

15c. a Copy

Vol-3

No-68

July 14 1923

\$6.00 a Year

# RADIO

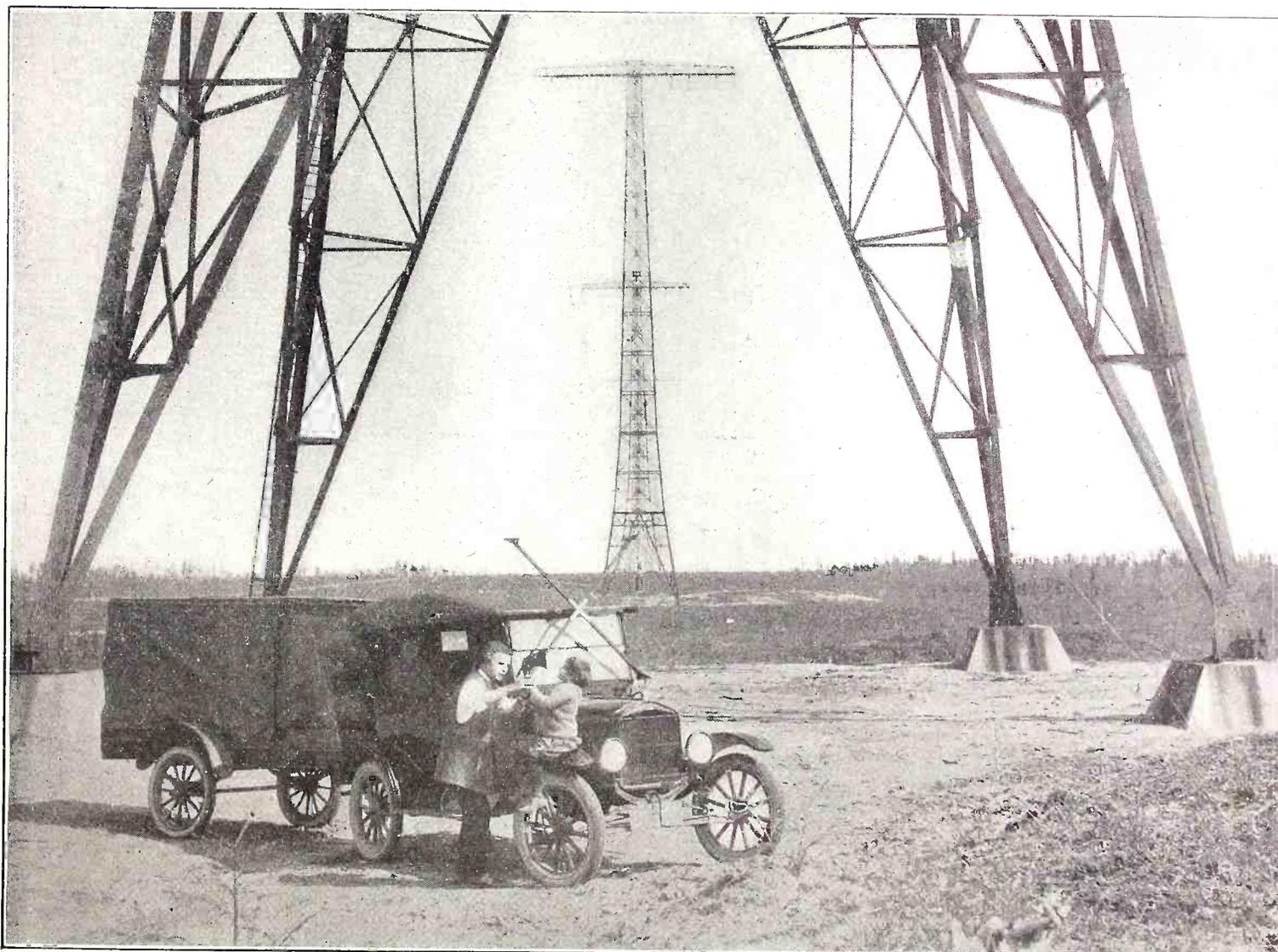
Title Reg. U. S. Pat Off.

# WORLD

ILLUSTRATED

EVERY WEEK

## AN INTERESTING CONTRAST IN ANTENNAE



(C. Kadel & Herbert)

An enthusiastic radio tourist stops his caravan under the 652-foot radio towers at Rocky Point, L. I., to listen in on his portable loop.

A Cheap and Efficient Crystal Set (See Inside)

# Federal Audio Frequency Transformer

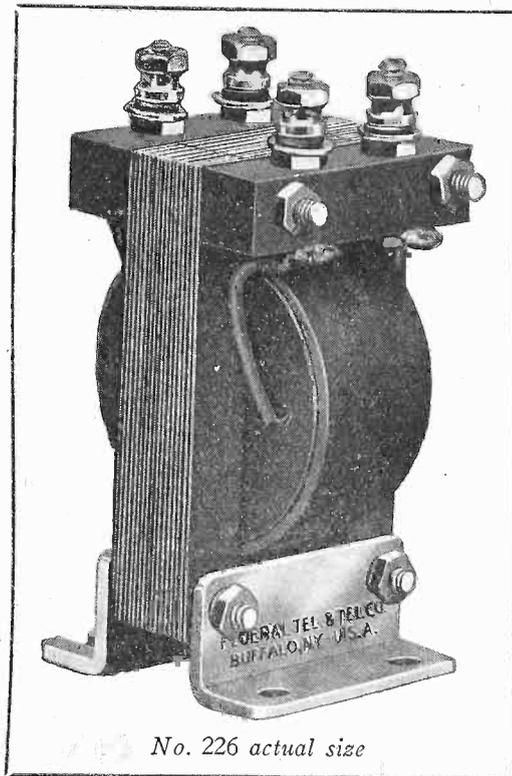
No. 226

*Amplification  
without Distortion*

**T**HIS A. F. Transformer has been pronounced by leading Radio engineers, after exhaustive tests, to excel in all essentials.

Federal A. F. Transformer No. 226 can be used with any vacuum tubes in common use.

