switch is moved to the right for Range No. 1, where wave lengths between about 360 and 650 meters may be reached. With the switch at the left, the second range is in use, and the condenser covers stations from 180 to 400 meters. The G. R. coupler has 80 turns on its outside winding, with one binding post for connection to the middle. Any other coupler may be similarly arranged by connecting the entire winding, or 80 turns of it, as the entire secondary coil, and providing a tap at the center. The variable condenser is the .00025 mfds. size, having 14 plates. Any variable from 11 to 15 plates will do, however. Note the type of vernier provided: a large gear with smaller gear and external knob. This is the form of vernier desirable—and do not attempt to use this circuit without a vernier of some kind, for it will be almost impossible to set the condenser just right with the large knob. The vernier must not be of the type including an extra plate or a small condenser on the end, for this upsets the dial settings of the large dial. Stations will then not come in at the same dial reading time after time and tuning will be very much confused. The vernier should be a friction or geared arrangement which moves the entire set of movable plates.

The bottom view, Fig. 2, illustrates the placing of

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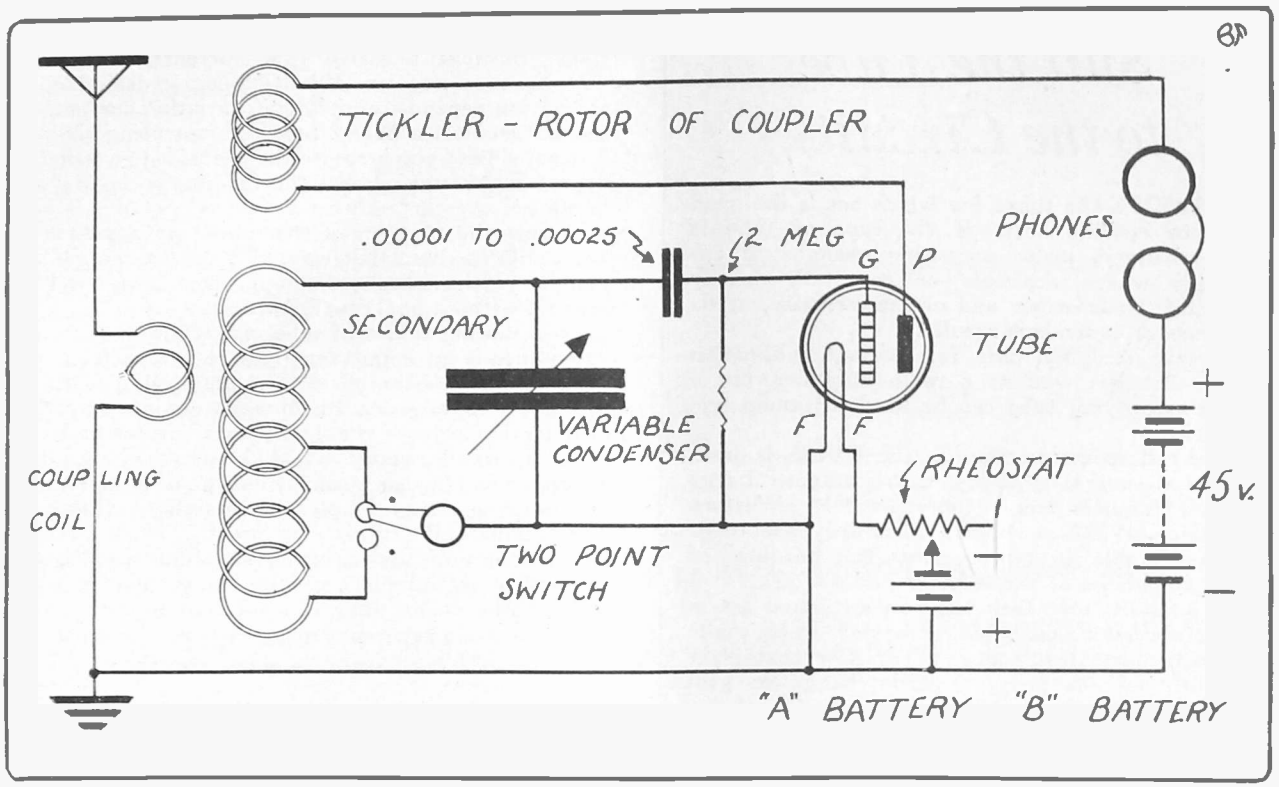
Change Your Single Circuit to This



THREE-CIRCUIT TUNER'S WIRING (Fig. 3) into which single circuit set can be converted.

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the coupling coil—just inside the grid end of the vario-coupler winding. The four clips on the hard rubber strip are, from left to right, "B" plus, "B" minus, "A" plus, "A" minus and some of the wiring may be followed from Fig. 3. The binding posts at the lower left are for the phones, while those at the right are for ground and aerial. Note that the ground is connected to the plus "A," and it is to this point that the return lead from the antenna coupling coil comes.

The coupling coil is made by winding 15 turns of double covered wire about No. 22 in size, on a cylinder slightly smaller than the inside of the vario-coupler's outer tubing. The turns are then held together, "bunched" you might term it, and placed inside the tubing. There they are allowed to spring apart till they fit inside the tubing snugly. Then two or three wraps of tape are placed on the coil to hold the turns together and it is replaced in the coupler, at the grid end. Be sure to get the coupling coil at the end which contains the half of the secondary coil which is in use no matter which way the double contact switch is thrown.

Fig. 3 gives the circuit diagram in conventional style, and this carries its own message. The circuit delivers a great deal of volume from local stations, and if you live within 15 miles of them you will find that you can work your loud speaker to some extent on just the single tube. A power tube such as the 216A or even the 201A gives very good volume. As far as DX is concerned, there is little difference between storage battery tubes and dry cell tubes, and the UV199 operates excellently. Except in the case of a soft detector tube, use a 45-volt "B" battery.

The antenna should not have too high a capacity, and a single wire 80 to 100 feet long operates very well. Its capacity may be kept low by elevating it ten or twelve feet above the roof and keeping the lead four or five feet out from the wall on the way down. This is done so that the "natural" period of the antenna circuit (which includes the coupling coil) may be lower than 200 meters. Otherwise its absorbing effect at its fundamental may interfere with regeneration on that wave length.

With the switch thrown to the right to include the entire secondary coil, the circuit will function much like the ordinary receiver, although it will tune considerably higher. For instance, on the set illustrated, 600 meters comes in at 85. KSD is heard at 66, KYW at 62½, WWJ at 58, WEAF at 51, WMAQ at 38½, WDAR at 23, WHN at 18½ and KDKA at 12. Move the switch over, and you'll get WOR at 91½ instead of at 27½ on the upper range. Tune lower and WHN comes in at 67. Here's what you should notice—on the upper range there are just 9 dial degrees between those stations.

If you want something simple and selective to the point of utmost gratification, try it. And withal, you'll have a high class receiver in which the setting of the regeneration dial doesn't have to be changed more than five degrees for the whole scale from 180 to 650 meters!

[*Readers are advised to add Thompson's Neutrad Unit to this circuit. Full constructional data and diagrams were published in* RADIO WORLD, *issue of May 3.—Technical Editor.*]

14 New Stations in Class B Soon

PLANS have been made for the erection of at least fourteen new class B broadcasting stations.

Valuable Tips on Choice of Tubes

Suit the Tube to the Circuit

CHOOSE the tubes for which set is designed to operate best. If the type of tube is changed, make necessary changes in apparatus where desirable or essential, usually rheostat, transformer and neutralizer size, or do not expect equivalent results.

A tube designed only for audio amplification will not serve well as a radio amplifier, but a radio amplifying tube can be used for audio frequencies.

Dry cell operation, such as the UV199, is practical and very satisfactory in low stages. Large volume requires larger tubes, as 201A, Western Electric, UV202 or equal. Standard base tubes are preferable, as replacements can be obtained most anywhere, as wanted.

If possible, test each tube on an actual set in operation before purchase, or have a dealer make an instrument test for you, to show that plate current changes properly with change in grid potential applied.

By P. E. Edelman

THE C battery is used to apply initial negative potential to grid and is not needed in detector connections, many radio amplification stages nor any low audio stages. It is only when the plate voltage is increased that a C battery becomes useful, and manufacturers give tables of C battery for different plate voltages. With 199 tubes, C batteries are not needed below 44 volts plate voltage, but up to 100 volts will be needed. The UV201A type tubes work well without C battery when 80 volts or less B battery is used, and up to possibly 100 volts. The IR drop across the rheostat included in the negative side of the filament circuit applies sufficient negative grid current. For some reflex stages, a negative C battery is not desirable, as stabilization depends on the audio variation current.

Do not connect a WD12 tube to a set using six-volt A battery unless you increase the rheostat to a value of 20 ohms maximum. Label the binding posts of your home-made set correctly so as not to get the B battery across the filament of the tubes, as thousands of tubes are burned out that way. Do not connect B battery until you have first connected A battery and lighted filaments without applying B battery.

In considering tables of tube characteristics, mutual conductance is an important guide to the performance of the tube as an amplifier. The amplifying factor is less important to consider in choosing an amplifier. For detection, a large change of plate current unilaterally with small change of grid current is wanted, whereas in amplifying a similar change of plate current corresponding to grid potential variation is wanted, without unilateral or rectifying effect. That is a reason why combination circuits using simultaneous detector and amplifying action are usually not so clear as when the functions are separated in different tubes.

AMPLIFIER RATINGS

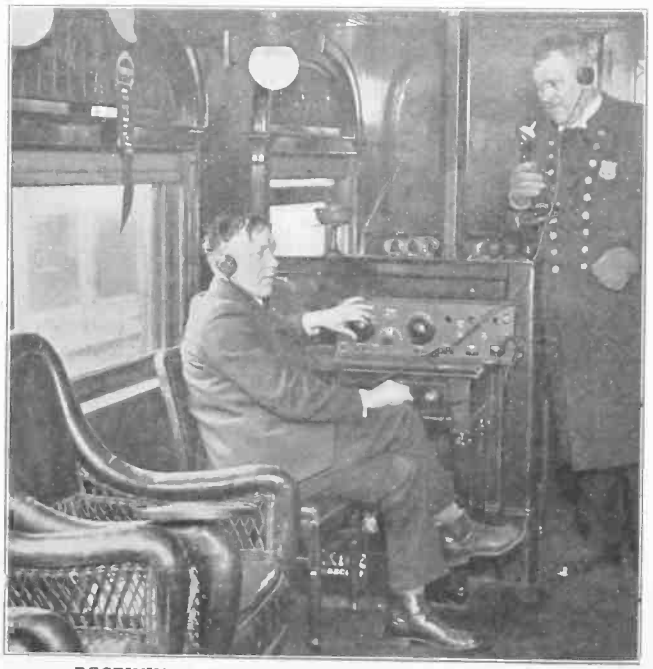
(AVERAGE, MANUFACTURERS' FIGURES)

Type Tube	*Plate Volts*	*Amplification Factor*	*Mutual Conductance (Micromhs)*
UV199	40	6.2 to 6.3	315
UV199	60	6.2 to 6.3	350
UV199	80	6.2 to 6.3	400
UV199	100	6.2 to 6.3	440
DV3	20	6.75 to 7.40	240
DV3	45	6.75 to 7.40	370
DV3	70	6.75 to 7.40	470
DV3	95	6.75 to 7.40	500
WD11	20	5.7 to 6.2	190
WD11	40	5.7 to 6.2	290
WD11	60	5.7 to 6.2	420
WD11	80	5.7 to 6.2	470
WD11	100	5.7 to 6.2	480
*UV201A	40	6.5 to 6.6	345
*UV201A	60	6.5 to 6.6	425
*UV201A	80	6.5 to 6.6	535
*UV201A	100	6.5 to 6.6	630
*DV2	25	6.75 to 7.30	350
*DV2	50	6.75 to 7.30	570
*DV2	70	6.75 to 7.30	720
*DV2	90	6.75 to 7.30	820
*DV2	120	6.75 to 7.30	920

(*) *Best all around amplifiers for radio, audio or reflex.*

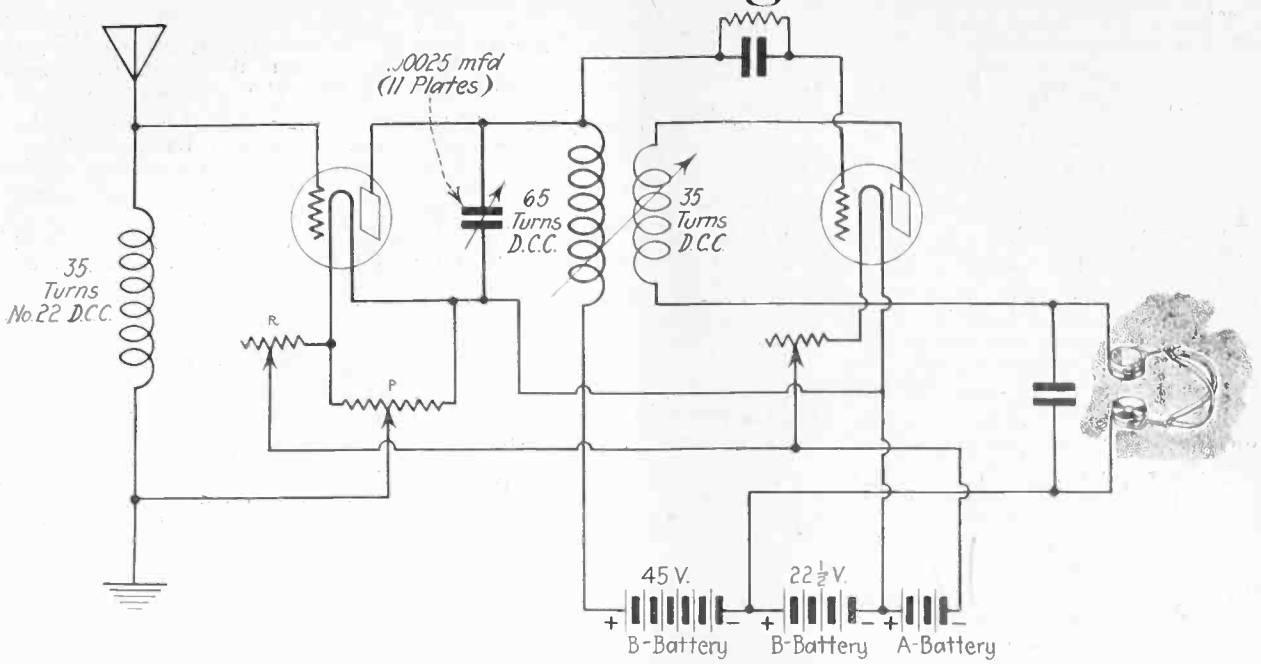
(Photos by Fotograms)

EXTENSIVE tests are being conducted by members of the American Radio Relay League, who are operating under Federal licenses in conjunction with the Pennsylvania Railroad. The object is to determine the availability of radio telegraphy for transmitting messages other than train dispatches should trouble develop over the usual wire lines.) The tests proved highly successful, and radio was demonstrated as practical for the purpose. Above photo shows the cage antenna system on top of a railroad car. The photo at the right shows the experimental installation in the club car of the train. Constant communication was held with the transmitting station, regardless of the moving of location.- Besides being available for the handling of train orders and passenger messages, the set is able to furnish entertainment for the entire train. This is especially desirable on long overland trips when the tiresome journey heretofore held no joys for the jadded traveler.



RECEIVING SET aboard a Pennsylvania R. R. train.

Untuned RF in a Regenerative Set



ADDING A STAGE OF RF to a single circuit regenerative set gives better signals and takes the set out of the radiation nuisance class. The diagram (Fig. 1) shows how to use a stage of untuned RF. This stage may be put in a separate little cabinet, or, if an entirely new set is being built, a 7x21 cabinet would suffice for the circuit and two stages of AF. There are only two controls—one for the variocoupler, the other for the variable condenser.

By N. N. Bernstein
Technical Editor

THE single circuit regenerative set, when operated by the novice, is very often allowed to oscillate. That is, the operator tunes in by means of the broadcasting station's carrier wave, which can only be heard when the tube is so adjusted that a slight hiss and whistling noises are audible in the ear phones. When the circuit is in such a state, it is in effect a miniature transmitter of radio waves.

Radio users have often condemned the "squeal boxes" or single circuit sets, when, in the midst of a nice program, some neighbor with such a set starts to tune in by first finding the carrier wave. The wavelength of the energy transmitted by the interfering set is the wavelength its operator is tuning on, therefore, should Mr. A be listening in on WEAF on 492 meters, and Mr. B next door tunes in on WEAF's carrier wave, Mr. A will hear all manner of squawks, howls, whistles, groans and scratchy noises until Mr. B gets off the wave.

There is a good method for stopping this interference, and at the same time improving the range and volume of the single circuit outfit. By the addition of one stage of radio-frequency amplification, which can be done at comparatively small cost, a muffler action is placed on the oscillations emitting from the detector tube and the energy is prevented from getting out to the antenna.

Fig. 1 shows the complete wiring diagram of a regenerative set with the addition of one stage of untuned radio-frequency amplification. The parts needed for the added stage are:

One tube
One socket
One 45-volt B battery
One rheostat
One 50-turn honeycomb coil or 35 turns No. 22 wire on a 3" tube
One 400 ohm potentiometer

These parts may be mounted on a baseboard or in a small cabinet 6" x 6". The only adjustment necessary on the RF stage is the potentiometer, which can be set where best results are obtained and left there for most stations.

In wiring the set, the antenna is connected to one side of the coil and to the grid of the first tube. No grid condenser or leak is used here. The ground is connected to the other side of the coil and to the center or switch arm of the potentiometer. The end binding posts of the potentiometer are connected directly across the filament leads going to the first tube. This does not short-circuit the battery, as the resistance of the potentiometer is so high as to allow only a trifling amount of current to pass. The rheostat is connected into the negative A battery lead.