It furnishes greater amplification and faithfulness in the reproduction of both voice and orchestral music. Install a No. 226 on your present set. It will prove a revelation to you.



No. 226 actual size

*Every unit guaranteed. Send today for illustrated catalog describing them fully*

## Your Dealer Sells Federal No. 226

The same engineering skill, based on twenty-three years' experience in the manufacture of communication apparatus, is behind every Federal Guaranteed Radio Product, and there are more than 130 separate, individual products in the line, each one of which is *guaranteed!*

**Federal Telephone & Telegraph Company**  
BUFFALO, N. Y.

# RADIO WORLD

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

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. III, No. 16. Whole No. 68

July 14, 1923

15c. per copy, \$6.00 a year

## Tuned Radio-Frequency Amplification

By Leon W. Bishop, 1XP

**R**ADIO-FREQUENCY amplification has been the subject of much discussion for ten years, but it is only in the last four years that we have been able to get good results on the shorter wave bands.

Fully 90% of the radio-frequency circuits employ transformers of fixed ratios for a given wave band and in some instances use iron to broaden the range. No matter what method you use to broaden the band with a fixed ratio transformer you still have one narrow band that is favored while the efficiency drops off rapidly on either side. Now that the broadcasting wave band has been widened we must turn to tuned radio-frequency amplification for real results which is the only logical method.

There is no need of a double circuit tuner when several stages of tuned radio-frequency are used and where a slight amount of regeneration is present. In Fig. 1 let the dotted line represent a given wave length and point A the tuning point of the single circuit. Now if the first tube is tuned to this exact point, regeneration will occur, but a place on either side of A will be found where no regeneration occurs and the amplification is normal. The point C represents the tuning peak of the second tube and it may be seen that the relative positions of B and C may be reversed so as to minimize interference from local sources. The third stage is shown by D and is not critical of tuning due to the great amount of amplification delivered to it by the first two stages. However, a wide range of selectivity may be obtained by using this stage in connection with the second.

Fig. 2 shows one tuned stage of radio-frequency and detector. The variable condenser C is .0005 mfd. (23 plates). The tuning inductance L consists of 60 turns of No. 22 wire wound on a four-inch tube and tapped every 10 turns. V is a variometer and should be free from shellac on the windings. The success of this circuit depends upon the grid leaks and for that reason it is best to use a variable grid leak. The first

grid leak GL is about one megohm, and the second or detector grid leak GL1 is about one-half megohm. The grid condenser C2 is of the mica type and .0005 mfd.

The high vacuum type of tube is best for the radio-frequency circuits while the standard type of detector tube is best adapted for the detector circuit. The B battery for the first radio-frequency tube should be from 45 volts up, and the detector voltage should be that amount recommended by the manufacturer.

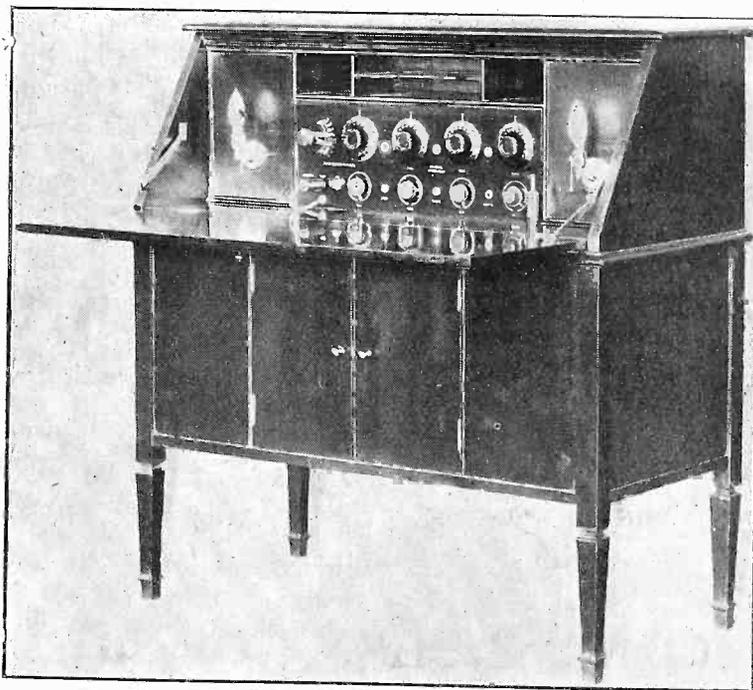
The grid leak should be adjusted to the point where only a small path of regeneration occurs when tuning the variometer. A variometer may be used in the plate circuit of the detector tube with increased amplification—also increased tuning troubles.

Fig. 3 shows three tuning stages and detector. The aerial circuit is the same as that described in Fig. 2. The fixed condensers C1 are .001 mfd. and of the mica type. The grid leaks on the first and second tubes should be capable of adjustment as low as 10,000 ohms. A 300 or 400 ohm potentiometer P is connected across the A battery and the negative B battery returned to it. A separate tap is provided for the first stage of RF while the second two stages are connected to the same point on the positive B battery. As much B battery as possible should be used on the radio-frequency tubes up to about 130 volts. The proper amount is determined by trial. The phones should be shunted with a .002 mfd. condenser.

For those interested in power amplification Fig. 4 shows three stages of radio-frequency and two stages of audio-frequency amplification. The radio-frequency part of the circuit is the same as that shown in Fig. 3. The fixed condenser C3 is .002 mfd. The point X should be connected to the negative side of the filament and not to the negative side of the A battery.

Fig. 5 shows a neat and inexpensive charging arrangement for any panel. Care should be taken to use metal covered cable for the AC circuits.

(Concluded on next page)



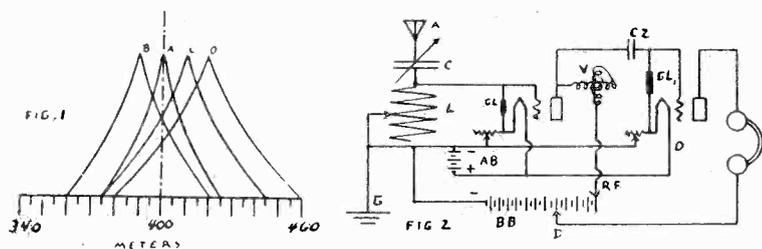
Set employing tuned radio-frequency, as described in the accompanying article, built for Mrs. F. A. Ball, of Athol, Mass., daughter of the late L. S. Starrett, tool manufacturer.