The variable condenser which is already in the original set is connected as follows: One end of the primary of the coupler, which is connected to the grid condenser and leak, is wired to the rotor plates of the variable condenser and to the plate of the first tube. The stator plates of the condenser are connected to the positive A battery lead. The other end of the primary is connected to the 45-volt positive tap of the added B battery. The minus of this new B battery is connected to the plus of the original 22½-volt battery. The secondary of the coupler, or tickler, is connected to the detector tube plate at one end and to the ear-phone binding post at the other. The remaining ear-phone binding post is wired to the 22½-volt tap on the 22½-volt B battery. A small fixed condenser of .001 mfd. may be connected across the phone posts for improving the tone of the music received.

Aerial for Portable

A GOOD way of making antenna and ground connections when in the country or woods with a portable set is to drop a few feet of bare wire into the river or lake for the aerial. A sort of counterpoise for this is a large spike or piece of iron pipe connected to another piece of wire driven into the soil five or ten yards from the bank. With sets that use a loop this method brings fairly good results. The set should be set on a dry box so as to be well insulated from the ground.

Completing Super-Heterodyne

[The following is the fourth and final instalment of J. E. Anderson's article on how to build a coast-to-coast Super-Heterodyne. The previous instalments were published May 31, June 7 and June 14.]

By J. E. Anderson

PART IV.

THERE is a quite simple method of adjusting the transformers, which may be used in case a wave meter is not available. This, however, requires that the set be in actual operation and that a signal is coming in. The method is entirely satisfactory and is always available, and it has the advantage that no extra testing equipment is necessary, except possibly, for convenience, three variable air condensers.

Connect these condensers in parallel with the condensers C_1, C_2, and C_3. Set them all at zero. Now tune in the circuit until a signal is heard. There will be two distinct points on the C_2 dial which will give the same signal. The distance between these points is a measure of the frequency to which the three transformers T_1, T_2, and T_3 are tuned. If the capacities of the auxiliary condensers across the secondaries are increased, the distance between the two points will decrease. If the points are not sharply defined, that is, if the selectivity is not satisfactory, it means that the transformers are not selective or that they are tuned to slightly different frequencies. Adjust the condensers until the signals come through loudest and until the selectivity is good. If the condensers are to be left in the circuit, clamp them in that tuning position, and the adjustment is complete.

If the condensers are not to be left, but are merely used as an aid in tuning, gradually reduce their capacities until one is on zero. Remove a few turns from the coil across which this condenser is connected, and tune again. The settings of the other two condensers will now be nearer the zero mark. Continue removing turns from the first coil until two of the condensers are on zero while one is still above zero. Now remove equal number of turns from the two until the third is also on zero. The transformers are then in tune with the same frequency, and the auxiliary condensers may be removed. Any differences in the zero setting capacities of the three condensers may be neglected, so the coils may still be considered in tune with the same frequency after the condensers have been removed.

Now the grid terminals which were left unsoldered before should be soldered. A layer of friction tape may be wound over the secondary windings to protect them from injury.

Now let us return to the construction of the receiver.

In regard to the arrangement of the various parts of the receiver considerable latitude is allowable. Some may wish to build it in a long and low cabinet, others may want to shorten it, and build it in two tiers, while still others may want to make the cabinet moderately long and arrange the parts in two rows, one back of the other. Any of these methods may be used, and it is wholly a matter of taste. The last method will be shown in detail below.

No matter in which way it is decided to assemble the receiver, enough room must be allowed for the various parts. Do not crowd the apparatus. Allow from four to six inches for each of the three high frequency stages, at least four inches for each of the three intermediate frequency stages, and somewhat less than that for the two audio frequency stages. This refers particularly to the transformers. If the circuit is built in a long cabinet, 36 inches is probably the minimum length that may be used without crowding the transformers. If the other types of construction be used, the length may be from 18 to 24 inches. In that case either the baseboard or the panel must be about twice as wide.

Before purchasing the cabinet, baseboard, and panel, lay out all the parts on a piece of paper and decide on the proper sizes for the panel nad baseboard, and which type of assembly is the most suitable. Arrange the panel layout as nearly symmetrical as possible without sacrificing good electrical design. Similarly arrange the baseboard, taking into consideration the panel layout already decided.

The three tubes which support the tuning coils should be mounted with their axes mutually at right angles as near to their respective condensers as is practicable. The three intermediate frequency transformers should also be mounted with their axes mutually at right angles. Similarly, the audio frequency transformers should be mounted at right angles if they are very close together. This, however, is not essential because the magnetic flux outside the iron cores is negligible. It is well to connect the cores to the grounded bus bar.

The two grid biasing batteries should be placed so that the grid return leads are as short as possible. In the cases of E_2 the leads from the intermediate frequency tubes should determine the position rather than the audio frequency tubes. The positions of the three jacks and the three rheostats will be determined largely by the panel layout. The leads to these parts will be at a low potential, and the currents flowing through them will either be audio frequency or direct. There will be very little radio frequency current in them provided the by-pass condensers are properly placed. Hence long leads will not be serious.

The six binding posts required in the rceiver may either be placed on the panel or on a sub-panel at the rear of the cabinet. The latter method is recommended as it will give the finished receiver a much better appearance, and it will remove all batteries and battery leads to the rear.

A suitable arrangement of the binding posts on the sub-panel is as follows: Looking from the rear of the cabinet, the antenna binding post is at the right hand end of the sub-panel, then the ground binding post, then in turn, the common, or negative post, the positive A, the 60-volt B, and at the extreme left, the 120-volt B. The distance between them may be from one to one and a half inch.

The receiver must be carefully shielded. One shield must be placed back of the panel to eliminate body capacity. Another shield should separate the oscillator circuit from the rest of the receiver. One shield may also be placed between the radio frequency part of the circuit and the intermediate frequency part.

The best shielding material is sheet copper, brass, or aluminum about 1/16 of an inch thick. But if the proper tools for working this material are not available then copper or tin foil may be employed. The thicker the foil is the better will be the shielding.

In preparing the shields be sure to cut holes in the metal big enough so that mounting screws and condensers shafts do not touch it anywhere. Where wires are to go through the shields drill fairly large holes so that the wires may be kept away from the metal.

The high frequency coils L_1 to L_6 should be mounted as far from the shields as possible. One inch should be regarded as the minimum distance allowable, and this should be measured from the nearest

(Continued on next page)

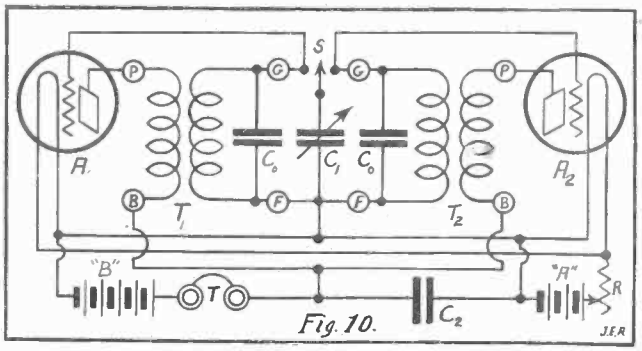


Fig. 10.

TWO identical oscillators used to adjust intermediate frequency transformers. (Fig. 10.) The variable condenser C-1, which may be thrown from one circuit to the other by switch S, enables both transformers to be adjusted to coupling distance. Condensers C-0 are fixed capacities and C-1 is a 5-plate variable. Condenser C-2 across the B battery and phones decreases the coupling between the two oscillators if the adjustment is close.

U. S. Aids Broadcasting News for Business Men

THE Federal Government has taken advantage of radio as a means of disseminating information calculated to be of interest to business men, bankers, exporters, producers and farmers throughout the United States. Today, 20 broadcasting stations are carrying items on domestic and foreign commerce every Friday night, 131 stations broadcast weather reports every day, and 85 transmit market reports at least once daily, in practically every state.

The broadcasting of the weather and market reports is well known to most farmers who own radio receivers, or who listen in nightly at community centers, but the efforts of the Commerce Department to keep commercial men informed as to business conditions both here and abroad may not yet be fully appreciated.

Friday night each week broadcasting stations in Detroit, Chicago, New Orleans, Dayton, Memphis, Minneapolis, Pittsburgh, Nashville, Rochester, Providence, Cleveland, San Francisco, Boston, Seattle, St. Louis and Atlanta put on as part of their programs a brief resume of domestic and foreign conditions, and a detailed list of trade opportunities abroad.

KGO WIRES UNDER BAY TAP STUDIO IN SAN FRANCISCO

THE broadcasting resources of KGO, the Pacific Coast station of the General Electric Company at Oakland, Cal., have been greatly increased by the introduction of a San Francisco studio at the Hotel St. Francis. Ground wires under San Francisco Bay connect the San Francisco studio with the control room and power house of KGO, ten miles away. It will no longer be necessary for San Francisco artists to travel to Oakland to fill a radio engagement with KGO.

Tuning Directions for "Super-Het"

(*Continued from preceding page*)

point of the windings. This may not be practicable in all cases, but if it is not observed, the losses in the metallic shields be mounted as far from the shields as possible. One inch should be regarded as the minimum distance allowable, and this should be measured from the nearest may be excessive, thereby cutting down seriously both selectivity and sensitivity.

After a satisfactory layout for the panel and baseboard has been decided upon, proceed with the drilling of the panel. First lay it out carefully on a piece of strong paper the exact size of the panel. Meaure the apparatus that are to be mounted on the panel and transfer the dimensions to the paper. When this has been done check carefully and clamp the paper to the panel. Mark the panel with a sharp instrument where a hole is to be drilled. Remove the paper template and check again to make sure that all marks are at the correct places. Accuracy is essential. Now deepen the marks with a center punch and drill.

In drilling use a drill which allows considerable clearance for rotating parts, and hold the drill at right angles to the panel. Countersink where required.

Now attach the shield to the back of the panel. If foil is used, glue or shellac may be employed; but if heavier sheet metal is used, either small machine screws or small escutcheon pins may be employed for the purpose.

Then mount condensers, jacks, rheostats etc., on the panel. Attach the panel to the baseboard and arrange the parts that go on the baseboard in the most suitable manner, mounting shields where they are to go.

When the wiring has been finished go over it carefully to make sure that it has been done correctly. Connect the filament battery and insert the tubes in the socket. See that they all light and that the three rheostats function properly. If they do not, find out where the open circuit is and mend it.

Now connect the plate battery. First connect the positive and then tap the negative terminal post with the negative lead from the battery. The tubes should not become brighter. If they do not, it is safe to make the negative connection permanent. Ascertain whether the plate potential reaches the various plate binding posts on the tube sockets. This may be done by merely touching them with the finger, provided contact is also made to the other side of battery. If the high potential does not reach these points, there is an open circuit which must be attended to.

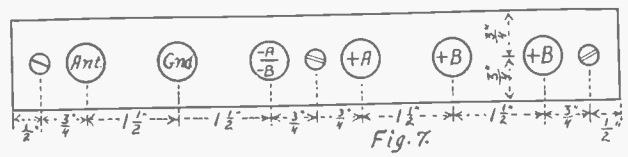


Fig. 7.

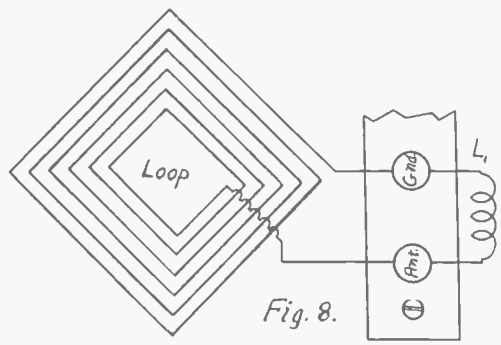


Fig. 8.

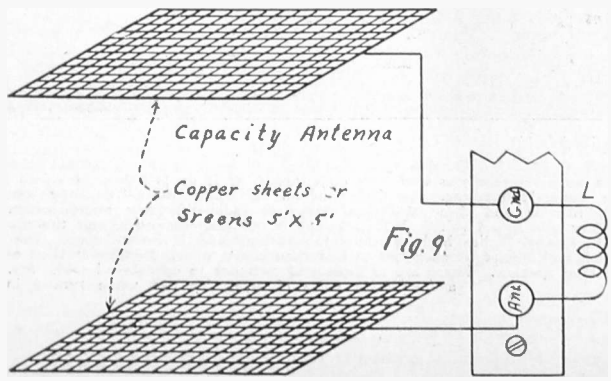


Fig. 9.

FIG. 7 — Binding posts at rear of set. Fig. 8, loop may be used by merely connecting it to the antenna and ground binding posts. Capacity antenna (Fig. 9) consisting of two copper sheets or wire screens placed five to fifteen feet, one above the other, and gives excel-

If you have a buzzer these tests may be made without using the batteries. The buzzer may also be used for testing the other parts of the circuit—testing the condensers to see whether they are open or short-circuited, and testing the grid circuits for continuity in the connections.

When the preliminary tests have been completed to the satisfaction of the builder, the circuit is ready for a test under actual receiving conditions. Connect the antenna and ground to the receiver, and turn on the filaments of the tubes to the proper brilliancy. Insert the headset plug in jack J_1, or the loud speaker plug in J_3.

Then tune. Set the dial of condenser C_2 on zero and the dial of C_4 on a point about 10° above zero. Then turn the dial of C_6, the oscillator, very slowly from zero upward. If there is a signal coming in on the shorter wave lengths it should be heard. If none is heard, set the dial of C_4 on a point about 20° above zero, and repeat with C_6. Continue until the entire dial of C_4 has been covered, or until a signal has been picked up.

If there is a station within the reception range of the receiver broadcasting at the time, its signals will probably be heard, and they will be heard at two distinct points on the dial of C_6. As soon as a signal has been picked up, leave the dial of this condenser in the position where the volume is loudest and tune with condenser C_4. Only one point will be found on the dial of this where the signals are a maximum. When this has been found leave this condenser and tune C_1. One point will also be found on this where the signals are a maximum. The receiver is now in tune with that particular signal. The second point on the dial of C_6 may be found without changing condensers C_2 and C_4.

As soon as a station has been picked up, all the tuning data should be recorded. How this may be done is illustrated in Table 1. This gives a sample calibration chart covering the entire broadcasting wavelength range from 550 to 1350 kilocycles. For convenience both the frequency and the corresponding wave length are given in this table. Then follow the corresponding readings of the three tuning condensers where the signals come in. Under condenser C_6 both the upper and lower positions are given. Following the tuning data are several columns reserved for call letters of stations that are picked up.

The readings under the three condensers are given to the nearest whole division of the dials. This is accurate at the upper end but it is only approximate at the lower, because for the lower wave lengths the slightest touch on the dials will produce a great change in the volume of the signal.

Should the signals from the local stations become too strong for comfortable reception on either the headset or the loud speaker, the volume may be reduced by detuning condenser C_2 and by turning down the filaments, especially those of the high frequency tubes. The loud speaker may also, of course, be plugged into jacks J_1 or J_2 to reduce the volume.

If there should be any undesirable oscillations anywhere in the circuit due to stray feed-back, notwithstanding careful shielding and placing of coils, special adjustments must be made. Chief of these is the neutralizing condenser C_1, which may be used to prevent oscillations in the muffler tube. This is done in exactly the same way as a neutrodyne receiver is neutralized. It is connected between the grid of the muffler tube and tap on coil L_4, and adjusted to the proper value.

Remove the first tube, A_1, from its socket, and put a piece of paper over one of the filament contact springs. Return the tube to the socket. The tube should not light now, but otherwise there should be no change in the circuit. Now tune the circuit to some strong signal. Signals will probably come through as before, but not nearly as strong. This energy reaches the grid of the modulator through the capacity between the electrodes of the muffler tube and between the leads to that tube. It is this capacity that must be neutralized. This is done by adjusting condenser C_1 until the signal either disappears or until it becomes a minimum. When this has been done leave the condenser in that position, and clamp it so that it will not move.

The first tube may now be lighted, and the signals permitted to pass through in the usual way. No oscillations should now occur in that tube. But if there is still a tendency to oscillate for certain settings of the condensers, the filaments may be turned down a little, which should stop it.

An additional simple way of tuning the intermediate frequency transformers to the same frequency is to use a test circuit such as that which is shown in Fig. 10. This circuit consists of two identical ocillators in which two of the transformers to be tested are used to produce oscillations. Since the transformers have been made as nearly alike as possible, and since the two oscillators are alike, the frequencies generated by the oscillators will be very nearly the same, and they will be very nearly the same as the frequencies for which the transformers are most efficient when used as such. Ordinarily the difference will be low enough so that the beat current formed by the modulation of the two will be audible in the telephones. The difference is due to the variation in the distributed capacities of the circuit and the coils, to the deviation of the condensers C_6 from their rated value, and to slight variations in the inductances of the coils.

The variable condenser C_1 shown be-

(*Concluded on page 26*)

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JUNE 21, 1924

Why the Multi-Tubes?

WHY more than three tubes in a set? The question is asked repeatedly. The answer gets little publicity.

A 3-tube set generally means one detector tube and two tubes for audio-frequency amplification, enabling loud speaker operation. Unless regeneration is used, the volume may not be sufficient. If regeneration is used it will probably cause much annoyance to neighbors who have sets, due to radiation resulting from unskilful operation. Therefore a fourth tube is used, serving as a blocking wall against radiation, and usually making the set more selective. That tube is for radio-frequency amplification. Two stages of RF are most popular. Hence we find 5-tube sets in big demand, such as the Neutrodyne. Those who care to spend more money for greater distance-getting buy or make a Super-Heterodyne.

In reflex circuits the crystal is popular as a detector (substituted for a tube) and brings down the cost of the set.

PUBLIC LEARNS TO TUNE

A LISTEN-IN on the air nowadays convinces one that the great radio public has learned how to tune their sets properly. There is a decided lessening of radiation compared to six months ago.

It Is the Patriotic Duty of All Citizens to Have a Radio

BROADCASTING being only two and a half years old, naturally enough makes its bow this year as a factor in a Presidential campaign. It started spendidly by giving radio owners and their friends a ticket of auditory admission to the Republican convention in Cleveland. It will finish in even greater splendor, with laurels newly won and more certainly implanted. The right of way of radio to the homes and the hearts of all our people is emphasized by an injunction that now becomes obvious:

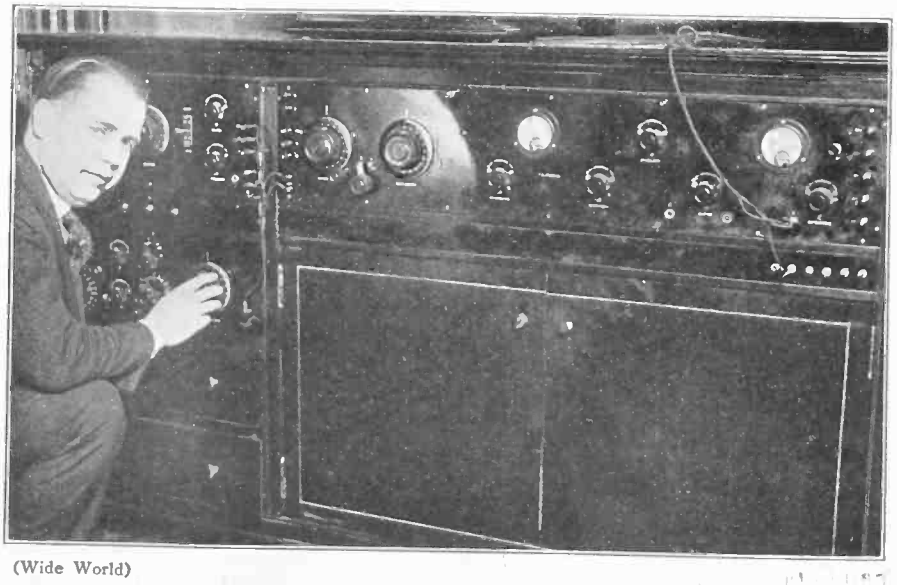
It is the patriotic duty of all our citizens to have a radio.

Anything that contributes to a citizen's knowledge of candidates for the highest office within the gift of an enlightened electorate of the greatest country is an essential possession. Only by knowing all it is possible for them to know about candidates can the electorate intelligently discharge the most important task that they have franchised to themselves.

By hearing candidates a better appraisal of their character can be made than by just reading what they say. It is possible for only a minor percentage of the voters ever to see the candidates. Our physical vastness has its commanding advantages, but some disadvantages, too, of which this circumscription is one. Swinging around the circuit does not bring a candidate's compass at more than two points of any given diameter. But with the radio circuit that's different! Though you may not see him, you will hear him, and a voice has sometimes altered the destiny of nations. While destiny may tread her even course no matter who is elected, nobody with even the slightest interest in our government would want to miss hearing the candidates on the great political issues of the day. The public interest in the event was newly affirmed by the close attention given to the Republican convention by the radio audience. There never was any doubt who would be accorded first place on the Republican ticket. Now the Democratic convention impends. There is almost feverish interest in who is going to be nominated for President at this session, which opens Tuesday June 24, at Madison Square Garden, New York City.

Constitute yourself a radio delegate, attend via the ether, and you'll never regret it.

His Super-Heterodyne Employes 8, 9, 11 and Even 14 Tubes



(Wide World)

THIS GIANT RADIO SET was designed and built by F. R. Greene (above), of New York City. It is a Super-Heterodyne operating on either 8, 9, 11 or 14 tubes, arranged as follows: Eight tubes in the Super-Heterodyne, two tubes in an additional audio-frequency amplifier, one step of power amplification and three additional steps of radio-frequency amplification. It uses 275 volts of B battery and two 6-volt A batteries—one of 100 ampere hours, and the other 150 ampere hours. The cabinet is 41 inches high, 3 feet 6 inches long and 16 inches deep. The set requires no ground or aerial, and connot be operated on less than eight tubes. Distant stations are brought in like locals on the loud speaker. There are 19 dials and switches to operate all told. Mr. Greene would like to hire a few extra pairs of arms for use while tuning in DX.

The Radio University

A Question and Answer Department conducted by RADIO WORLD for its Readers by its Staff of Experts. Address Letters to Radio University Department, RADIO WORLD, 1493 Broadway, New York City.

I WOULD like the following advice on Charles H. M. White's Simplified Super-Heterodyne, details of which appeared in RADIO WORLD *for May 17. 1—Is it advisable for a novice to undertake to build this set?. 2—If the set is built according to diagram and best material used, what receiving range can I expect? 3—What is the wavelength range of this set? 4—For use in city home, would you advise UV201A or 199 tubes? 5—Can you give me some general information for making a suitable loop for this set? 6—I am unfamiliar with the symbol shown connected across the filament leads of the second tube in the diagram. What is this part? 7—How can I connect a C battery in this set?—Leonard Olivier, 1890 Acushnet Ave., New Bedford, Mass.*

1—If you are careful and have had even just a little experience in building radio sets, you should be able to construct this outfit. 2—With average conditions, you can expect from 1,500 to 3,000 miles on this set. 3—The entire broadcasting range, 200 to 600 meters, can be covered with this set. 4—The tubes to be used depend on whether you wish to use dry or storage batteries for lighting the tubes. Either type will be suitable. 5—A loop for the Super-Heterodyne can be made as follows: Two strips of wood 1x1x3½ inches long, should be fastened together in the middle, crossways. Starting from the ends, cut 15 slots with a hack saw spaced one inch apart. In these slots wind 15 turns of stranded insulated wire. A supporting base can be constructed of an 8-inch square block, one inch thick, with a large nail driven through the center to support the upright loop. 6—The symbol you refer to is the sign of a potentiometer. 7—Fig. 18, right, shows the position of the C battery.

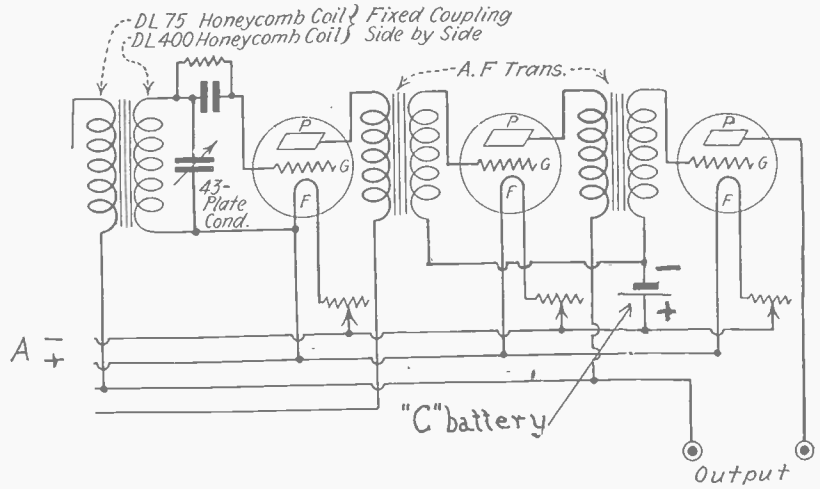


FIG. 18—Showing how to connect a C battery in an AF circuit, published in answer to Leonard Oliver's question, which applies particularly to Charles H. M. White's Simplified Super-Heterodyne.

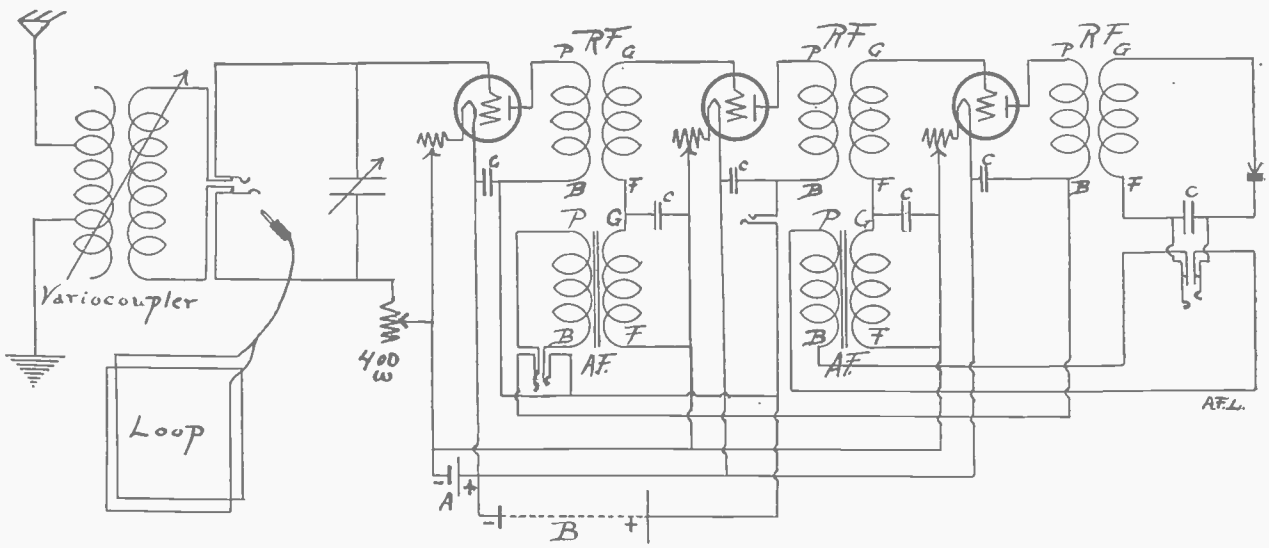
1—Diagrams I have seen of the Superdyne show the primary and secondary windings of the variocoupler wound in opposite directions. Is this essential? 2—Will the Superdyne work with two stages of radio amplification, and would this be preferable to one stage? 3—Are three stages of audio-amplification necessary in this set?—T. L. Reger, 1113 Pennsylvania Station, Pittsburgh, Pa.

1—You evidently refer to the tickler coils or rotors on the couplers, in which case they should be of the 180-degree type. The reverse or negative effect in this case is obtained by merely turning the rotor to the opposite side from which it oscillates. 2—A modified two-stage Superdyne article appeared in RADIO WORLD, issue of June 14, and gives you fuller information than is possible here. The article is by J. E. Anderson. 3—Three stages of AF amplification is entirely too much on any set, sufficient volume being obtained with two stages.

* * *

Kindly let me know if the set published in

(Concluded on page 27)



HOOK-UP of the improved Grimes Reflex circuit, showing how to connect a double circuit jack so that the set may be used with a loop or outside antenna and additional varicoupler. Jacks are provided for after the first and second audio-frequency stages. The fixed condensers C are all .002 mfd. UV199 tubes work efficiently in this circuit, and enable the set to be built for portable use. The diagram (Fig. 19) is published at the request of Paul Anderson, whose question appears on page 27.

In reference to the simplified Super-Heterodyne by Mr. White in RADIO WORLD *for May 17. 1—What are the secondaries of the 30 K.C. transformers connected to? 2—In this circuit, which tube is the detector? 3—Can I use two UV201A tubes, one UV200, one Navy type and two C301As and in what order should they be placed?—Dr. W. J. Bickford, Mosley Clinic, Newburyport, Mass.*

1—The secondaries of the intermediate frequency transformers are connected to the center tap of a 400-ohm potentiometer, as shown in Mr. White's diagram. 2—The fourth tube from the left is the detector tube. In all circuits, the detector tube is the one having a grid leak and condenser connected to the grid of the tube. 3—Your tubes can be used in this set, placed as follows, starting from the left, C301A, C301A, UV201A, UV200, C301A, and the Navy tube in the last socket. The grid leak can usually be dispensed with when a UV200 is used as the detector.

* * *

Can you tell me which stations I could receive the baseball returns from on my 3-tube reflex when I return to my home town, Shamokin, Pa.? How should I go about adding another stage of audio-frequency amplification?—Jos. J. Marcinck, St. Procopious College, Lisle, Ill.

You should be able to receive the sport news and baseball returns from New York, Philadelphia, Pittsburgh, Chicago, Schenectady and many other stations. Fig. 18 shows how to connect a stage of AF amplification to the set you already have.

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BROADCAST PROGRAMS

Thursday, June 19

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." 6:30 P. M., "Music While You Dine," Tom Cooper's Country Club orchestra. 7:20 P. M., resume of the day's sports.

WHN, New York, 360m (830k), E. S. D. S. T.—5 P. M., Buddy Baldwin's Nassau Hotel orchestra. 6-7 P. M., at the Festive Board. 9-10 P. M., broadcasting from stage of Loew's Astoria Theatre. 10 P. M., All Nation's program. 10:25 P. M., songwriters' controversy. 10:30 P. M., The Sheres trio, in classical selections. 11 P. M., Sylvia Brown, popular songs. 11:15 P. M., Ross Fowler, baritone. 11:30 P. M., program announced.

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.

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, member faculty of Peirce School. 5:45 P. M., baseball scores. 7:30 P. M., Dream Daddy with the boys and girls.

WOAW, Omaha, Neb., 526m (570k), C. S. T.—6 P. M., dinner program by Carl Sibbert, tenor; J. V. Barborka, harpist; Dorothy Jones, pianist and accompanist. 9 P. M., concert by Louis Culp's orchestra of Hotel Fontenelle.

WEAF, New York, 492m (610k), E. S. D. S. T.—11 A. M., market and weather reports; talks to housewives. 4 P. M., Joseph Fledell, baritone; Betty A. Bright, contralto; Moonlight Instrumental Concert Trio; stories and songs for children. 6 P. M., dinner music from Hotel Waldorf-Astoria; Minnie Wasserman, pianist; The Happiess Boys—Billy Jones and Ernest Hare; Helen Larkin, soprano; B. Fischer's Astor Coffee orchestra.

WJZ, New York, 455m (660k), E. S. D. S. T.—5:30 P. M., state and federal agricultural reports; Farm and Home reports; closing quotations, N. Y. Stock Exchange; foreign exchange quotations; news. 7 P. M., Cafe Savarin Scandinavian ensemble. 7:20 P. M., financial developments of the day. 8 P. M., French lesson. 8:30 P. M., Wanamaker concert. 10:30 P. M., Hotel Majestic orchestra.

WJY, New York, 405m (740k), E. S. D. S. T.—A NIGHT OF THE PAST—8:30 P. M., overture. 8:35 P. M., prologue. 8:40 P. M., "The Songs You Know." 9 P. M., "Songs of the 60's," by the Royal Trio. 9:30 P. M., "Songs of the 90's," by Max Kalfus, tenor. 10 P. M., "Reminiscences," by George Laval Chesterton. 10:15 P. M., "Songs of 1900," by the Temple quartette.

KHJ, Los Angeles, 395m (760k), P. T.—6 P. M., Art Hickman's Concert orchestra. 6:45 P. M., children's program; bedtime story by Uncle John. 8 P. M., program, courtesy Fitzgerald Music Company. 9:15 P. M., Mackie's Red Moon Serenaders; Stewart Watson, baritone.

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

WLS, Chicago, 345m (870k), C. S. D. S. T.—Frank Westphal's orchestra, College Inn, playing at intervals during the evening. 7 P. M., live stock review from U. S. D. A.; "Beef Making Tips," John M. Evvard. 7:45 P. M., lullaby time, Glenn Rowell and Ford Rush. 10:15 P. M. to 1 A. M., Phyliss Campbell and music message of the Indian; A Night of real Indians and real Indian music; tribal music; songs of Indian romance and war; Midnight Mardi Gras.

WOC, Davenport, Ia., 484m (620k), C. S. T.—9 A. M., opening market quotations. 10 A. M., garden and household hints. 10:55 A. M., time signals. 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; 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.

WLW, Cincinnati, 309m (970k), E. S. T.—10:30 A. M., weather forecast and business reports. 12:45 P. M., Spanish lesson from Crosley University. 1:30 P. M., business reports. 3 P. M., market reports. 4 P. M., talk: "Graphite," by Mr. Fred J. Brunner; piano solos by Miss Adelaide Apfel. 5:15 P. M., baseball results. 10 P. M., Times-Star Radio Club of the World. 11 P. M., special entertainment by Doherty Melody Boys.

WIP, Philadelphia, 509m (590k), E. S. D. S. T.—10 A. M., seashore gossip, from WIP control station on the Steel Pier, Atlantic City. 1 P. M., weather forecast. 3 P. M., "What the Wild Waves are Saying," picked up by a microphone placed amidst the breaking waves under the Steel Pier, Atlantic City, New Jersey. 3:05 P. M., radio baby clinic. 3:20 P. M., visiting artists and chats with celebrities. 3:30 P. M., Comforts Philharmonic orchestra; Miss Veronica Sweigart, mezzo-soprano; Mr. Wm. Tracy, cello soloist.

Caruso, Shipping Clerk Tenor, in Debut at WGY

CARUSO, TENOR (first name Antonio, however), who was discovered in the shipping department of the General Electric Co., at Schenectady, N. Y., made his first public appearance before the microphone at WGY, Friday evening, June 13. Caruso sings the songs of southern Italy as only an Italian can, wherefore he aspires to reach the heights attained by his namesake. Tony has the name, and the chance and his friends say he has the voice, too.

10:30 P. M., Ted Weems orchestra at B. F. Keith's Theatre. 11:15 P. M., dance music by LeRoyale orchestra.

WRC, Washington, D. C., 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 American Automobile Association. 8 P. M., treasury department of vocal and instrumental music. 9 P. M., dance program by Pete Macias' L'Aiglon orchestra. 9:55 P. M., time signals and weather forecasts.

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. 1 P. M., music and one-act play, "A Soldier's Courtship," by John Poole. 5 P. M., produce and stock market quotations; news bulletins; baseball results. 5:30 P. M., organ recital by Stephen E. Boisclair. 7:45 P. M., "A Few Moments with New Books," L. L. Hopkins. 8 P. M., drama, "The House Next Door," by WGY Players.

WBAP, Fort Worth, Tex., 476m (620k), C. S. T.—9:30 P. M., organ recital by Will Foster, of First Methodist Church, classical and ballad numbers.

KDKA, Pittsburgh, 326m (920k), E. S. D. S. T.—5:30 P. M., dinner concert by the KDKA Little Symphony orchestra. 8 P. M., concert of Civil War and other old-time melodies, by KDKA Little Symphony orchestra. 9:55 P. M., time signals; weather forecast; baseball scores. 10 P. M., concert.