(Concluded from preceding page)

Fig. 6 shows an outline of the panel which is 28 x 8 inches for those wishing to follow the design.

The results obtained with this circuit depend upon two points—first, the adjustment of the grid leaks; and second, your knowledge of tuning.

201-A tubes are the best for all of the amplifiers, and may be used for the detector but the old standard detector tube with proper plate voltage seems to give the best results. When distance (DX) is the object the tap on the first RF tube should be lowered but when volume is desired this tap should be moved up on the B battery.

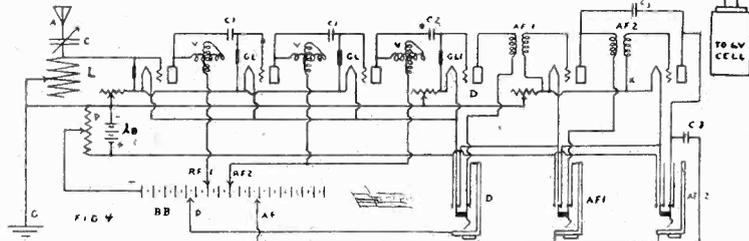
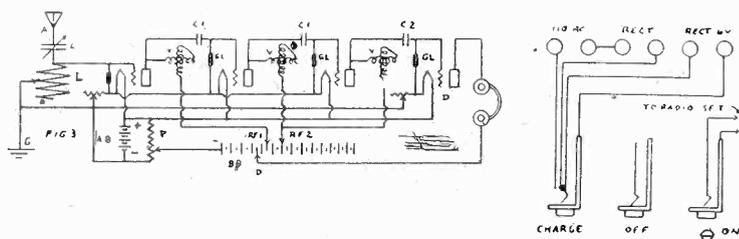


Figs. 1 and 2. Showing the advantage of using tuned radio-frequency and circuit diagram of a two-tube set employing one stage of tuned radio-frequency amplification with tube detector.

The dials should be set to correspond with the variometers; that is, the dial should be at zero when the variometer is at minimum as readings obtained on various stations have a meaning and the same station will always appear at a given point providing the values of the grid leaks have not been changed in the meantime.

As much B battery as possible should be used on all tubes up to about 140 volts for maximum results.

When the circuit is first used regeneration will run wild, but this can be controlled by decreasing the grid leaks. The leak on the second tube is most critical and is always the lowest, sometimes in the order of 10,000 ohms. As the leaks are decreased tuning becomes broader but it is advisable to have a path of regeneration on the first variometer. When regeneration enters into this circuit it comes on with a bang and all signals stop. The greatest signal strength is obtained on either one side or the other of this regenerative point.



Figs. 3, 4 and 5. Sets employing three stages of tuned radio-frequency amplification with detector, and also with two stages of audio-frequency. A neat panel charging device is also illustrated.

Once a rough setting of the grid leaks is obtained the third variometer dial can be set at 75 and the second dial at 40, tuning the first variometer and aerial condenser to a given signal using both hands in the op-

eration. The tuning may be finished up by a final setting of the second and third variometers.

The most active part of the first variometer dial is the first eighth of the dial; the second variometer the middle half and the third is active over the last half. This is a given normal condition but many variations may be tried that are more selective.

Wherein points of regeneration may be found in this type of tuner it must be remembered that it is not classed with the common species of regenerative set that produces untold interference in the neighborhood.

This circuit is taken from old British practice of reactance capacity coupling and remodeled to suit our present broadcasting reception.

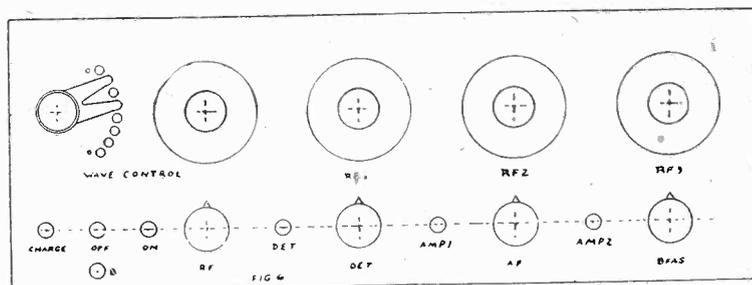


Fig. 6. Panel layout suggested for the sets described herewith.

This circuit is designed for use with a loud speaker on distance reception as well as local. Stations 1,500 to 2,000 miles away may be reproduced in the loud speaker with wonderful volume and no distortion.

Indoor types of aerials may be used with success and loops for local work.

This set greatly reduces interference (QRM) from local stations as well as static (QRN).

The following are the references covered in the diagrams: A aerial, AB A battery, AF audio-frequency, BB B battery, C .0005 variable condenser, C1 .001 fixed condenser, C2 .0005 fixed condenser, C3 .002 fixed condenser, D detector, G ground, GL grid leak, GL1 detector grid leak, L tuning coil, P potentiometer bias, RF radio-frequency, V variometer.

## Watch the Details

**I**N the construction of a receiver the builder is generally in such a rush to get the set made and working that he neglects to think of minor details that help in reception. Do you ever think of the polarity of the phone connections? Do you ever stop to test each soldered connection? Do you test your condensers for shorts before putting them in the set? Do you see that your jacks and plugs are perfect before using them? Do you do a hundred other little things such as brushing and blowing the little filings and chippings out of your condensers and wiring? Think it over, and don't blame the set when you have to hunt for "Old Man Trouble."

## A Handy Hint

**C**ONDENSERS like everything else that is subject to much use, occasionally lose their friction control and will not stay set, but slip around. If you attempt to tighten them by the use of the friction screw there is a liability of shorting the plates. If instead, you remove your dial and put a washer of felt or cork between the dial and the panel, fitting it carefully over the shaft, you can get any desired amount of friction—and you won't have to bother with tightening any screws.