KYW, Chicago, 536m (560k), C. S. D. S. T.—5:45 P. M., children's bedtime story. 6 P. M., dinner concert broadcast from Congress Hotel. 6:35 P. M., talk on "Sports" by Lee Fisher. 6:45 P. M., talk on "Finance and Markets," by Mr. Thomas Hoyne. 7 P. M., "Twenty Minutes of Good Reading," by Rev. C. J. Pernin. 7:20 P. M., musical program.

WBZ, Springfield, Mass., 337m (890k), E. S. D. S. T.—6:30 P. M., dinner dance music by Leo Reisman and his orchestra. 7:30 P. M., bedtime story for the kiddies. 8:15 P. M., concert, Quarbury port. 9:15 P. M., Lina Damiano McSweeney, soprano; Aiden Redmond, baritone; Mae Gorman, pianist; Arthur Moll, accompanist. 10:55 P. M., time signals and weather reports.

Friday, June 20

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 the children. 7:20 P. M., "Music While You Dine," the Dixie Minstrel troupe. 7:20 P. M., resume of the day's sports.

WHN, New York, 360m (830k), E. S. D. S. T.—4:45 P. M., Glenwood Terrace Society orchestra. 5:15 P. M., Victor Wilbur, baritone. 6 to 7 P. M., at the festive board. 9 to 10 P. M., broadcasting from Loew's Astoria Theatre. 10 P. M., Henry Hock and his Entertainers. 10:15 P. M., Flo Williams, soprano. 10:30 P. M., Roseland Dance orchestra. 11 P. M., Ted Barron program. 11:30 P. M., program announced.

WOO, Philadelphia, 509m (590k), E. S. D. S. T.—4:45 P. M., grand organ and trumpets. 7:30 P. M., sports results and police reports; dinner music, Hotel Adelphia orchestra. 8:30 P. M., musical program. 9:30 P. M., grand organ recital, Mary E. Vogt. 10 P. M., dance program, Hotel Adelphia orchestra. 10:55 P. M., signals and weather forecast.

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; recital from studio. 4:30 P. M., program of dance music. 5:45 P. M., baseball scores. 7:30 P. M., Dream Daddy with the boys and girls. 7:50 P. M., book review. 8 P. M., author's and poet's corner; Arcadia orchestra. 10 P. M., Howard Lannin's dance orchestra.

WOAW, Omaha, Neb., 526m (570k), C. S. T.—6 P. M., speakers' half hour. 6:30 P. M., dinner program by Pat's Melody Boys. 9 P. M., program courtesy American Institute of Banking.

WEAF, New York, 492m (610k), E. S. D. S. T.—11 A. M., Thursday morning talks to housewives; market and weather reports. 4 P. M., Joseph C. Wolff, bass baritone, accompanied by Bessie Krey; Alma D. Stoll, contralto, accompanied by Gertrude Donde; Royal Novelty Orchestra; Ethel H. Elderkin, dramatic soprano; children's hour program. 6 P. M., dinner music from Hotel Waldorf-Astoria; stories for children; Mabelanna Corby, composer-pianist, and group of artists; Charles Magnantem, accordionist; and Anthony Torre, violinist; "WEAF" announcers' hour program; Vincent Lopez and his orchestra.

WJZ, New York, 455m (660k), E. S. D. S. T.—5:30 P. M., state and federal 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 P. M., American Museum of Natural History, "The Economic Value of Insects," Dr. Frank C. Lutz. 8:15 P. M., Goldman band concert; Beethoven program; Maino Kauppi, cornet soloist, direct from Mall, Central Park. 10 P. M., peoples chorus concert. 10:45 P. M., Paul Specht's Alamac orchestra.

WJY, New York, 405m (740k), E. S. D. S. T.—SPORT—8:30 P. M., overture. 8:35 P. M., prologue. 8:40 P. M., jazz (xylophone, Hennessey orchestra). 9 P. M., "A Sing-Song"; "The Dixie Stars" (Bernard and Robinson). 9:30 P. M., "Three Miles Up," by Andrea Peyree, holder of world's altitude record for women flyers. 9:45 P. M., "Popular Melodies," Koty and Abram. 10:15 P. M., J. Andrew White. 10:30 P. M., jazz.

KHJ, Los Angeles, 395m (760k), P. T.—2:30 P. M., matinee musicale. 6 P. M., Art Hickman's concert orchestra. 6:45 P. M., children's program. 8 P. M., San Pedro Night, courtesy of Mollie Chustas. 10 P. M., Art Hickman's dance orch.

WGI, Medford, Mass., 360m (830k), E. S. D. S. T.—6:30 P. M., closing stock market reports; code practice; Boston police reports. 7 P. M., meeting, Amrad Big Brother Club. 7:30 P. M., selected verses by Mr. Charles L. H. Wagner. 7:40 P. M., late Ampico releases. 8 P. M., musicale; weather report and time.

WLS, Chicago, 345m (870k), C. S. D. S. T.—6:30 P. M., studio music. 7:45 P. M., lullaby time, Glenn Rowell and Ford Rush. 9 P. M., farm program; weekly market summary of dairy products and eggs; Verna Elsinger, social service director; John Tunipseed, associate editor, Prairie Farmer; music by Illinois College of Music.

WOC, Davenport, Ia., 484m (620k), C. S. T.—9 A. M., opening market quotations. 10 A. M., garden and household hints. 10:55 A. M., time signals. 11 A. M., weather and river forecast. 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: Zoe Fullerton, reader; Arvid Enstrom, baritone; Roy Work and Wesley Gosline, Hawaiian guitars. 9 P. M., weekly tourists' road bulletin.

WLW, Cincinnati, 309m (970k), E. S. T.—10:30 A. M., weather forecast and business reports. 1:30 P. M., market reports. 3 P. M., stock quotations. 4 P. M., special program, T. C. O'Donnell, lecture on "Practical Lessons in Writing."

KSD, St. Louis, 546m (550k), C. S. T.—8 P. M., Silverman's orchestra concert broadcast from Lyric Skydome.

WOS, Jefferson City, Mo., 441m (680k), C. S. T.—7:45 P. M., Dr. Homer A. Wilson, "Hydrophobia or Rabies as a Menace to Animals and Folks." 8 P. M., address by Mr. George A. Pickens, General Secretary, Greater Missouri Association. 8:20 P. M., musical program, Hermann, Missouri, juvenile orchestra.

WIP, Philadelphia, 509m (590k), E. S. D. S. T.—3:05 P. M., visiting artists and chats with celebrities. 3:30 P. M., Comfort's Philharmonic orchestra. 6 P. M., weather forecast. 6:05 P. M., dinner music by the 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 the children.

WRC, Washington, D. C., 469m (640k), E. S. T.—3 P. M., fashion developments. 3:10 P. M., song recital by Arthur McCormick, baritone. 3:20 P. M., "Beauty and Personality," by Elsie Pierce. 3:25 P. M., current topics. 3:35 P. M., piano recital by Ethel Grant. 3:50 P. M., magazine of Wall Street. 4 P. M., song recital to be announced. 5:15 P. M., time signals and weather forecasts. 6 P. M., stories, songs for children.

WGY, Schenectady, N. Y., 380m (790k), E. S. T.—11:55 A. M., time signals. 1 P. M., music and household talk. 5 P. M., produce and stock market quotations; news bulletins; baseball results. 5:30 P. M., stories for children. 5:45 P. M., children's story, in French. 6 P. M., International Sunday School lesson. 7:35 P. M., health talk, N. Y. State Dept. of Health. 7:40 P. M., baseball results. 7:45 P. M., Mediterranean travelogue by James A. Leary.

WBAP, Fort Worth, Tex., 476m (620k), C. S. T.—9:30 P. M., concert by the Four H quartet of Paradise, Texas.

KDKA, Pittsburgh, 326m (920k), E. S. D. S. T.—6 P. M., baseball scores; dinner concert. 6:30

(Continued on next page)

WJY Inaugurates Unit Programs

Novelty Is Instituted to Stimulate Deeper Interest in Broadcasts

THE "unit program" idea is being put in practice by WJY, one of the two stations operated in New York City by the Radio Corporation of America. Charles B. Popense, director, is presenting an "Omni-Oral Production" for four nights. This name has been given to the experiment, the station frankly admits, "for lack of a better term." The plan is this:

At 8:30 p. m. on each of the four nights the orchestra will play an overture. Next comes a prologue, explaining the acts which will follow. Each artist or "team" will be heard for from 15 minutes to half an hour. Each act will be different, but all will come under one group heading. The "scenery" will be "painted" by the announcer, omni-oral fashion. The "curtain" falls at 10:30, though not necessarily to enable commuters to catch their trains.

The novelty was inaugurated Tuesday, June 17, with "A Night With the Conquistadores." In announcing the series, Stuart Hyde Hawkins, in charge of the Information Bureau, said:

"Throughout the past year there has been a marked tendency among both radio listeners and the radio press to demand something new and better in broadcasting. From time to time Broadcast Central has presented various broadcast novelties, but a more radical change has been considered essential if public interest in broadcasting is to be maintained, particularly during the summer season."

The ensuing program of this feature follows:

Thursday, June 19, "A Night Out of the Past."

Friday, June 20, "Sport."

Sunday, June 22, "A Night at the Opera."

[Readers of RADIO WORLD *who listen in on these broadcasts and who desire to express their opinion of them in* RADIO WORLD, *should address Program Editor,* RADIO WORLD, 1483 *Broadway, New York City.]*

P. M., the children's period. 7 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 P. M., popular concert by the KDKA Serenaders. 9:55 P. M., time signals; weather forecast; baseball scores.

KYW, Chicago, 536m (560k), C. S. D. S. T.—8 P. M., Midnight Revue. 5 P. M., news; financial and final markets; Dun's Review and Bradstreet's Weekly Review. 5:45 P. M., children's bedtime story. 6 P. M., dinner concert, broadcast from Congress Hotel.

WBZ, Springfield, Mass., 337m (890k), E. S. D. S. T.—7:30 P. M., bedtime story for the kiddies. 10 P. M., concert by Garvin Waldron, tenor; Blanche Haskell, soprano; Alma Garrish, accompanist, Boston studio. 10:30 P. M., recital by Beatrice E. Sample, soprano. 10:55 P. M., time signals and weather reports. 11 P. M., concert by WBZ Trio, and Mrs. Charles Weston, soprano; Katherine Gravelin, accompanist.

Saturday, June 21

WOR, Newark, N. J., 405m (740k), E. S. D. S. T.—6:15 P. M., "Music While You Dine," Ernie Krickett's Cinderella orchestra. 7:20 P. M., resume of the day's sports. 8 P. M., Gene Ingraham's Bell Record orchestra. 8:55 P. M., artists' recital from studios of Mme. Jessie Fenner Hill. 10:10 to 11 P. M., Ernie Young's Revue at Dreamland Park; the Marigold Garden Four, male quartet.

WHN, New York, 360m (830k), E. S. D. S. T.—5 P. M., Original Louisiana Five. 6 to 7 P. M., At the Festive Board. 7:30 P. M., musicale program. 8 P. M., Jimmy Flynn, tenor. 8:30 P. M., Solly Newman, concert and jazz pianist. 8:45 P. M., Mrs. Henriette Grennan, lyric soprano, popular ballads. 9 P. M., Mr. Eugene Willis Bradley and quartet. 9:15 to 10:15 P. M., broadcasting from Loew's Astoria Theatre. 10:15 P. M., Fitzpatrick Brothers in old time melodies. 10:30 P. M., George Roberts and Jimmy Doyle, popular songs. 10:45 P. M., Josef B. Pobiner, in English ballads and Jewish folk songs. 11 P. M., Jimmy Clarke and his Entertainers. 11:15 P. M., John Healey and Arthur Camp, in songs written by themselves. 11:30 P. M., songwriters controvery. 12 to 12:45 P. M., Broadway Jones and his Club Tenessee Review.

WOO, Philadelphia, 509m (590k), E. S. D. S. T.—12 noon, luncheon music by the 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.

WDAR, Philadelphia, 395m (760k), E. S. D. S. T.—11:45 A. M., daily almanac. 12 noon, organ recital from Stanley Theatre; features from studio; Arcadia concert orchestra. 2 P. M., Arcadia concert orchestra. 4:30 P. M., dance program. 5:45 P. M., baseball and other sports results. 7:30 P. M., Dream Daddy with the boys and girls.

WOAW, Omaha, Neb., 526m (570k), C. S. T.—6 P. M., dinner program. 9 P. M., recital from vocal studios of Fred G. Ellis, baritone.

WEAF, New York, 492m (610k), E. S. D. S. T.—4 to 6 P. M., Greenwich Village Inn orchestra; Warren Scofield, baritone; Ella Mylius, soprano. 6 to 12 P. M., dinner music from Hotel Waldorf-Astoria; William O. Gilboy, tenor; Zez Confrey, popular pianist; bedtime story; joint program by Adelaide de Loca, contralo; Gladys Durham, soprano; Leslie Arnold, baritone, with accompaniments by Elsie T. Cowen; Victor Bay, violinist, and Amanuel Bay, pianist; Vincent Lopez and his orchestra.

WJZ, New York, 455m (660k), E. S. D. S. T.—7 P. M., Greenwich Village Inn orchestra. 8 P. M., Lenore Manselle, soprano. 8:15 P. M., The Outlook Period. 8:30 P. M., Lenore Manselle, soprano. 8:45 P. M., "Quieting the Receiver Neighborhood," by Dr. Alfred N. Goldsmith, chief broadcast engineer. 9 P. M., program, auspices, N. Y. Times. 10 P. M., Wellington Lee, pianist. 10:30 P. M., Club Lido Venice orchestra.

KHJ, Los Angeles, 395m (760k), P. T.—2:30 P. M., matinee musicale. 6 P. M., Art Hickman's concert orchestra. 6:45 P. M., children's program; Margaret Johnston, violinist; Thornton Ward, reader; bedtime story by Uncle John. 8 to 10 P. M., Santa Ana program: Ollimae Matthews, violin; Mme. Manuella Budrow, soprano; Caesar Cionfoni, trombone; Earl Frazer, pianist; Edward Burns, 'cellist. 10 P. M., Art Hickman's dance orchestra.

WGI, Medford, Mass., 360m (830k), E. S. D. S. T.—6:30 P. M., code practice; New England 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; time.

WLS, Chicago, 345m (870k), C. S. D. S. T.—8 P. M., national barn dance.

WOC, Davenport, Ia., 484m (620k), C. S. T.—9 A. M., opening market quotations. 10 P. M., garden and household hints. 10:55 A. M., time signals. 11 A. M., weather and river forecast. 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.

WLW, Cincinnati, 309m (970k), E. S. T.—10:30 A. M., weather forecast and business reports. 1:30 P. M., market reports.

KSD, St. Louis, 546m (550k), C. S. T.—8 P. M. Missouri Theatre orchestra and music specialties broadcast from Missouri Theatre.

PWX, Havana, 400m (750k), E. S. T.—8 P. M., concert at the studio, program of Cuban music: first soprano, Miss Aurelia Iturmendi; soprano, Mrs. Andrea Gonzalez de Munozguren; contralto, Miss Plana; tenor, Mr. Alvarez; baritone, Mr. Prado and Plana; tenor, Mr. Gonzalez; piano accompaniment by Mr. de Brand.

CKAC, Montreal, 430m (700k), E. S. T.—7 P. M., kiddies' stories in French and English. 7:30 P. M., Rex Battle and his Mount Royal Hotel orchestra; Benjamin Scherzer, violinist; and Herbert Spencer, organist. 8:30 P. M., La Presse studio entertainment. 10:30 P. M., Mount Royal Hotel Roof Garden dance orchestra.

WIP, Philadelphia, 509m (590k), E. S. D. S. T.—6 P. M., weather forecast. 6:05 P. M., dinner music by 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 the children. 8 P. M., Comfort's Philharmonic orchestra; Miss Veronica Sweigart, mezzo-soprano. 8:45 P. M., Vessella's concert band; Miss Margaret Keever, contralto. 10:15 P. M., Bob Lehman's orchestra.

WRC, Washington, D. C., 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., Bible talk. 8 P. M., musical program, announced. 8:30 P. M., talk on the Coast Guard. 9 P. M., song recital by Helen Harper, lyric soprano, and artist pupil of Paul Bleyden. 9:55 P. M., time signals and weather forecasts. 10 P. M., concert by the Harmonious quartet.

WGY, Schenectady, N. Y., 380m (790k), E. S. T.—11:30 A. M., stock market report. 11:40 A. M., produce market report. 11:55 A. M., time signals. 8:30 P. M., dance music by orchestra of Hotel Ten Eyck.

WBAP, Fort Worth, Tex., 476m (620k), C. S. T.—7 P. M., review of the interdenominational Sunday school lesson and radio Bible class by Mrs. W. F. Barnum.

KDKA, Pittsburgh, 326m (920k), E. S. D. S. T.—5:30 P. M., dinner concert. 6 P. M., baseball scores. 6:30 P. M., the children's period. 6:45 P. M., last minute helps to teachers. 7 P. M., baseball scores, "Sports Review," by James J. Long. 8 P. M., concert by the Allen Trio, of violin, cello and piano. 9:55 P. M., time signals; weather forecast; baseball scores.

KYW, Chicago, 536m (560k), C. S. D. S. T.—6 P. M., dinner concert broadcast from Congress Hotel. 7 P. M., musical program. 8 P. M., talk by Vivette Gorman, home economics. 8:05 P. M., short stories, articles and humorous sketches. 8:15 to 11:30 P. M., late show.

WBZ, Springfield, Mass., 337m (890k), E. S. D. S. T.—7 P. M., results of Eastern, American and National League games. 7:10 P. M., dinner concert by Leo Reisman ensemble. 7:30 P. M., bedtime story for the kiddies. 7:40 P. M., concert by the Hotel Kimball trio. 9 P. M., concert by Mrs. George Y. Kells and members of All Souls Church Choir Association. 10:55 P. M., time signals and weather reports.