# A Crystal Set—Cheap, Compact and Efficient

By *Kenneth Malcolm, A. I. R. E.*

THE person who lives in the vicinity of a transmitting station can reap the benefits of radio broadcasting without any great outlay of money. The solution of the poor man's radio is found in the crystal set. Of course, the crystal set has its limitations, but it also has advantages that are too often ignored by the present generation of fans, and the popular magazines. But here and now it might be mentioned that the crystal detector is the most efficient detector used, when it is considered that there is absolutely no local or battery current employed in its operation. Crystals are not very sensitive, comparatively, and they are sometimes difficult to keep in adjustment; but notwithstanding this, they afford a simple and effective means of bringing the broadcast concert into the homes of those of moderate means, who cannot consider any great expenditure.

The set to be described can be made at home, with little trouble and small cost, and will operate very efficiently for a set of its type. The writer operated such a set in Brooklyn, N. Y., and brought in all the local stations, including those in New York City and Newark, very distinctly and with considerable volume.

There are not many parts to buy, so it would pay to buy the very best; for the improved results will surely be commensurate. Apart from the set itself, the receivers, or 'phones, are a very important item. Try and get the most sensitive that you can afford.

The panel is  $5\frac{1}{2}$  inches square and  $\frac{1}{8}$ -inch thick, and of some of the recognized insulating materials. The parts for the detector may be bought at some radio store or supply house, or else they may be detached from the base of a mounted detector. The tube for the tuning coil may be of cardboard that has been impregnated with insulating varnish, vulcanized fibre, hard rubber, or one of the phenol condensation products—preferably the latter; and  $3\frac{1}{2}$  inches long and  $3\frac{1}{2}$  inches in diameter. About a half pound of No. 24 cotton covered wire is needed for the winding. Procure a small rotary switch of some sort and ten contact points or taps. A fixed condenser of .001 or .002 mfd. capacity is necessary for use across the phone terminals. In buying this it is best to be on the safe side by getting one with a mica dielectric; for the paper dielectric type are in many cases unsatisfactory, on account of their hygroscopic qualities and their changeable capacity, varying with pressure. The difference is not noticed so much, however, in this particular point of operation as in other parts of a circuit. A cabinet, connecting wire, and four binding posts, complete the list of necessary materials.

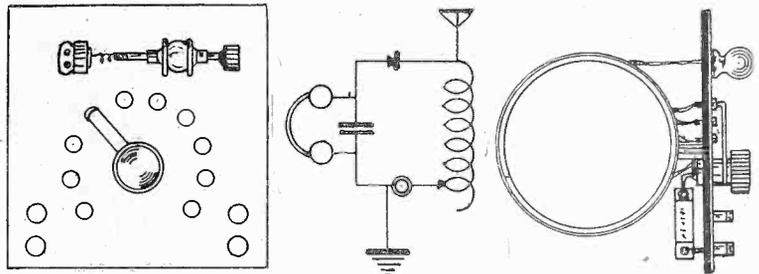
If your panel has a glossy surface, and you wish a dull finish, it is best to rub it down before mounting the instruments. Some very fine sandpaper, or better still, steel wool, will soon take off all the shine. Do not use a criss-cross or circular movement in rubbing, but rub back and forth in one direction. After the panel has been laid out, and the instrument holes drilled, the final finish of a rich dull lustre may be given by a rubbing with a piece of cotton waste, or an ordinary rag, dipped in machine oil, the superfluous oil being rubbed off with a dry cloth.

Now accurately lay out the panel for the various holes for the switch arm, taps, binding posts and de-

tector. If the panel is to be mounted in a cabinet, holes should also be drilled for the fastening of screws. It might be well to first lay out the different points on a piece of paper of the exact size of the panel; when complete and satisfactory, transferring them direct to the panel. A sharp center punch should be used in marking the points for holes, serving both as a marker and as a guide for the drill tip.

The tube may be mounted to the panel by means of two little brackets made of brass strip, or by means of a small brass tube passed over a long screw, as shown in the drawing; one tube and screw is used on each end of the tuner.

Before being mounted, the tube is given a coat of insulating varnish, and 80 turns of the No. 24 wire is smoothly wound on. There will be about a half-inch left at each end of the winding. Taps are taken from every eight turns. If the wire has been wound tightly enough, the coil will not need another coat of varnish; it is really better without it. Short flexible leads should be soldered to each of tapping points.



Front view of the completed crystal set, circuit diagram and side view, showing the method of fastening the tube to the panel and the arrangement of the leads.

The instruments may now be mounted on the panel. Before the tuner is permanently attached, it is best to solder all the little leads to the switch points. All the other joints should be soldered, also, for every effort should be made to preserve the minute currents that are available in a receiving set. A soldered joint in time means the saving of having to take your set apart nine times in the future.

Except for the tap leads, the connections may be made with rigid wire. No. 14 bare aerial wire is good for this purpose, and ordinary annunciator wire will do in a pinch. If bare wire is used, make sure that there is no possible way for crossing wires to touch and cause a short-circuit; and if a wood box is used, try to keep the bare wires from making a direct contact with the wood.

With a good crystal in the detector, the set is now ready for operation. As a personal preference I would choose galena. For, though it is not always stable, it is very sensitive; that is, providing it is a good piece, for specimens of all crystals vary considerably in their rectifying properties.

The binding posts at the left of the panel are for the aerial and ground connection, and the two posts on the right are for the phones.

The operation of the set consists simply in locating the sensitive spot on the crystal, and moving the switch over the various switch points until the station wanted is obtained.

# Radio Signals of Standard Frequency to Check Wave Meters

HERE is given below a schedule of standard frequency signals to be transmitted from the Bureau of Standards at Washington (station WWV). These signals should be of interest to all station operators who transmit on frequencies above 425 kc as they may be used for checking wavemeters and adjusting transmitting and receiving apparatus. Their accuracy is better than three-tenths of one per cent. Information regarding the use of these signals was given in February, 1923, issue of the Radio Service Bulletin. More detailed information is given in Bureau of Standards Letter Circular No. 92 which may be obtained on application to that bureau.