Sunday, June 22

WHN, New York, 360m (830k), E. S. D. S. T.—9:30 P. M., "Government by Default," by Joseph T. Cashman. 9:40 P. M., Clarence Wainwright MacMurphy, composer and pianist. 10 P. M., Baby Edna Keir, actress and vaudeville artist. 10:05 P. M., Evelyn Keir, popular songs. 10:10 P. M., "Twenty Years in Hell's Kitchen," by Rev. Harry W. Murphy, assisted by the Sunshine Chapel Choir. 10:30 P. M., Alfred Dulin, concert pianist. 10:50 P. M., "A Bit of Shakespeare," by James O'Connell. 11 P. M., Charles Mansfield, lyric tenor. 11:15 P. M., Jos. C. Wolfe, baritone soloist. 11:30 P. M., program announced.

WOO, Philadelphia, 509m (590k), E. S. D. S. T.—10:30 P. M., morning services from Bethany Presbyterian Church. Recital at 10:30 A. M. by Miss Caroline Quigg. 2:25 P. M., musical exercises, Bethany Sunday School. 3:15 P. M., old time hymns, melodies and sacred chimes recital.

WOAW, Omaha, Neb., 526m (570k), C. S. T.—9 A. M., radio chapel service, conducted by Rev. R. R. Brown. 9 P. M., musical chapel service, courtesy Pearl Memorial Methodist Church.

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

WLS, Chicago, 345m (870k), C. S. D. S. T.—8 P. M., program by Salvation Army Band, instrumental sextette and brass quartette.

KPO, San Francisco, 423m (710k), P. T.—1 P. M., undenominational and non-sectarian church services; soloists, Mrs. S. N. Stoner, contralo; organ selections by Theodore J. Irwin. 6:30 P. M., Rudy Seiger's Fairmont Hotel orchestra.

WWJ, Detroit, 517m (580k), E. S. T.—11 A. M., services at St. Paul's Episcopal Cathedral. 3 P. M., concert by Schmeman's concert band. 2 P. M., Detroit News orchestra.

WCAE, Pittsburgh, 462m (650k), E. S. D. S. T.—3 P. M., People's Radio church services. 6:30 P. M., dinner concert from William Penn Hotel.

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

CKAC, Montreal, 430m (700k), E. S. T.—4:30 P. M., sacred concert.

KGW, Portland, Ore., 492m (610k), P. T.—6 P. M., church services, Rose City Park Presbyterian Church. 7 P. M., George Olsen's concert orchestra in dinner program; baseball scores.

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

WHAS, Louisville, Ky., 400m (750k), C. S. T.—9:57 A. M., organ music. 10 A. M., church service auspices Warren Memorial Presbyterian Church; William E. Pilcher, organist. 4 P. M., concert, direction Miss Fanny May Baldridge.

KFI, Los Angeles, 469m (640k), P. T.—5 P. M., Evening Herald news bulletins. 5:30 P. M., Examiner news bulletins. 8 P. M., Evening Herald concert. 10 P. M., Examiner concert. 10 P. M., Ambassador Cocoanut Grove orchestra.

WIP, Philadelphia, 509m (590k), E. S. D. S. T.—7:30 P. M., evening services broadcast from Holy Trinity Church. 9:30 P. M., special Sunday evening concert, with prominent soloists.

WFAA, Dallas, Tex., 476m (630k), C. S. T.—9 P. M., sacred song recital by double male quartet, Grace Methodist Episcopal Church. 10 P. M., orchestra recital.

KYW, Chicago, 536m (560k), C. S. D. S. T.—10 A. M., morning service, announced by radiophone. 1:30 P. M., studio chapel service, direction, Chicago Church Federation.

Monday, June 23

WHAZ, Troy, N. Y., 380m (790k), E. S. T.—9 P. M., concert by pupils of Mrs. Jean Lyman Cooper. 9:30 P. M., "Bringing Back the Birds—What Reforestation is Doing to Conserve Wild Life," Cassius A. Johnston.

WOAW, Omaha, Neb., 526m (570k), C. S. T.—6 P. M., speakers' half-haur. 6:30 P. M., dinner program by Randall's Royal orchestra. 9 P. M., program, courtesy Lions Club of Pittsburgh.

KPO, San Francisco, 423m (710k), P. T.—4:30 P. M., Rudy Seiger's Fairmont Hotel orchestra. 5:30 P. M., children's hour stories. 7 P. M., Rudy Seiger's Fairmont Hotel orchestra. 8 P. M., organ recital by Theodore J. Irwin. 9 P. M., Ruth May Friend, soprano. 10 P. M., Bradfield's versatile band.

(Concluded on page 18)

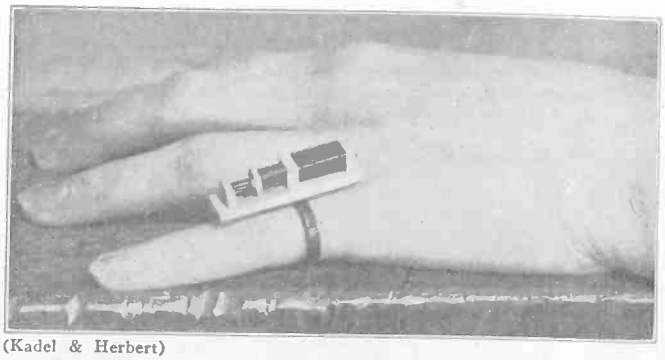
The Radio Woman

(Foto Topics)

PRETTY MAE SCHNITZER hit upon this novel idea of providing a small loud speaker. A single headphone was used in place of the double set and one of those small metal horns used for portable phonographs was fastened to the phone cap. Under good conditions sufficient volume can be had to supply dance music, but if the terpsichorean couples demand a regular loud speaker, why blame Mae? The small horn, although unable to amplify the earphone signal with great volume, nevertheless suffices for ordinary purposes such as the camping tent or on a canoe. It wouldn't be a bad idea to have two of these small horns, one for each phone.

(Kadel & Herbert)

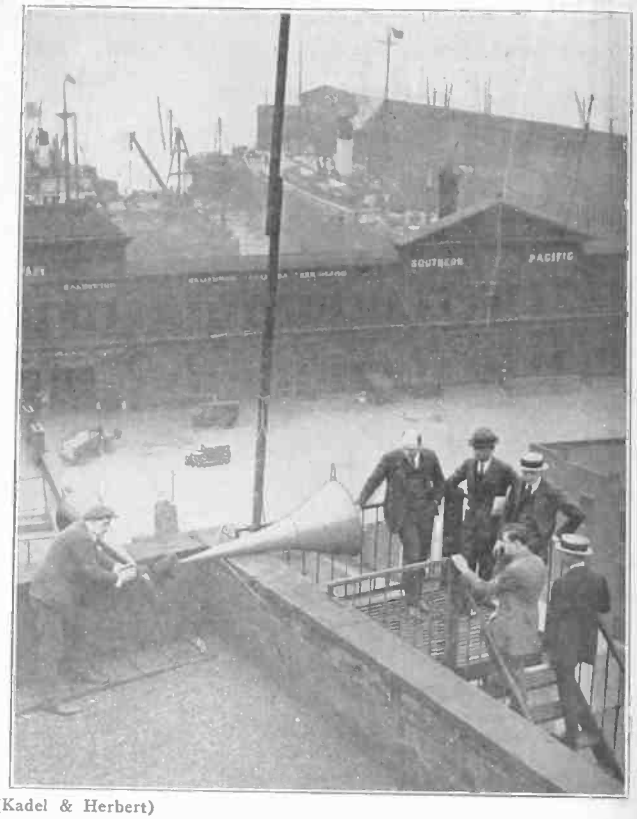
THIS LARGE RADIO receiving set is installed at one of the stands in Luna Park, Coney Island. The photo shows Miss Anne Kopp tuning in preparatory to switching on the loud speaker for an appreciative group of prospective purchasers of frankfurter sandwiches. It would be a good idea for all the amusement places at the Island to take radio up as a part of their business, she advises with genuine self-immolation. During the slow hours of the day, the radio is turned on for the benefit of the stand concessionaires themselves. The all hot establishments may even take on a side line of radio sets and parts.



(Kadel & Herbert)

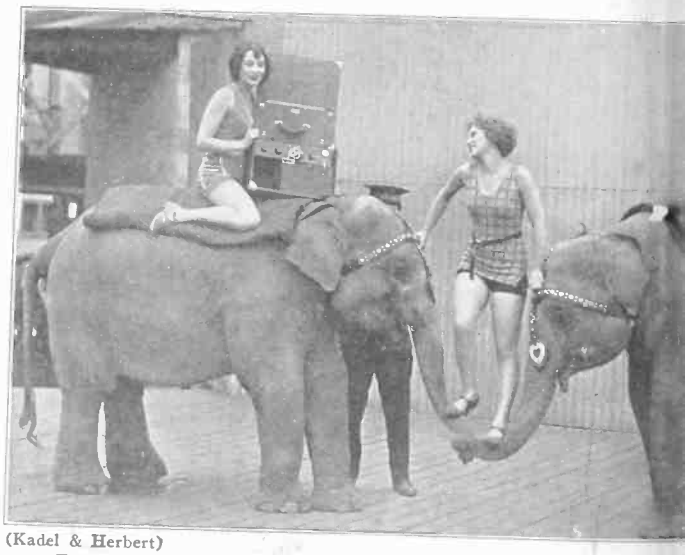
SUMMER fashion hint for the girl radio fan—Miss Helen Dickinson, of New York City, suggests that all girl radio fans wear some kind of a radio insignia this summer. She has started the idea full blast by wearing this miniature loose coupler on her ring. It is a real loose coupler and it works. The wire with which it is wound is extremely fine and can tune from 200 to 600 meters. The base and coil ends are fashioned of genuine ivory, and the whole mounted on a gold ring.

Speakers Used in Novel



(Kadel & Herbert)

ONE of the most urgent needs on the waterfront in New York was a loud speaker that would reproduce music faithfully, yet would be able to compete with the fog-horn competition from ships plying the harbor. This has been accomplished, says Paul De Kilduchevsky, a New York inventor, commenting on his efforts. The photo shows a demonstration on the roof of a building in lower Manhattan. The result was tried out on auditors who stood on the sidewalk.



(Kadel & Herbert)

THE RADIO and Peggy Watts (center) entertain elephants at Luna Pa

Tests in New York City

(Foto Topics)

RADIO played an important part in an Army Lawn Fete at Governors Island, New York. Through special loud speakers on the rooftop the various events were announced. Between features the auditors heard music picked up by receivers and amplified. This is the first time the stunt has been done in Army circles in this particular way.

Ciey Island.

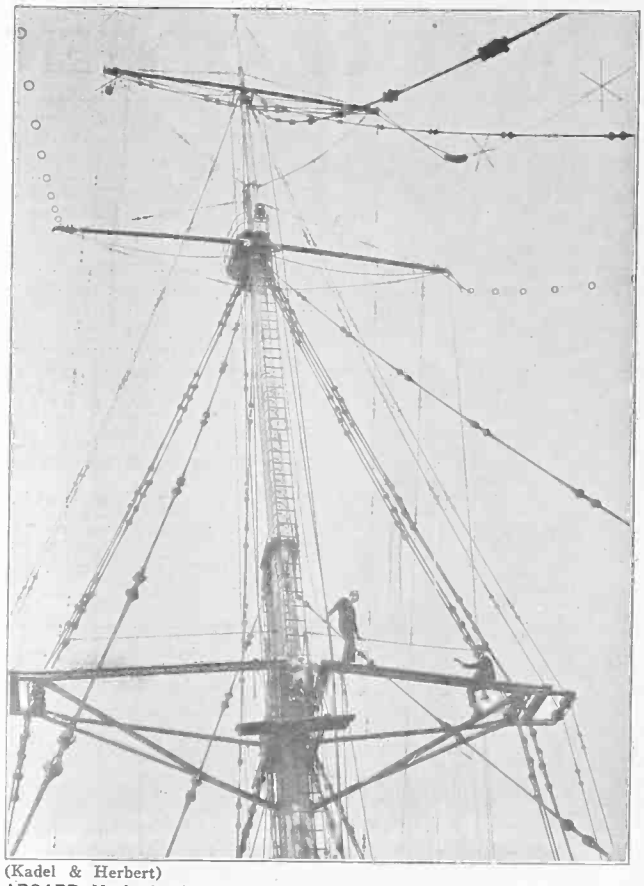
foto Topics)

LEFT—John Reinartz, prominent radio amateur and inventor of the Reinartz circuit, receiving the cup awarded him by the Executive Radio Council of Second District, for doing the best for amateur radio in the past year. Center, Lloyd Jaquet, editor, Amateur Radio; right, W. L. Cowell, president, executive council.

(Kadel & Herbert)

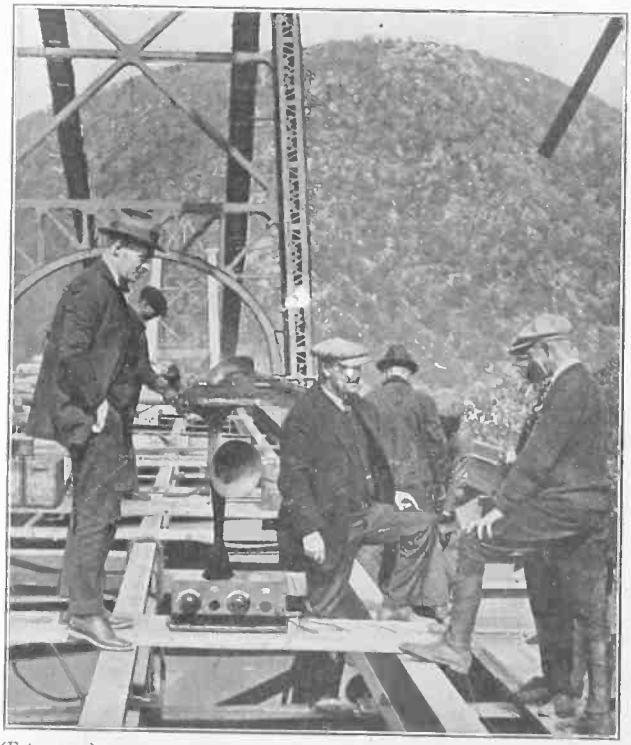
SUCCESSFUL tests were made for transmitting and receiving messages and voice with a set located in solid steel U. S. war tanks.

Navy's Best Sea Aerial



(Kadel & Herbert)

ABOARD Uncle Sam's newest light cruiser, the Trenton, are the Navy's best receiving and transmitting antennae. Several antennae of the cage type, of different sizes, are strung from end to end of the craft from the top-masts. All those knobs on the guy wires are circuit-breakers or insulators, to prevent the steel guys from picking up the energy from the antennae and radiating the signal on another frequency. This also prevents undue absorption of transmitted energy by the surrounding objects.



(Fotograms)

RADIO livens up the lunch hour period for the construction gang on the world's largest suspension bridge, now being built over the Hudson River between Bear Mountain, the popular summer resort, and Anthony's Nose.

RADIO WORLD
ISSUE OF JUNE 21, 1924.
Vol. 5. No. 13. Whole No. 117. *Every Week*
Illustrated

TABLE OF CONTENTS

NEXT WEEK WILL BE PUBLISHED AN EYE-OPENING ARTICLE BY B. J. BONGART, DESCRIBING HOW TO BUILD A 4-TUBE SUPER-HETERODYNE. TWO OF THOSE FOUR TUBES ARE FOR THE AUDIO-FREQUENCY CIRCUIT. THERE IS NO REFLEXING. HOW IS IT DONE? HOW GOOD IS THE SELECTIVITY AND DISTANCE? MR. BONGART EXPLAINS FULLY AND DWELLS ON THE NOVEL METHOD BY WHICH HE ACCOMPLISHED THIS FASCINATING FEAT. THE ARTICLE IS ILLUSTRATED WITH FIVE DIAGRAMS AND GIVES COMPLETE CONSTRUCTIONAL DETAILS, INCLUDING MINUTE ASSEMBLY DATA. CONSTRUCTION IS SIMPLE.

Another feature in next week's issue will be "The Improved Ultra Reflex," RADIO WORLD's unique circuit brought to a point of fine selectivity. The circuit consists of one straight stage of RF, a stage of RF and one of AF reflexed in the second tube, and a straight second stage of AF, crystal detector being used. Loud-speaker results on this three-tube wonder are excellent.

P. E. EDELMAN, IN THE SAME ISSUE, WILL CONTRIBUTE AN AUTHORITATIVE ARTICLE ON AERIALS, TAKING UP THE QUESTION OF THE BEST AERIALS FOR VARYING PURPOSES, INCLUDING THE UTMOST DISTANCE RECEPTION. THE ARTICLE WILL BE ILLUSTRATED WITH 18 DIAGRAMS.

Programs

Monday, June 23 (concluded from page 15)

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

WCAE, Pittsburgh, 462m (650k), E. S. D. S. T.—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. 8:30 P. M., musical program by the Chilcott Family quartet; Theodore W. Fortenbacher and Raymond Grimm, pianists. 11 P. M., late concert by Siviter Entertainers, vocal selections and Hawaiian instrumentations.

WOS, Jefferson City, Mo., 441m (680k), C. S. T.—8 P. M., address, "Uncle Sam's Movies," by Arthur T. Nelson, state marketing commissioner. 8:20 P. M., musical program by Rosalind McPherson, twelve years, and Staunton Calvert, eleven years, assisted by Mrs. James T. Quarles, contralto.

CKAC, Montreal, 430m (700k), E. S. T.—1:45 P. M., Mount Royal Hotel orchestra. 4 P. M., weather; news; stocks. 4:30 P. M., Mount Royal Hotel the-dansant orchestra.

KGW, Portland, Ore., 492m (610k), P. T.—11:30 A. M., weather forecast. 3:30 P. M., literary program by Portland Library Association. 7:15 P. M., police reports. 7:30 P. M., baseball scores; weather forecasts; market reports. 8 to 10 P. M., purogram of old songs by Beaux Arts Society.

KGO, Oakland, Cal., 312m (960k), P. T.—3 P. M., short musical program. 4 P. M., Hotel St. Francis dance orchestra. 6:45 P. M., stock exchange and weather reports; news items. 8 P. M., educational program; musical numbers by Arion Trio; courses in agriculture, Spanish, music, economics, and literature.

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; Welsh tenor, Fred Hughes of New York City; "Just Among Home Folks"; selections by Walnut Theatre orchestra; late news bulletins. 4:50 P. M., livestock, produce and grain market reports. 4:55 P. M., baseball scores. 5 P. M., Central Standard time.

KFI, Los Angeles, 469m (640k), P. T.—10 P. M., L. A. Church Federation service. 4 P. M., Choral Society program. 6:45 P. M., musical program. 8 P. M., Ambassador Hotel concert orchestra. 9 P. M., Examiner concert. 10 P. M., Packard Six orchestra.

WFAA, Dallas, Tex., 476m (630k), C. S. T.—12:30 P. M., address, W. C. Everett, "Taking Yourself Seriously." 8:30 P. M., Sherley Lee Alley and his orchestra.

Tuesday, June 24

WOAW, Omaha, Neb., 526m (570k), C. S. T.—6 P. M., dinner program by Lions Club of Pittsburgh. 9 P. M., recital program, vocal class of Walter B. Graham.

KPO, San Francisco, 423m (710k), P. T.—2:30 P. M., organ recital by Theodore J. Irwin. 4:30 P. M., Rudy Seiger's Fairmont Hotel orchestra. 5:30 P. M., children's hour stories. 6:30 P. M., "Cleveland Six" orchestra. 7 P. M., Rudy Seiger's orchestra. 8 P. M., program, management Mrs. John Merrill. 10 P. M., Bradfield's Versatile band.

WWJ, Detroit, 517m (580k), E. S. T.—10:25 A. M., weather forecast. 11:55 A. M., Arlington time. 12 noon, Detroit News orchestra. 3 P. M., concert by Schmeman's concert band. 3:50 P. M., weather forecast. 3:55 P. M., market reports and baseball scores. 5 P. M., baseball scores. 8:30 P. M., concert by Schmeman's concert band. 9:30 P. M., Detroit News orchestra.

WCAE, Pittsburgh, 462m (650k), E. S. D. S. T.—4:30 P. M., stock market reports; the Sunshine Girl. 6:30 P. M., dinner concert from the William Penn Hotel. 7:30 P. M., Uncle Kaybee. 7:45 P. M., baseball scores. 8:30 P. M., musical program by Paul Kramer's Syncopators. 11 P. M., late concert by artists from Loew's Aldine Theatre.

CKAC, Montreal, 430m (700k), E. S. T.—4 P. M., weather; news; stocks; music. 7 P. M., kiddies' stories in French and English. 7:30 P. M., Mount Royal Hotel orchestra; Nap. Dansereau, cellist. 8:30 P. M., entertainment by orchestra of "S. S. Canada." 10:30 P. M., Mount Royal Hotel Roof Garden dance program.

KGW, Portland, Ore., 492m (610k), P. T.—11:30 A. M., weather forecast. 3:30 P. M., children's program. 7:15 P. M., police reports. 7:30 P. M., baseball scores; weather forecast; market reports. 8 P. M., concert by Sieberling-Lucas Music Co.

KGO, Oakland, Cal., 312m (960k), P. T.—4 P. M., concert orchestra of the Hotel St. Francis. 6:45 P. M., stock exchange and weather reports; news items. 8 P. M., "In a Persian Garden," a song cycle, with words from Rubaiyat of Omar Khayyam; California mixed quartet; Josephine Holub, violinist; Clan MacDonald double male quartet; Beatrice L. Sherwood, piano soloist. 10 P. M. to 1 A. M., Hotel St. Francis dance orchestra.

WHAS, Louisville, Ky., 400m (750k), C. S. T.—4 P. M., selections by Walnut Theatre orchestra; police bulletins; weather forecast for Kentucky, Indiana and Tennessee; Welsh tenor, Fred Hughes; "Just Among Home Folks"; selections by Alamo Theatre orchestra; late news bulletins. 4:50 P. M., livestock, produce and grain market reports. 4:55 P. M., baseball scores. 5 P. M., Central Standard time. 7:30 P. M., agricultural talk; concert by Carl Zoeller's melodists.

KFI, Los Angeles, 469m (640k), P. T.—5 P. M., Evening Herold news bulletins. 5:30 P. M., Examiner news bulletins. 6:45 P. M., vocal concert. 8 P. M., Ambassador Cocoanut Grove orchestra. 9 P. M., Examiner concert. 10 P. M., Maud Reeves Barnard arranging concert.

WFAA, Dallas, Tex., 476m (630k), C. S. T.—12:30 P. M., address, DeWitt McMurray, in a medley of humor, pathos and wisdom. 8:30 P. M., varied program by talent from Princeton, Texas. 11 P. M., Melrose orchestra.

Wednesday, June 25

KPO, San Francisco, 423m (710k), P. T.—12 noon, time signals; reading of Scripture. 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.

PWX, Havana, 400m (750k), E. S. T.—8 P. M., concert at the Malecon Band Stand by the General Staff Band, Cuban Army, program of operas and national music.

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

WCAE, Pittsburgh, 462m (650k), E. S. D. S. T.—3:30 P. M., baseball scores. 4:30 P. M., stock market reports; Uncle Kaybee. 6:30 P. M., dinner concert from the William Penn Hotel. 7:30 P. M., the Sunshine Girl. 7:45 P. M., baseball scores. 8:30 P. M., "School Days," a one-act play.

WOS, Jefferson City, Mo., 411m (680k), C. S. T.—8 P. M., address: "Feed and Care of Dairy Cows During the Summer Months," by A. C. Ragsdale. 8:20 P. M., barn dance music by A. A. Taylor's String band.

CKAC, Montreal, 430m (700k), E. S. T.—1:45 P. M., classic orchestra concert. 4 P. M., weather; news; stocks. 4:30 P. M., dance orchestra.

KGW, Portland, Ore., 492m (610k), P. T.—11:30 A. M., weather forecast. 3:30 P. M., talk by Jeanette P. Cramer, home economics editor of the Oregonian. 7:15 P. M., police reports. 7:30 P. M., baseball scores; weather forecast; market reports. 8 P. M., concert by Elizabeth Reger, contralto, and Lucille Cummins, pianist. 10 P. M., dance music by George Olsen's Metropolitan orchestra; Consuelo Allee, mezzo-soprano.

KGO, Oakland, Cal., 312m (960k), P. T.—3 P. M., short musical program; address, "Creative Expression," by Wilda Wilson Church. 4 P. M., concert orchestra of the Hotel St. Francis. 6:45 P. M., stock exchange and weather reports; news items.

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

KFI, Los Angeles, 469m (640k), P. T.—5 P. M., Evening Herald news bulletins. 5:30 P. M., Examiner news bulletins. 6:45 P. M., Nick Harris detective stories and concert. 2 P. M., Evening Herald concert. 9 P. M., Examiner concert. 10 P. M., Hollywoodland orchestra. 11 P. M., Ambassador Cocoanut Grove Orchestra.

WFAA Dallas, Tex., 476m (630k), C. S. T.—12:30 P. M., recital by the Sycopating Jackrabbits orchestra.

Who Is America's Most Popular Radio Entertainer?

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

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

Use the accompanying blank and mail to Broadcasting Manager, RADIO WORLD. Cut off. Fill out. Mail today.

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

Dear Sir:

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

Yearly subscribers for RADIO WORLD may, when sending in their $6.00 for a yearly subscription, vote the entire fifty-two issues in advance for their favorite entertainer, when they so designate their desire to do so. In the June 7 issue there was published a tally showing H. M. Snodgrass, of WOS, Jefferson City, Mo., leading. Another tally will be made and published in an early issue.

15 Stations Broadcast Convention

Millions Hear Speeches Delivered at Republican Session in Cleveland

First of Its Kind, Event Is Success

Coolidge and Dawes, as Radio Fans, Hear Selves Nominated—Elaborate Installation at Cleveland

CLEVELAND.

THE broadcasting of the Republican Convention that nominated Calvin Coolidge for President and Charles G. Dawes, of Illinois, for Vice-President, was a complete success.

It was the first time a Presidential convention was broadcast. Fifteen stations put the convention on the air and millions heard the speeches and votes.

Elaborate preparations had been made for the broadcasting.

In addition to sending the speeches broadcast by radio, the American Telephone and Telegraph Company is furnishing a running commentary on the convention, delivered by Graham McNamee, one of the best known of its announcers. Mr. McNamee was stationed in a glass sound-proof booth erected on the right side of the stage directly under the proscenium arch.

There is an elaborate installation which carries the waves to these fifteen broadcasting stations: WRC and WCAP, Washington; WEAF and WJZ, New York; WNAC, Boston; WGY, Schenectady; WGR, Buffalo; KDKA, Pittsburgh; WJAX and WTAM, Cleveland; WLW, Cincinnati; WLS and WGM, Chicago; KSD, St. Louis, and WDAF, Kansas City.

Both President Coolidge and Brig.-Gen. Dawes heard themselves nominated. The President was at the White House, where special amplifiers made every sound plainly audible. Dawes was at the home of his sister, Mrs. Alice Beach, at Marietta, O., the town where he was born.

The rank and file of radio listeners all had the same privilege and opportunity as these two. They heard the result and were thrilled at the enjoyment of listening in on such an important and interesting occasion. They heard the votes cast. Coolidge was nominated on the first ballot—Coolidge, 1,065; La Follette, 34; Hiram Johnson, 10. Dawes won on the third ballot—Dawes, 682½; Hoover, 234½; William S. Kenyon, 75.

The whole nation responded nobly to the fascinating opportunity to listen in. The broadcasting constituted one of the momentous events in radio history, not only because of the imposing array of personalities connected with it, but because

(*Concluded on page 23*)

(United)

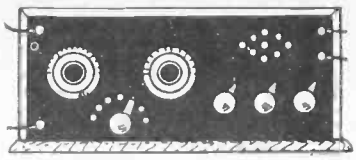
THE OPENING SPEECH—Representative Theodore E. Burton, of Ohio, as temporary chairman, is shown making the opening speech at the Republican National Convention at Cleveland. His words were broadcast throughout the United States. His was the "keynote speech." The speech nominating Coolidge was made by another Burton—Dr. Marion Leroy Burton, president of the University of Michigan, and not related to Theodore. (United)

(International Newsreel)

ON THE INSIDE—The big room in the Auditorium, Cleveland, constituting the "broadcasting department," was abustle during the entire convention. The work of these men enabled broadcast listeners to "attend" the convention via the ether. Special attention was paid to modulation. The experts worked day and night at their tasks, which were crowned with success, for which the radio fans were thankful.

(International Newsreel)

SECONDED COOLIDGE'S NAME—Nathaniel A. Elsberg, of New York, former State Senator, one of the seven who seconded the nomination of Coolidge. Limited to five minutes, he spoke only three, beginning with the promise: "If you won't be cruel to me I won't be cruel to you."



The RADIO PRIMER

Information and Instruction for the Beginner

What Makes it Possible for You to Receive Broadcasts

IT is still a big mystery to many as to how it is possible to transmit signals, voice and music from one place to another with no apparent means of conveying the necessary electrical energy. To learn how the transmitting is done, and why we are able to pick up these transmitted signals, let us first start at the sending end, and find out how the electrical impulse is forced out into space.

First, there is a source of electrical energy and a system of aerial wires suspended in the air—the wires to act as a promulgator for the energy sent up from the source. This can be likened to a locomotive steam cylinder. The energy (steam) is formed in the boiler or source. From there it is sent to the cylinder, where it pushes out the piston. In radio, the high voltage is the steam, the antenna the cylinder, and the radio wave the piston.

The energy, pushed out or radiated from the antenna, flows in all directions into space for practically unlimited distance. We know that there is energy passing through the air all around us. The problem is to make use of this energy by means of the proper apparatus.

It is reasonable to suppose that if a wire suspended in the air is capable of throwing off wireless waves, another wire, likewise suspended in the air, should be capable of intercepting at least a small part of the wave that passes its immediate vicinity. Such is the case, and that is the reason why some form of collector or antenna is used with all radio receiving sets.

The question now arises, how can we hear these radio waves, now that we have an aerial? The system of reception using a crystal detector or rectifier will be first explained, it being the simplest form of receiving radio waves.

Before telling how the detector works, it is necessary to say that the waves transmitted from the sending station have a definite wave length. Wave length can be defined as an electrical vibration of a certain frequency. For example, a tuning fork having two 4-inch prongs will vibrate at a certain note or frequency when struck. Another tuning fork having 6-inch prongs will emit a different note or frequency when struck. A second 4-inch tuning fork will vibrate in unison when placed near the first 4-inch fork, but will remain inactive when the 6-inch fork is struck. The same effect, fundamentally, holds true in radio. Therefore we understand that the receiving set must be brought "in tune" with the transmitter before the signals are available.

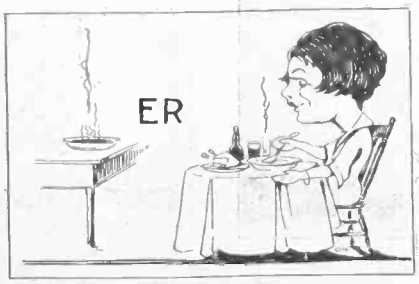
This tuning is done by means of coils of wire and condensers which can be regulated to suit our purpose. The coils of wire, called inductances, are for the purpose of adding more wire to the aerial so as to have a total of inductance which is equal to that of the sending station's wave length. The condenser, non-technically speaking, is for the purpose of giving the coils enough electrical capacity to maintain the wavelength desired. Theoretically, we are now tuned to the wavelength of the sending station. Our next problem is to hear the radio wave, which we will do by means of a crystal detector, or rectifier, and a pair of ordinary ear phones. These are connected by wire to the coils and condenser.

The radio wave, without being rectified cannot be heard by the human ear, therefore, we must chop this wave into smaller parts suitable to actuate the ear phones. This is done by the crystal rectifier. The crystal, which is usually a natural mineral such as lead ore (galena), silicon, carborundum,etc., has the property of being able to stop half of the radio wave, and allow the other half to pass through itself and into the ear phones. Thus we see that the original wave has been changed or rectified to go only in one direction. The received wave is a very high frequency alternating current which flows from positive to negative and then back to positive in quick succession. The part of the wave heard is when the current is flowing from negative to positive, which we call a positive charge on the crystal. The other half is blocked off by the crystal so as not to interfere with the positive charge. Now we are able to hear the wave sent out by the transmitting station whether it be code signals, voice, or music.

In a future article the action of a vacuum tube receiver will be explained.

The Weekly Rebus

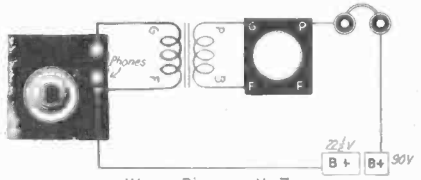
CAN you decipher this Rebus? Send your answer to Rebus Editor, RADIO WORLD, 1493 Broadway, New York City, and mention Rebus No. 6. The names and addresses of those sending in the correct answer will be published, so be sure to write your full name and address very plainly. A list of the correct answers 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 puzzles, and their names will be enrolled on the Rebus Honor Roll. The Rebuses previous to No. 6 were published May 17, May 24, May 31, June 7 and June 14.



REBUS NO. 6—What circuit does this drawing represent? The circuit was featured recently in RADIO WORLD. It uses a system of negative feedback.

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. 7. The names and addresses of those sending in



Wrong Diagram No 7

correct answers will be published. The following were among those who sent in correct answers:

WRONG DIAGRAM NO. 3

C. W. Pomeroy, 7064 Pershing Ave., St. Louis, Mo.
Okoe Goff, 1403 Fifth Corso, Nebraska City, Neb.
Leo Burnes, 193 Montague St., Brooklyn, N. Y.

WRONG DIAGRAM NO. 4

LaVerne Auchue, 37 N. Sibley St., Fond du Lac, Wis.
D. D. Church, Chanute Field, Sec. A., Rantoul, Ill.
Don Bunner, Mentone, Ind.
F. J. Capone, 515 La Salle St., Berwick, Pa.
Glenn W. Slater, 62 E. Huron St., Pontiac, Mich.
F. A. Sirvatka, 2218 Austin Blvd., Cicero, Ill.
Duncan Lang, 1044 Main St., Camden, S. C.

Join the A. B. C.

THE American Broadcast Club, formed under the auspices of RADIO WORLD, has for its object the promotion of the welfare of the broadcast listeners of the United States, Canada and Mexico.

Membership is open to all interested in radio in any way, either as broadcast listener, dealer, manufacturer, wholesaler or jobber.

A novel feature of the A. B. C. is that membership entails no duties or obligations whatever. There are no dues. All you have to do is enroll. That will signify your interest in radio and make you one of the thousands unselfishly united in a common interest.

NEW MEMBERS

Charles H. Peterson, dealer, 176 Hopkins Ave., Jersey City, N. J.
Dr. J. A. Lane, 2524 F St., Eureka, Cal.
Henry J. Lane, 2524 F St., Eureka, Cal.
I. C. Peterson, 2012 Second Ave., Minnepolis, Minn.
Don Bunner, Mentone, Ind.
Clifford Fields, 1218 S. Jefferson St., Rochester, Ind.
G. W. Slater, 62 E. Huron St., Pontiac, Mich.
Irvin C. Kodar, 825 East 161st Street, Bronx, New York City.
W. C. Bolton, 312 South High St., Warsaw, Ind.
Jennings Gain, 215 West 13th St., Norfolk, Va.
John F. Ayers, Box 178, Pleasantville, N. Y.
D. A. Nordeen, South Cypress St., Dwight, Kas.
Henry G. Bergman, 5217 Ellis Ave., Chicago.
H. H. Davis, St. Vincent, Minn.
Jos. P. Sameck, 2543 Church avenue, Brooklyn, N. Y.
Robert Burkhan, Kent School, Kent, Conn.
L. M. Church, Aid Office, War Department, Washington, D. C.
Earl Tompkins, Jermyn, Pa.
F. A. Nance, Salisbury, N. C.
Wm. Filler, 1741 Washington Avenue, Bronx, New York City.
Gordon Schwarz, Laurence Ave., Dumont, N. J.
John K. Fliteroft, 225 E. Second Street, Peru, Ind.