Commercial and ship stations should be especially interested in the 425, 500, and 600 kc waves. The 425 kc wave is the new frequency assigned by the Department of Commerce for commercial ship traffic. The remainder of the schedule includes the frequencies used by broadcasting and amateur stations. The transmission on the morning of October 7, is especially for amateur stations and includes only frequencies used by them. It will be helpful if amateur operators will stand by while the standard frequency signals are being transmitted on this date, so there will be as little interference as possible with their general reception.

In the schedule below the "general call" is given by voice during the first half of the four minute period and by continuous wave telegraph during the second half; this call is given to enable listeners to tune in WWV. The "standard frequency signals" consist of the station call letters WWV repeated with very long dashes intervening and are transmitted by unmodulated continuous waves. The "announcements" are made by voice during the first half of the period and by CW telegraphy during the latter half. The general call and the announcements are made on the same frequency as the standard frequency signals and may be used for some measurement purposes, but it is recommended that accurate measurements be made on the standard frequency signals only. With highly sensitive receiv-

ing apparatus it should be possible to receive these signals anywhere east of the Mississippi River.

Schedule of Standard Frequency Transmission from WWV

Eastern Standard Time	Signal	Kilocycles length in meters)			
		July 17	Aug. 15	Sept. 13	Sept. 28
10:55 to 11:04 p.m.	General call	425 (705)	425 (705)	425 (705)	500 (600)
11:04 to 11:08 p.m.	Standard frequency				
11:08 to 11:11 p.m.	Announcements				
11:15 to 11:19 p.m.	General call	500 (600)	500 (600)	500 (600)	700 (428)
11:19 to 11:23 p.m.	Standard frequency				
11:23 to 11:26 p.m.	Announcements				
11:30 to 11:34 p.m.	General call	666 (450)	666 (450)	666 (450)	900 (333)
11:34 to 11:38 p.m.	Standard frequency				
11:38 to 11:41 p.m.	Announcements				
11:45 to 11:49 p.m.	General call	850 (352)	850 (352)	850 (352)	1,100 (273)
11:49 to 11:53 p.m.	Standard frequency				
11:53 to 11:56 p.m.	Announcements				
12:00 to 12:04 a.m.	General call	1,000 (300)	1,000 (300)	1,000 (300)	1,300 (231)
12:04 to 12:08 a.m.	Standard frequency				
12:08 to 12:11 a.m.	Announcements				
12:15 to 12:19 a.m.	General call	1,250 (240)	1,250 (240)	1,250 (240)	1,500 (200)
12:19 to 12:23 a.m.	Standard frequency				
12:23 to 12:28 a.m.	Announcements				
12:30 to 12:34 a.m.	General call	1,500 (200)	1,500 (200)	1,500 (200)	1,700 (176)
12:34 to 12:38 a.m.	Standard frequency				
12:38 to 12:41 a.m.	Announcements				
1:55 to 2:04 a.m.	General call	1,350 (222)	.....	.....	.....
2:04 to 2:08 a.m.	Standard frequency				
2:08 to 2:11 a.m.	Announcements				
2:15 to 2:19 a.m.	General call	1,500 (200)	.....	.....	.....
2:19 to 2:23 a.m.	Standard frequency				
2:23 to 2:26 a.m.	Announcements				
2:30 to 2:34 a.m.	General call	1,600 (187)	.....	.....	.....
2:34 to 2:38 a.m.	Standard frequency				
2:38 to 2:41 a.m.	Announcements				
2:45 to 2:49 a.m.	General call	1,700 (176)	.....	.....	.....
2:49 to 2:53 a.m.	Standard frequency				
2:53 to 2:56 a.m.	Announcements				
3:00 to 3:04 a.m.	General call	1,800 (167)	.....	.....	.....
3:04 to 3:08 a.m.	Standard frequency				
3:08 to 3:11 a.m.	Announcements				
3:15 to 3:19 a.m.	General call	1,900 (158)	.....	.....	.....
3:19 to 3:23 a.m.	Standard frequency				
3:23 to 3:26 a.m.	Announcements				
3:30 to 3:34 a.m.	General call	2,000 (150)	.....	.....	.....
3:34 to 3:38 a.m.	Standard frequency				
3:38 to 3:41 a.m.	Announcements				

## Radio Amateurs Aid Victims in Oklahoma Flood

SAND SPRINGS, Oklahoma.—Sticking to their radio sets for three days and nights during the unexpected rise of the Arkansas River, radio amateurs in this vicinity recently maintained communication between here and Tulsa when floods swept a large section of Tulsa County. Fully 500 people were driven from their homes and thousands of dollars damage was caused by the high water which put wire lines out of commission.

The towns are connected normally by an electric interurban road, four telephone lines and the telegraph line, but all were down except the latter and one telephone line. Most of the flood victims, whose homes had either been destroyed or made uninhabitable, were housed temporarily at a park here and fed until the water began to recede. Meanwhile scores who frantically besieged local telephones had to wait three hours before they could get a call although the distance is only seven miles.

Halton H. Friend, a member of the American Radio Relay League, offered to send messages through by

radio, also bulletins on the rise of the river for the daily newspapers at Tulsa. He got in touch with Raymond U. McKinney, 5SG, John B. Lewis, 5WX, at Tulsa, and Earl W. Abrey, 5GA, at Osceola, Ark. The first night they kept fifteen minute schedules until 2 A. M. and the next two nights forty minute schedules until after midnight for the emergency.

Scores of personal messages were sent relieving the minds of relatives of those who had lost their homes. Amateur stations were also utilized by newspaper reporters who were unable to use wire lines on account of the limited service.

### Important but Neglected

MANY single circuit sets could be improved over 50% by the use of a potentiometer in the filament-grid circuit. The control of the set is made a little more difficult, but the results gained will more than pay for the added trouble.