SOME OF THOSE ANSWERING REBUS CORRECTLY

REBUS NO. 2

A. O. Yakil, Box 17, Port Arthur, Tex.

REBUS NO. 3

F. J. Capone, 515 La Salle St., Berwick, Pa.
C. J. Minder, R. R. No. 6, Muscatine, Ia.
Don Bunner, Mentone, Ind.
Henry Gilchrist, Bedford, Ia.
A. O. Yakil, Box 17, Port Arthur, Tex.
La Verne Auchue, 37 N. Sibley St., Fond du Lac, Wis.
F. A. Sirovatka, 2218 Austin Blvd., Cicero, Ill.
A. N. Peatman, 84 Germain St., St. John, N. B.

REBUS NO. 4

J. M. Smith, Arcanum, O.
Fred Gomo, Jr., 278 Flushing Ave., Brooklyn.
Allen Brande, 1091 Payne Ave., St. Paul, Minn.
B. J. Killeen, 34 Indiana St., Wheeling, W. Va.

How Frequency Standards Were Fixed

ABOUT 570 radio broadcasting stations are now operating in the United States. With the range of each station constantly increasing through the improvements in receiving and transmitting equipment, what is to prevent the programs from getting hopelessly mixed up? The Department of Commerce has assigned definite wave lengths to the various stations, but then there remains the problem of setting up a practical standard of wave length and holding the transmitter to it.

In the old spark telegraph days "wave length" was a convenient unit, but in these modern times of accurate design "frequency" has been found better. Wave length and frequency are connected by a simple rule: Speed of light divided by wave length equals frequency. Wave length is given in meters; the speed of light is approximately 300,000,000 meters per second, and so for a 400-meter broadcasting station the frequency of the alternating current generated by the oscillator tubes is 750,000 cycles per second.

Currents Are Grouped

This current is called the "carrier," and on it are impressed the "voice" currents. The voice current is really made up of a great many currents having frequencies ranging from 100 cycles to 5,000 cycles, and when it is impressed or modulated on the carrier the result is a group of currents covering the range from 745,000 to 755,000 cycles.

The Department of Commerce has assigned to the Class B stations carrier frequencies 10,000 cycles apart. Since each station uses substantially this full range, it has become necessary to develop some accurate and reliable standard with which to check the frequency of the transmitting circuit. Otherwise, the programs of two stations might overlap, or the carriers of the two stations might "heterodyne" in receiving sets and cause a constant and annoying whistle.

Started at Middle

In their search for such a standard, engineers of the Western Electric Company determined to go back to the most nearly constant thing known, the rotation of the earth upon its axis. But this has a frequency of 1 cycle per 24 hours. how could it be used to check up electric currents having frequencies around 1,000,000 cycles per second?

To solve the problem, says the "New York Times," the engineers decided to start at the middle and work out. If they could produce an alternating current of say, 100 cycles per second, they could make it drive a clock, and by comparing the clock's performance with the Arlington time signals they could determine accurately this frequency. Then by electrical means they could compare it with successively higher frequencies up to the desired amount.

The apparatus devised by the engineers to produce electric currents of known and constant frequencies depends for its action upon the old familiar tuning fork. An alternating current of any desired frequency can be produced from a direct current by means of any device which will vary the direct current regularly. Because of the regularity of its action, a tuning fork was selected for the controlling device.

The tuning fork used has a frequency of 100 cycles a second and is kept in motion electrically. A high-impedance telephone receiver is clamped close to each prong of the fork, but without touching it, so that the motion of the prong will affect the magnetism through the receiver coils. Thus the fork can sing into the electrical system. A pair of electromagnets are fastened near the top of the fork, without touching it, in such a way that each prong in its vibration will pass through the "lines of force" between the poles of one of the electromagnets.

Fork is Vibrated

The fork is made to vibrate by tapping one of the prongs. The vibration of the prongs sets up an alternating current in the receivers, whose frequency is exactly equal to the frequency of the vibrations of the fork. This current, amplified by a two-stage vacuum tube amplifier, is then passed through the windings of the driving electromagnets.

The current is so timed by the amplified circuit that each time the prongs of the fork pass between the poles of the electromagnets they are given a slight magnetic "pull," and so kept in motion. It is apparent, then, that the tuning fork can be kept in motion as long as desired by the magnetic effect of the alternating current whose frequency is determined by the rate of the fork's own vibration. Since none of the apparatus touches the fork changes in its rate will only be caused by changes in temperature or variations in the characteristics of the electric circuit. It is comparatively easy to keep such changes so small that their effect upon the fork will be negligible.

Closes a Circuit

To compare the frequency of the fork with that of the earth's rotation, it is necessary to count the number of cycles of the fork per day. A vacuum tube amplifier is controlled by the driving circuit of the fork, and the output of this amplifier operates a synchronous motor designed to rotate once to every five vibrations of the fork.

The motor in turn, through a reduction gear and a commutator, closes a circuit once a second, thus driving an electric clock. If the fork makes exactly 100 vibrations every second, this clock will keep correct time. To check its accuracy, the fork-driven clock is compared directly with a high-class laboratory electric clock and with time signals received from Arlington by radio.

The Two Differ

Records of comparisons made over long and short periods of time show that the tuning fork and the laboratory clock differ from each other in rate by about six parts in 1,000,000, and that, compared to the time signals sent out by Arlington, the electric clock is the more accurate. The modern mechanical clock has been developed during several centuries, and one will feel an added respect for American research technique, which has in less than two years developed an electrical device to exceed the accuracy of all but the finest chronometers and astronomical clocks.

Frequency standards have a very interesting and important property—that of absolute portability, by means of wire by radio. Currents obtained from harmonics of the tuning fork at the Bell System Laboratories in New York have been transmitted to a number of points throughout North America for checking the calibration of such secondary standards as were being used in the adjustment of communication apparatus. During the installation of the Havana-Key West cable the calibrations of oscillators in Cuba were frequently checked directly against the freguency of the fork in New York.

A TIP ON WIRING A SET

IN wiring a set, keep all leads as short as possible, especially grid and plate leads, which should not be parallel.

MR. D. X. HOUND

Radio World's Own Artist Creates An Enjoyable Character

By HAL SINCLAIR

The Radio Trade

Sale of New R. C. A. Sets Is Put at $2,000,000 a Month

RADIO CORPORATION OF AMERICA'S report for 1923 showed enormous increase in operations in the last three years to be as follows:

	1923	1922	1921
Gross Income	$26,394,789.58	$14,830,856.76	$4,160,844.52
Gen. Oper., etc.	21,833,039.93	12,126,464.71	3,762,231.48
Other Income	176,024.11	270,187.72	28,186.55
Net Income for Year	$ 4,737,773.76	$ 2,974,579.77	$ 426,799.59

These figures are good but are only half the picture, says Stanton's Wireless Bulletin, which sets forth the following:

The company started the year 1923 with many handicaps. A great deal more money could have been made had the manufacturers been able to supply them with tubes of which there was a shortage of hundreds of thousands. It also developed that receiving sets that were being manufactured on a large scale were not adaptable to the changed conditions in broadcasting.

An effort was made to dispose of a large portion of these sets in the South American market without success and they were returned. The climax came early last summer when this material was dumped on the market at which we understand to have been a loss of more than a million dollars. By this time the tube production began to rise so that the last four months of the year was very profitable. All this time the sets that were being offered were not up-to-date and the company's engineers were concentrating on a new line of sets ranging in price from $35 to $425. These sets were offered to the public on April 1, 1924.

April of this year will be the first month to show the sales of new sets which we learn amounts to about $100,000 a day or approximately $2,000,000 a month. This with the tube sales running close to 1,000,000 tubes should bring April sales up to $5,000,000 or about three times that of April, 1923, and more than the gross of the whole company's operation in 1921. These are big figures, how about profits?

It has been said by many that R. C. A. is run by the large electrical concerns who get all the profits and the R. C. A. take all the risk and loss if any. This is not true as the report shows a net profit of $4,737,773.76 on a gross of $26,394,789.58 or 20 per cent on the business handled. True, R. C. A. had to take the loss on sets that became unsaleable. This was due to the manner in which this great business grew. No manufacturer could keep pace with it.

The rapid increase from three local to 600 stations scattered across the country changed the demand from one class of equipment to altogether another class. Conditions like these usually happen in the first three years of any new industry.

A large sales force is in charge of distribution. Competent engineers in charge of production programs. Manufacturers have trained forces so that production can be timed so as not to become overstocked and at the same time keep pretty close to the demand. All this means better control of the business in hand which results in larger profits with small risk.

Take for example, the tubes for April, 1924. (According to official figures published in the RADIO WORLD, the sales of tubes in January this year were 768,816, February 825,936 and March over 900,000.) In spite of these large sales they are hundreds of thousands behind the demand. We understand that R. C. A. contracted to buy these tubes from the General Electric and the Westinghouse Co.'s on a sliding scale, that is, the first million or so at one price and the next at a lower price, right down until all extra cost was removed, bringing the price of the tubes down to a minimum to R. C. A.

Third Annual Show in New York Nov. 3

THE Third Annual National Radio Show will be held this year in Grand Central Palace during the week of November 3. Those attending will be able to see Roxie and his gang at an actual broadcast from the show. Roxie (S. L. Rothafel) has consented to take charge of the entertainment program of the show.

Sets for Vacation

MARVEL Radio Specialty Co., 132 Nassau Street, New York City, is specializing on two good portable sets for vacationists. One is a 2-tube model and the other has three tubes. Both are easy to handle. The 2-tube outfit is mounted in a leatherette carrying case with compartments for headphones and batteries. This concern has also laid in a full stock of supplies for outdoor radio fans, including campers.

New Corporations

CORPORATIONS

Champion Radio Corp., New York City, $2,000. E. F. and G. F. Reubert, F. A. Bridges. (Attorney, K. G. Osborn, 100 Broadway.)

Kraftsman Electric Svc. Co., Bronx, New York City, general contracting, $10,000. M. Gold, A. Brody, M. Funkel. Attorney, L. Himmelfarbe, 61 Park Row.)

International Broadcasting Asso., Wilmington, Del., $25,000. (Corporation Trust Co. of America.)

Little Wonder Radio Corp., New York City, electric work, etc., $10,000. C. Sattler, R. Ascher. (Attorney, H. Ascher, 1540 Broadway.)

Shore Electric Co., New York City, radio, $10,000; T. J. Miller, J. J. McGinty, F. Gold. (Attorney, S. H. Kaufman, 60 Wall St.)

Kadel Electric Co., Port Jervis, N. Y., machinery, 200 shares common stock, no par value; L. C. and K. Kadel, M. Fitzgerald. (Attorneys, Gregg & Feuchs, Port Jervis.)

Electrical Prospecting Corp. of America, New York City, develop patents, 1,000 shares common stock, no par value; E. E. Mueser, A. A. Berle, Jr., H. R. Habicht. (Attorneys, Lippitt & Berle, 67 Wall St.)

Sunbeam Radio Sales Co., New York City, $20,000; M. Borrman, E. Dornheimer, A. K. Kaufman. (Attorneys, Hays, Podell & Shulman, 50 East 42d St.)

Alpine Radio Corp., New York City, $10,000; E. V. Church, D. Baron, J. R. Gibson. (Attorney, M. J. Levie, 220 Broadway.)

CAPITAL INCREASES

Joseph & Cull Silk Mills, N. Y. C., $100,000 to $125,000.

Finkelstein Dress Co., N. Y. C., $10,000 to $25,000.

Corning Bread Co., Corning, N. Y., $20,000 to $40,000.

Erie-Buffalo Corp., Buffalo, $20,000 to $50,000.

Electric Supply Sales Co., Rochester, 100 shares common stock, $50 each, to 850 shares, of which 100 are common, $50 each, and 750 common, no par value.

Capitol Distributing Co., N. Y. C., $30,000 to $100,000.

Hudson P. Rose Co., N. Y. C., $75,000 to $600,000.

Modern Camps Corp., Bronx, N. Y., $20,000 to $30,000.

Niagara Battery Corp., Buffalo, N. Y., $5,000 to $25,000.

Mutual Shoe Co., Brooklyn, N. Y., $50,000 to $75,000.

ASSOCIATION INVESTIGATES PACKING

THE National Radio Trade Association, with headquarters at New York, announces a special investigation into the decimal system of packing radio parts, a special committee having been appointed to ascertain the extent to which the decimal system is already in use in the industry.

Nicholas I. Allen of the Coto-Coil Company of Providence, R. I., has been appointed chairman of the committee. Other members are: D. W. May, of the D. W. May Co., Newark, N. J., and Frank Wigglesworth, of the Atlantic Radio Company of Boston, Mass.

Business Opportunities Radio and Electrical

Rates: 40c a line; Minimum 3 lines.

BUSINESS OPPORTUNITIES

ESTABLISHED IMPORTERS of electrical product will admit partner with $20,000 investment; unusual opportunity. Box 1, Radio World.

RADIO PHONOGHAPH SHOP, established seven years; low inventory; excellent location; owner has other interests. Box 2, Radio World.

RESEARCH AND DESIGN engineer desires capital connection to start production. O. E. H., 10613 Liberty Ave., Richmond Hill, N. Y.

RADIO OPPORTUNITY, fully equipped factory making high grade receiving sets; owner has other business; will sacrifice for $8,000; free and clear. Box 3, Radio World.

Broadcasting of Convention Aids Radio Business

FIFTEEN of the country's most powerful stations scattered from Boston to Kansas City broadcast the opening session of the Republican National Convention to an audience of approximately 25,000,000 persons, according to estimates.

Two New York stations, WJZ, on top of Aeolian Hall, and WEAF, 195 Broadway, were "on the air" with the proceedings from Cleveland at 11:30 a. m.

The keynote speech by Representative Burton and selections by Sousa's band were features. WEAF worked on the 492 meter wavelength and WJZ on 455 meters. Other stations in the region were silent, so that no interference resulted.

The radio stations were all connected with the microphones in Cleveland by telephone lines furnished by the American Telephone and Telegraph Company. The convention announcer was Graham McNamee of WEAF's staff, and his voice served all stations simultaneously.

Radio stores throughout New York reported increased business in radio and the demonstration rooms of many of the larger stores were crowded with enthusiasts listening-in on Cleveland.

Coolidge Hears Self Nominated

WASHINGTON.

PRESIDENT COOLIDGE "listened in" practically all the time the convention was in session. On the day he was nominated he did not go to his executive office during the afternoon because of the keen desire of himself and Mrs. Coolidge to hear the speeches and votes. The only person with them was Henry Long, who was Coolidge's private secretary when Coolidge was Governor of Massachusetts. It was not noticeable that the President became excited when word was sent to him in his office that if he wanted to hear the nominating speech he had better hurry. He methodically put some papers on his desk in order and with equal calmness walked to his study where the radio had been tuned and was giving out the proceedings.

Eyes Dimmed, Coolidge's Father Listens In

PLYMOUTH, VT.

IN the simple living room where Calvin Coolidge took the oath of office as President, John C. Coolidge sat before a radio receiving set and heard his son nominated at Cleveland.

As the cheers which greeted the President's name came to him through the air, the old man's eyes watered, but his nerves were steady and he calmly took out his watch and timed each long round of applause.

Two or three friends also had head sets, and as Chairman Mondell was heard, "the Colonel" remarked to them that his voice sounded "just like Cal's."

When Dr. Marion Leroy Burton in his speech of nomination mentioned some episode of the President's life in Plymouth the father exclaimed, "I wonder how he knew that."

Convention Broadcasting Proves Big Success

(*Concluded from page 19*)

of the scientific accomplishment. Radio was brought still closer to the hearts of the people.

COOLIDGE'S MESSAGE TO SMITH RELAYED BY SHENANDOAH

A MESSAGE from President Coolidge to Governor Smith, of New York, was handled in an unusual manner on the occasion of the 300th anniversary of the founding of Albany. The message was sent to the Naval Communications Service by messenger from the White House at 9:35 A. M., relayed by radio to the airship Shenandoah over New York City, and held by Commander Lansdowne until the airship was over Albany, at 10:30 A. M., when it was repeated through a loud speaker, and reached the ears of the Governor in person.

The Federal Telephone and Telegraph Company broadcasting station WGR, at the Hotel Statler, Buffalo, New York, was in constant contact with the Shenandoah over a radius of fifty miles, maintaining perfect two way conversation. The Shenandoah officers commented on the clearness of WGR station, saying that no repeat was necessary.

Radion Employes Chip In

THE many radio fans who work on Radion panels, dials and other parts in the factories and offices of the American Hard Rubber Company at Akron, O., Butler, N. J., College Point, N. Y., and New York City, have collected $500, which has been turned over to S. L. Rothafel of the Capitol Theatre for use as part of the "Roxie" Fund to equip veteran hospitals everywhere with radio sets.

The success of the Fund seems fully assured since the widespread interest has been developed due to the untiring efforts of "Roxie and his gang" in boosting for it so persistently and consistently over the radio every Sunday evening. This will mean that there will be one headset for every veteran in every hospital in the United States and is substantial evidence of the appreciation which the radio listening public has for not only the veteran but for the generous entertainment provided by the owners of the Capitol Theatre enjoyed all over the country.

Coming Events

JUNE 24—Opening of Democratic National Convention, Madison Square Garden, N. Y. C. Speakers nominating candidates for President and Vice-President will be broadcast.

JULY 7 TO 12—Radio show, Bangor, Me., auspices R. C. A.

JULY 21 TO 26—Radio show, Burlington, Vt., auspices of R. C. A.