# Radio-Frequency and Regeneration Combined

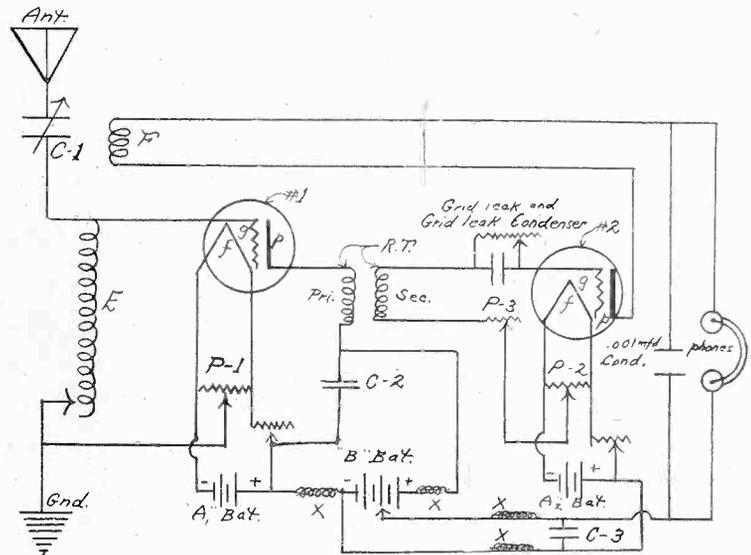
By C. White, Consulting Engineer

RADIO-FREQUENCY amplification and regeneration is going to be just as popular in the near future as the single circuit regenerative tuner is today. For the past year radio-frequency amplification and regeneration have only been considered as two separate and distinct methods of radio reception. The former was considered ideal since it was very quiet, but the latter proved to be more efficient and popular because more could be done with one tube using regeneration than by any other known method. It has been a battle of smooth and quiet operation versus economy and compactness. No one ever thought of combining the two on a commercial scale nor did any amateur ever think it was advisable to tackle; it either meant that he would have a radio-frequency outfit or a regenerative receiver, and not a combination of the two. But conditions have favorably changed on the radio market and parts which were not readily obtainable for amateur use are now to be had at almost any radio supply store. These parts are namely large size paper condensers, often called telephone condensers, and radio and audio-frequency choke coils. The coming of the UV199 tube has materially aided the accomplishment of the feat since it is now possible to operate a multiple tube outfit much cheaper than it was to operate one of the older types of tubes. Then again, with the past year we have changed some of our hard and fast ideas in regard to detectors and, in reality, it is this change of ideas that has made it possible to use low filament current tubes. Heretofore we have considered a soft or gaseous tube as the only one that was capable of use as a detector. Still the gaseous tube was not only more difficult to manufacture with uniform quality but required quite a high consumption of power to operate its filament at the correct temperature. It was also very erratic and critical requiring quite a bit of skill to handle it successfully. This idea has been thrown to the winds for all the new series of tubes are hard or high vacuum tubes. These tubes when used correctly in a circuit give very much clearer and louder volume than the old type of detector, but they must be used correctly.

The circuit illustrated herewith is the old reliable and simple single circuit regenerative receiver with one stage of radio-frequency amplification. The choke coils X are absolutely essential to the correct operation of the set. These choke coils which are .1 henry inductance act together with the bypass condensers C-2 and C-3, thus forming a sort of filter arrangement that effectively blocks out radio and audio-frequency currents from passing through the common "B" battery, thereby preventing serious leakage and coupling. The condensers C-2 and C-3 should be paper condensers of 1.0 micro-farad capacity apiece. The potentiometers P-1, P-2 and P-3 should have a resistance of 400 ohms apiece, and, in order to prevent noise in tuning it is better to get the carbon pile resistance units, since wire units do not make it possible to smoothly vary resistance from a minimum to a maximum. The condenser C-1 must be a well insulated 23 plate air variable with a vernier attachment or plate. The main tuning coil and tickler feed-back coil is the unit E-F which is a good 180 degree coupler, using the coil F as the rotor and the coil E as the stator tuning inductance. Failure

of the circuit to regenerate properly will most likely be due to the fact that the tickler is connected in the circuit backwards, which condition is easily cured by reversing the wires connected to the terminals of the tickler coil. The other parts of the receiver are self-explanatory and can be ascertained from the standard symbols used on the schematic diagram. For portability and economy of operation I recommend the new radiotron UV199, although the circuit will operate with almost any type of hard amplifier tubes.

This receiver is especially designed for the amateur who has already in his possession a single tube regenerative receiver and wishes to add some radio-frequency amplification as well as make some changes



Schematic diagram of a circuit combining the old reliable single circuit regenerative receiver with one stage of radio-frequency amplification.

in his outfit. There are several special features on this receiver that will appeal to the advanced amateur; namely, the use of potentiometers rather freely. It might appear to be a waste of apparatus to do so, but if you will stop to consider the trouble that it prevents the outlay is readily justified. By the practise of adjusting these potentiometers you can readily learn to get maximum volume without causing the tubes to oscillate or spill over at the most sensitive spot. After tuning in you can always improve volume as well as quality by carefully turning these potentiometers. Do not use a high "B" battery potential on the detector tube (No. 2) because its action is very much better even when less than 20 volts is employed. But, on the amplifier (No. 1) as high as 80 volts can be used without impairing quality. A good make of radio-frequency amplifying transformer (R. T.) is used. The builder of this receiver is warned not to have too many turns on the rotor or tickler coil F. In fact, when this type of regeneration is used with radio-frequency you cannot critically feed-back as though no radio-frequency were employed. Connect the movable plates of the condenser C-1 to the antenna, and use a variable grid leak with a grid leak condenser of .00025 mfd. capacity.

It is, of course, rather difficult to guarantee any definite mileage for this receiver, but on try-out using only a small 20 foot indoor aerial 2,000 miles was obtained with ease and clarity that was truly remarkable.



# An Improved Turnbull DX Loop Receiver

By A. D. Turnbull

**A**FTER having received many letters from fans and friends as to the wonderful results obtained by the use of my circuit published in RADIO WORLD for May 19, and quite a few questions relating to whether or not this circuit could be accommodated to a loop I finally decided to evolve one for them with the results shown below.

Before giving information as to the construction of the receiver, a few words as to the tubes used will not be amiss. I have done all my work with the Canadian R-215A tubes, which are dry cell tubes similar to the popular dry cell tubes that you are accustomed to using. I have found that as good results could be obtained with these small tubes as with any others—if the set is properly tuned. Contrasting the work of both the six volt tubes and the 1½ volt tubes the difference if any is so slight that I myself could not detect it unless I measured it with resistance bridges and galvanometers, and even in that case there was but very little variation. This goes to show that the important thing in the operation of a set is not the tubes used, but how the set is tuned and how the operator constructs his set.

By looking at the present set and comparing it with the original diagram, but little difference can at first be noted. The technical points of the circuit remain intact except for some few changes, such as a potentiometer in the filament-loop lead, which acts as a stabilizer and permits very fine control of the regeneration and tuning. Of maximum importance is the coupler. It is much better to have a coupler that is capable of fine tuning than to get one of the bank wound type that will cause you no end of trouble through distributed capacity and dead-end losses.

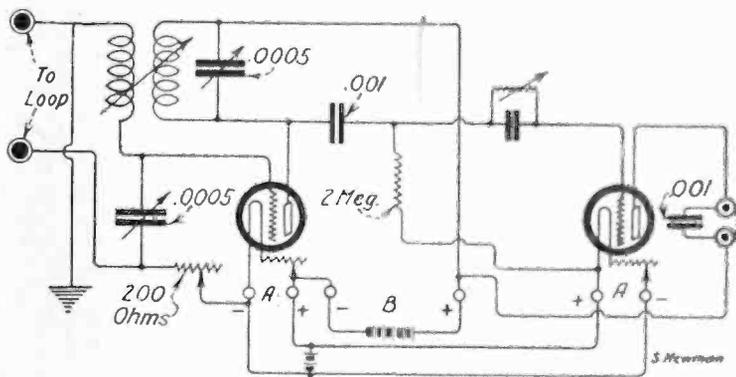
The condenser capacities in the plate grid lead of the two tubes are of major importance and no other capacity will give the proper results. Of particular importance also is the two megohm grid leak in the grid circuit of the second tube, leading from the filament side of the tube to the plate-grid condenser.

When tuning in the set it will be noted that super-regenerative action ensues when the coupling of the tickler is tightened, and when this reaches a certain point, the amplification is enormous, but this must be

done very cautiously, otherwise the set will howl like a cat that has been trod on. On account of this it is best to have the rotor of the coupler wound with coarser wire than is usually the case, and about 35 or 40 turns at the most.

A good ground to the grid lead side of the loop is essential to the proper operation of the set, and as queer as it may seem the reception and tuning will improve 100% when a good ground is connected. For those who do not happen to have a coupler handy, good results may be had by the use of honeycomb coils. For this purpose a coil of 50 turns for the primary and 35 turns for the secondary will do. If lower waves are desired, a 35 and a 25 turn coil can be used.

With this set operated properly and the tuning systematically done wonderful results will be accomplished, but the builder will have to become acquainted with his circuit before he obtains the best results, but as the tuning controls are quite simple it should not prove a difficult circuit for the fan to handle.



The original Turnbull receiver adapted to loop reception. Note the ground connection to one side of the loop.

As to distances that this receiver will work over, it can be said that stations 2,200 miles distant were received with perfect clarity and freedom from noise, all of course depending upon the existing conditions at the time of reception.

## Think This Over

**C**OULD you go out and get an automobile and learn to run it in a day by means of a book of written instructions? No—unless you were a super-man. Could you lay bricks without the knowledge of how it is done? Could you learn from printed instructions? No.

Then why do you think you can learn to tune your set by merely reading about it? Go to it and learn by experience. Your set may be turned out in hundreds from a factory, yet it has its own little twists and twirls, and individuality. You have to get the feel of it first and it may take a week or two before you can even tune in the local stations correctly.

Therefore do not get impatient and yell for assistance. Go to it and learn by doing. If you find out that your set works best when the potentiometer is at 50 and the printed instructions say that it should be at 75, leave it at 50, and consider that you have put something over on the maker of the set.

(Concluded from preceding page)

and ground. This will prevent the aerial from charging if a transmitter is used as it will discharge through the leak instead of sparks jumping the condenser. This leak will not have any effect on the signal strength. When constructing the set be sure to buy the best material obtainable. Be sure that every connection is properly soldered. Tinned bus bar wire should be used for connecting the different instruments. A very great percentage of the efficiency of the set depends on the tuning. If it is thoroughly understood what each part is for no difficulty will be experienced in getting good results but even the very loudest stations will be missed if it is not tuned slowly. Take your time in tuning, and in a short while you will understand the action of the set and tuning will be very simple.

Any one undertaking to build this set will be amply repaid for his patience and trouble as, when properly constructed and operated, it will give marvelous results both in selectivity and long distance reception.

# New Regulations Benefit Amateurs

**W**ASHINGTON, D. C.—The Department of Commerce has authorized a broader band of wave lengths for general and restricted amateur radio stations, and created a new class of amateur operator's license to be known as Amateur Extra First Class. The new regulations sent to all District Supervisors of Radio read:

Supervisors of Radio and Others Concerned:

Licenses will be issued permitting the use of any type of transmitter (CW, Spark, AC-CW, ICW, unfiltered CW and phone) with the restriction that when using pure CW they are authorized to use wave lengths from 150 to 200 meters and when using spark, AC-CW, ICW, unfiltered CW and phone the wave lengths from 176 to 200 meters only can be used. The types of transmitters must be specified in the application and the license.

Special Amateur Radio Station Licenses will be issued permitting the use of pure continuous wave transmitters only, authorizing the use of wave lengths from 150 to 220 meters.

For the purpose of application to amateur stations, pure CW is defined as follows: A system of telegraphing by continuous oscillations in which the power supply is substantially direct current as obtained from (1) a generator, (2) a battery, or (3) a rectifier with an adequate filter. (A filter is not deemed adequate if the supply modulation exceeds five percent.)