AUG. 16-21—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.

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.

Roy's Radio Shop, Box 1293, Electra, Tex., would like to hear from wholesalers.

E. G. Bartlett, Ethel, Mo., wants radio literature.

J. A. Bennett, 2733 West 3rd St., Chester, Pa., wants radio literature.

Texas Has Greatest Number of Broadcast Stations

THE question of the "survival of the fittest" in broadcasting is again before the public, and the Government, for that matter, as radio broadcasting stations are almost as numerous as a year ago, and still increasing. Today there are 584 in operation, whereas the peak was only 591. Practically all wave lengths have been exhausted, necessitating a division of time.

Texas is leading with 42 radio broadcasting stations; Pennsylvania is second, with 41; California, which used to be first, has 39; and Ohio is third, with 30. New York and Illinois are tied with 29 each; Missouri has 28, Washington 24 and Iowa 23. Nevada, New Hampshire and Porto Rico bring up the rear with one each, but every state is supplied with one or more stations.

Broadcasters by States

Alabama	4	Montana	7
Alaska	3	Nebraska	15
Arizona	3	Nevada	1
Arkansas	8	New Hampshire	1
California	39	New Jersey	15
Colorado	12	New Mexico	3
Connecticut	4	New York	29
Delaware	2	North Carolina	3
Dis. of Columbia	8	North Dakota	4
Florida	9	Ohio	30
Georgia	7	Oklahoma	8
Hawaii	3	Oregon	17
Idaho	6	Pennsylvania	41
Illinois	29	Porto Rico	1
Indiana	10	Rhode Island	9
Iowa	23	South Carolina	4
Kansas	12	South Dakota	5
Kentucky	2	Tennessee	8
Louisiana	18	Texas	42
Maine	4	Utah	6
Maryland	3	Vermont	3
Massachusetts	14	Virginia	6
Michigan	18	Washington	24
Minnesota	14	West Virginia	3
Mississippi	3	Wisconsin	10
Missouri	28	Wyoming	3

CHILE PREFERS AMERICAN APPARATUS, DESPITE PRICE

IMROVED broadcasting in Chile has stimulated the demand for radio equipment. American apparatus, though higher in price, is preferred to French and German radio equipment. The Cia Radio Chilean proposes to install a new 500-watt transmitter.

New Patents Granted

Radio Telegraph System
Radiotelegraphy Signaling System

No. 1,473,220: Patented Nov. 6, 1923. Patentee: Harold F. Elliott, Palo Alto, Calif.

This invention relates to radio telegraphy signaling systems and particularly to a signaling system for use in connection with high power transmitting stations.

An object of the invention is to provide an efficient and effective signaling system for high power radio transmission stations.

Another object of the invention is to provide a uniwave signaling system for high power stations.

The invention possesses other advantageous features, some of which, with the foregoing, will be set forth at length in the following description, where I shall outline in full those forms of the invention which I have selected for illustration in the drawings accompanying and forming part of the present specification. In said drawings I have shown several transmission systems embodying my invention, but it is to be understood that I do not limit myself to such forms, since the invention, as set forth in the claims, may be embodied in a plurality of other forms.

The system of my invention is particularly applicable to a continuous wave transmitting system and in the present embodiment I have shown it used in connection with a continuous wave arc generator 3 of the Poulsen type, but it is to be understood that it may be employed with other constant frequency generators of radio frequency current. One side of the arc is grounded and the other side is connected to the antenna 4, through one winding of the transformer 5 and the inductance or main loading coil 6. When the system of this invention is used in connection with an arc radio generator in a uniwave signaling system, a non-radiating oscillatory circuit 7 containing the other winding of the transformer 5, an inductance coil 8, a capacity 9 and a variable resistor 12, is connected across the arc, but this non-radiating circuit may be omitted when an alternator or other constant frequency generator of radio frequency current is used.

Completing Super-Heterodine

(Concluded from page 11)

tween the condensers C_6 is used to tune one of the oscillators to the frequency of the other. It may be thrown either to one side or the other according to requirements. Its value should not be greater than that given by a five-plate tuning condenser. If the beat frequency is increased when this condenser is connected across one of the coils, throw it over to the other side, when the beat frequency should decrease. Increase the capacity in this condenser until the beat disappears at the lower end of the musical scale. If it disappears suddenly at a frequency which is above 100 cycles per second it means that the two oscillators are coupled too closely. Here is where condenser C_2 enters. This is a by-pass condenser across the "B" battery and the telephones which decreases the coupling between the two oscillators. Its value should not be less than .1 microfarad. As this condenser is connected into the circuit the sound in the telephones will become much feebler, but the beats may be heard much lower. If they still disappear suddenly above 100 cycles per second, increase still further the value of C_2. It may be increased to a point where the beat current ceases to be heard as a tone and where the individual beats may be perceived. It is not necessary, however, to use a condenser so large that the beat tone may be heard much below 100 cycles per second.

Before making any adjustments on any of the transformers, insert the third transformer in place of the transformer which tunes to the lowest frequency, that is, the one of the two in the circuit which does not require condenser C_1 in parallel. Then tune for zero beat again. This will determine which of the three tunes to the highest frequency. Use this as a standard in the test circuit and adjust the other two to meet it. The adjustment is done by removing turns from the two having lower frequencies until the beat tone is about 100 cycles or less. Each turn will increase the frequency about 40 cycles; that is, each turn will decrease the frequency of the beat tone by 40 cycles.

When these adjustments are being made, condenser C_1 should not be connected across either of the transformers.

Slight changes in capacity will produce large changes in the beat tone, as will be evidenced by pointing a finger at either of the transformers, or at the grid circuits of either oscillator. Hence, in adjusting, it is necessary to make a change and then move the hands away, and to make no other changes than those required. Make all leads as short and direct as possible, and make them rigid so that no changes will be introduced. (This should also be observed in connecting the transformers into the intermediate frequency amplifier.)

If it is decided to use this method in testing the coils, the apparatus which ultimately will go into the receiver may be used for setting up the test circuit.

Radio World's University

(Concluded from page 13)

RADIO WORLD *for May 17 interferes with other sets while it is in operation. The outfit is the one described by Mr. Caldwell, "2,000 miles on one tube."—F. Layman, 686 Bergenline Ave., West New York, N. J.*

The set you refer to is a one-tube reflex, and when operating does not interfere with other sets.

* * *

1—In the Superdyne circuit, as described in RADIO WORLD *for May 17, 24 and 31, is it advisable to ground the secondary lead (negative filament)? 2—Is the grid leak to be shunted across the grid condenser, or should it run to the negative filament lead from the grid?—Carl H. Lambach, 808 Putnam Bldg., Davenport, Ia.*

1—In many cases the set works better when the negative filament lead is grounded. Use the ground if that connection improves the working any. 2—Some tubes have been found to work a bit better with the grid leak across the condenser in this circuit, and some when the leak is connected to the negative filament.

* * *

When the vario-coupler in the Superdyne is assembled, what should the distance be from the first turn of wire on the rotor to the first turn of wire on the stator?—Ernest V. Olander, 1332 Milton St., S. E., Grand Rapids, Mich.

The bottom turn on the rotor is placed approximately on a level with the top turn on the stator. Some experimenters place it a little lower which may give more negative feedback.

* * *

Will you kindly republish the improved Grimes Reflex circuit which appeared in RADIO WORLD *some time ago with the following changes: Using an outdoor antenna with variocoupler and 43-plate condenser for tuning. This is to be connected to a double circuit jack, allowing a loop to be plugged in, thereby cutting out the outdoor antenna and using the loop with the same condenser for tuning the loop. Also show jacks after detector and first audio stage. Please show how to connect a C battery in this circuit.—Paul Anderson, Blackfoot, Idaho.*

Fig. 18 shows the circuit you want. The fixed condensers C are all .002 mfd. The correct voltage for the B battery is about 100. The 400-ohm potentiometer has one end connected to the stator plates of the variable condenser and the switch arm to the negative A battery lead. The remaining end is left free. A C battery is not advisable in reflex circuits.

* * *

I have built the Transcontinental Reflex as described in RADIO WORLD, *issue of May 3, and find that I cannot get very much volume. Can you give a diagram showing where these rheostats should be placed?—J. Fuchs, 253 Twelfth Ave., Long Island City, N. Y.*

Suggest you go over the wiring carefully and try to shorten all the leads as much as possible. If necessary, move some of the parts so as to enable you to do this. A diagram of the Transcontinental Reflex showing position of all rheostats was published in RADIO WORLD for June 7 in the University Department.

* * *

In RADIO WORLD, *issue of February 23, you described how to convert a double variometer regenerative receiver into a 2-tube reflex. I made this change and am pleased with the way it now works, but the volume seems limited. I am using UV201 tubes with 90 volts on the plate. My transformers are 5-to-1 and 3-to-1 ratio. What can I do to get more volume?—John Russo, 68 Garside St., Newark, N. J.*

The set you refer to is not much for volume. The best way to obtain great volume with that outfit is to add one stage of straight audio-frequency amplification. Also suggest that you use UV201A tubes throughout.

* * *

Referring to the write-up in RADIO WORLD, *issue of May 24, on page 22, please advise me where I can obtain a sketch of the 5-tube reflex, tuned radio frequency circuit mentioned in the last paragraph.—C. H. Dawson, 565 Maryland St., Gary, Ind.*

Write to Acme Apparatus Company, Cambridge, Mass.

Hints on Panel Drilling that Will Save You Trouble

As a sort of warning to prospective builders, the following should be of value. Before you think of drilling your panel, test your instruments out on a test board, using the apparatus that you intend incorporating in the finished product. To do this is to save time, money and temper, because rest assured, if the set does not work properly after being carefully wired up on a test board, with short lengths of wire, it will not work on the panel. When wiring the test board, use heavy bell wire, or annunciator wire, and make your connections straight and short. Then you can play around with it, and if it does not give the correct results you can determine just what is the trouble beforehand. Sometimes the wrong transformer will show itself, or any of a hundred other little things, or some particular arrangement of the component parts will produce some greatly desired effect, which arrangement can be carried out on the panel and the best results will be gained. Once you place the material on the panel, changing is a bad job, and nine cases out of ten, the apparatus will be damaged in some way.

Furthermore, as often said, always use the best materials and parts. You may save a few measly pennies on a condenser, but you will pay dollars in time and patience when the set is in use. The old motto of "Look after the pennies and the dollars will take care of themselves" does not apply to the purchasing of radio materials. There is a best, and there is a MOST EXPENSIVE. To be the best, a part does not have to be most expensive, but it must be THE BEST.

China to Have Station That Will Hear U. S.

WASHINGTON.

In cooperation with the Radio Corporation of America and with the approval of the Chinese Government the Federal Telegraph Company will soon begin construction of a high-powered radio station, which, when completed, will be able to receive and transmit messages directly between the United States and the more important cities of China. The station is also expected to reach European cities directly.

Crosley Official is Radio Church Soloist

When you tune to the broadcast service every Sunday morning from the Presbyterian Church of the Covenant, radioed by Crosley WLW you hear the beautiful contralto voice of Louise Koetter who is an official of the Crosley Radio Corporation, Cincinnati.

CRAM'S RADIO MAP IN COLORS—Giving call letters, stations, meters, names of broadcasters, etc., 35c postpaid. The Columbia Print, 1493 Broadway, New York City.

Experiments in Radio Movies Being Conducted

BCL in and Around London Actually Have Received Broadcast Moving Pictures on Their Sets, Consular Officers Report to Washington—Many Hear Only the "Whistle"

By Carl H. Butman

BRITISH radio-movie specialists are also experimenting in the transmission of moving pictures by radio, as is C. Francis Jenkins, of Washington, D. C.

Broadcast listeners in and around London have "heard" moving pictures by radio, according to a report from Consular Officials in England, but few fans, if any, have seen them, because they are not possessed of the proper receiving apparatus. All the listeners heard was a high-pitched intermittant whistle.

Recently a wireless device capable of transmitting moving pictures which can be received on tube sets, similarly to music and speeches, was tested by the inventor, J. L. Baird, operating from a town in England on the south coast.

The transmission apparatus is said to be simple, the object to be transmitted being placed in a beam of light before a rotating, perforated disc. The rays of light then pass through a second rotating disc, and are received on a selenium cell. They are then translated into an electrical current, equivalent to a musical note such as is prevalent in radio transmission.

Receiving sets will be equipped with another rotating disc equipped with a ring of electric lights arranged in positions corresponding to the holes in the disc of the transmitter. As the disc revolves rapidly, the lamps are lighted by the incoming signals. Earlier experiments in television, transmitted a sharp image, the reports stated, but it was subject to flickering. This difficulty has now been overcome, it is understood, through the employment of the revolving discs, and a picture similar to a brush drawing is reproduced at the receiving end. "A cinema picture can be transmitted so faithfully that every movement is reproduced," the dispatch states. To insure the dual operation of both the transmitting and receiving discs at exactly the same speed, a wireless wave is sent out by the transmitting motor which regulates the speed of the receiving motor.

New Broadcasters

CLASS A

Call	Owner	Kcys.	M.	W.
KFQA	The Principia, St. Louis	1150	261	50
KFQF	Donald A. Boult, Minneapolis	1340	224	10
WDBP	State Normal School, Superior, Wis.	1150	261	50
WDBQ	Morton Radio Supply Co., Salem, N. J.	1280	234	10
WDBR	Tremont Temple Baptist Church, Boston	1170	256	100
KFQG	Southern Calif. Radio Ass'n. Los Angeles, Calif.	1330	226	100
KFQH	Albert Sherman, Hillsbourgh, Cal.	1300	231	50
KFQI	The Thos. H. Ince Corp., Culver City, Calif.	1280	234	100
WDBI	Radio Specialty Co., St. Petersburg, Fla.	1330	226	10
WDBT	Taylor's Book Store, Hattlesburg, Miss.	1270	236	10
WDBU	Somerset Radio Co., Skowhegan, Maine	1160	258	10
WDBV	The Quimby Enterprises, The Strand Theatre, Fort. Wayne, Ind.	1160	258	100
WDBS	S. M. K. Radio Corp., Dayton, Ohio	1060	283	5
WJAB	American Electric Co., Lincoln, Neb.	1310	229	100

TRANSFERRED CLASS C TO CLASS A

Call	Owner	Kcys.	M.	W.
KFEL	Winner Radio Shop, Denver	1180	254	50
KFFQ	Marksheffel Motor Co., Colorado Springs, Colo.	1050	286	100
WMAK	Norton Laboratories, Inc., Lockport, N. Y.	1100	273	500
KLZ	Reynolds Radio Co., Inc., Denver	1060	283	500
WIAO	School of Engineering, Milwaukee	1220	246	100

The Funoflex Circuit

Funoflex Editor:

I WAS operating a set using the Funoflex Circuit last night and I found it so selective that I can't tune in all the pieces in an orchestra at one time. Can you tell me how to broaden it a bit?

ANXIOUS.

* * *

Funoflex Editor:

I see you are making a display of the set King George wears. Do I have to wear earphones to listen in or will an ordinary crown suffice?

JACK.

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BARGAIN: Freed-Eiseman neutrodyne, factory built. Coast to coast on loud speaker. As good as new. Will sell for $70.00, cost $150.00. Lester J. Towle, 786 So. Gilpin St., Denver, Colo.

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.

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

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Broadcast Problems Now Solved, Says Expert

WASHINGTON.

DR. J. M. DILLINGER, head of the Bureau of Standards' radio research, in a special interview, declared:

"Relatively speaking, and from the technical development viewpoint, the problems of broadcasting and of broadcast reception are solved, and other things are being developed. The real work of broadcasting development was done three to ten years ago. Of course there is great commercial and technical progress being made in this line, but the processes of fundamental development work are being directed to such things as transoceanic radio-telephone service, radio aids to navigation on the seas and in the air, directed radio transmission, radio distant control, conquering of atmospherics, and reduction of interference."

The extremely practical importance of scientific work on standards is illustrated by radio interference, Dr. Dillinger said, adding that much has been done to solve this great problem. Instead of the common attitude of complaint whenever a code message or other noise disturbs reception, an attitude of wonder and praise over the relative absence of interference would be more appropriate, he feels. There are each night several hundred radio messages simultaneously going through the ether from as many stations. Yet each reaches its hearers. There would be much conflict and pandemonium if each of these stations was not kept on, or very near, the assigned wavelength. This close adjustment of the station frequencies requires very accurate standards of frequency and constant vigilance to keep the stations and the measuring instruments in harmony with established standards.

ORGAN RECITALS BI-WEEKLY AT STATION WGY

AT WGY, Schenectady, every Tuesday at 10:15 p.m. for a period of an hour Stephen E. Boisclair will give a program of organ music and at 5:15 p.m. Thursday night he will offer a program of dinner music. Mr. Boisclair will play on the organ of Proctor's Harmanus Bleecker Hall, Albany, N. Y.

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KANSAS CITY.

RADIO fans listening to WDAF heard the first of the three official Shrine parades, staged during the national convention of the order.

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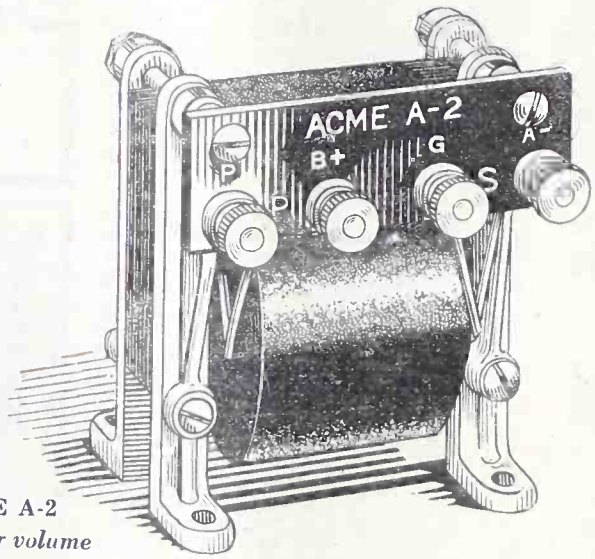

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