General Restricted and Special Amateur Stations are not permitted to use a transformer input exceeding one

kilowatt, or equivalent of this power based upon watt input to plates if tubes are used. (When input rating of tube is not specified by manufacturer this rating will be considered as double the manufacturers output rating.)

On licenses issued for amateur stations you will include the following: "This station is not licensed to transmit between the hours of 8:00 and 10:30 P. M., local standard time, nor Sunday mornings during local church services."

Special Amateur stations must be operated by persons holding an extra first grade amateur operator's license, or a commercial first class operator's license, or a commercial extra first class operator's license. Applicants must also meet the requirements of Regulation 63.

A new class of amateur operator's license is hereby established to be known as "Amateur Extra First Grade." Licenses of this grade will be issued to persons passing the required special examination with percentage of at least seventy-five and code speed in sending and receiving at least twenty words a minute, five characters to the word; who have had at least two year's experience as a licensed radio operator; and who have not been penalized for violation of the radio laws subsequent to the date of these regulations.

Respectfully,

Approved:

S. B. DAVIS,

Acting Secretary of Commerce.

A. J. TYRER,

Acting Commissioner.

## The Radio Woman

**T**HE Editor has shown me a letter from Miss May Clough, of New York State, who encloses a check for a renewal of her subscription for RADIO WORLD and in which she says: "I appreciate the paper very much and greatly enjoy keeping up with the new developments and news of radio. I have constructed the Sorensen set, described in your issue of January 20, using a U. V. 199 tube, and it proves very satisfactory. Your last number gives me an idea and I am going to replace the variocoupler arrangement with a coil mount to facilitate changing coils."

This is a fine letter and I'm tickled to death to hear from a woman radio enthusiast. I would like every woman who has built a set to write and tell me her experiences.

\* \* \*

Granny Tector recently made one of her long-promised trips down from the farm to see us. I guess it is nearly four years since she was here last, and she is the dearest thing ever. Even though four score and seven years old, she boasts the fact that she has never missed a single Sunday at church. Out where she lives it is a two hour ride in the "buggy" to church, but that doesn't detain that dear old lady. Seeing as how we were getting ready for a picnic in the woods that afternoon, we thought that we would take our church via radio, and accordingly made our plans. Granny prettied up and waited patiently for us to start, and when we told her that we were going to church by radio she was all a-flutter, but later on after she had sat through the entire service with a pair of phones on her ears she remarked in a quavering voice, "Well, I never! I often heard tell of 'tending meetin's'

by proxy, but this is the first time I ever thought of being in church by turning on a light."

\* \* \*

That afternoon we went out in the woods, of course, taking our set along with us, and turned on the beautiful organ music from one of the big broadcasters. She listened intently, often following the well known strains by humming in a high pitched voice, and after we had turned it off and started back home, she insisted that we must take her out and get one of those. "It'll be such a help to pa now. You know he still has rheumatics, and that two hour ride to church doesn't help him digest his Sunday dinner any—and I suspect that he sleeps in church anyhow, and this will keep him from sleeping, 'cause I can set right opposite him and keep him 'wake."

## Try This on Your Set

**S**OME time or other in the life of the average radio fan, he hears some little weak station which is just beyond the range of audibility. He knows it is there and can very faintly distinguish music or voice but he cannot bring it in. He fiddles, fusses, fumes and curses, getting gradually hot under the collar. Eminent scientists tell us that getting mad is very injurious to the liver and should not be indulged in.

The next time that you hear one of those "whispering stations" instead of getting sore, just place a crystal detector in your grid lead between your grid condenser and the tube, then turn on your tube, find a sensitive place on the crystal and try and get him again. You will be surprised to find the station that whispered before is plainly audible now. You may not notice much change in volume in local stuff, but for distance it is just the thing.

# Transformers in Theory and Practice

By Charles Byrnes, A. I. R. E.

TO the uninformed mind, transformers are little double coils with or without an iron core, that are put in the circuit because the diagram calls for them. Some people credit them with amplifying signals, and others have gone even so far as to accuse them of changing an alternating current to a direct current. In reality they do neither, but serve to change an alternating current from a higher to a lower or from a lower to a higher voltage. In the first case the current is increased, in the second case the current is decreased, and each in direct proportion to the decrease or the increase of the voltage.

A transformer usually has two distinct windings which are not connected to each other in any way, except through magnetic lines of force. The resistance of the magnetic circuit is reduced, in low frequency work, by the presence of an iron core. Transformers for very high frequency, however, have no cores other than air. The winding at which the current to be transformed enters is called the *primary* and the other winding is called the *secondary*.

The theory of the transformer is based on the theory of coils of wire in a changing magnetic field. In a given field, the greater the number of turns of wire the higher the voltage and the lower the amperage will be across the terminals. If one coil, energized by an alternating E.M.F., is allowed to act upon another coil within the field, it will be found that the voltage and amperage of the second coil will be in direct proportion to the number of turns which it includes, in relation to the number of turns in the first coil.

As an illustration let us assume that the primary coil is wound with 100 turns, and the secondary coil with 1,000 turns, or ten times as many turns as are in the primary. We exert an alternating pressure of 10 volts on the primary with a current strength of five amperes. If the transformer was 100 per cent. efficient we could expect a current of .5 of an ampere at a pressure of 100 volts in the secondary. If the number of turns was reversed and there were 1,000 turns on the primary and 100 turns on the secondary, we could expect a voltage of one, and an amperage of 50 at the secondary.

To impress the relationship more clearly we can find an analogy in mechanics that is first rate. Let us belt together two pulleys, as shown in the accompanying drawing, the larger pulley to be just twice the diameter of the smaller. If a turning force of 10 pounds is applied to the large wheel, which revolves at the rate of 100 revolutions per minute, a turning force of five pounds may be had from the small wheel, but at a rate of revolution of 200 a minute. That is, of course, assuming that the belt transmits the entire energy without loss.

If we now link turning force with voltage, and revolutions with amperage, we have a parallel in the action of a transformer and the action of belted pulleys. The larger the wheel, in proportion, the greater the turning force and the lesser the speed. The greater the number of turns, the greater the voltage and the lesser the amperage; and vice versa.

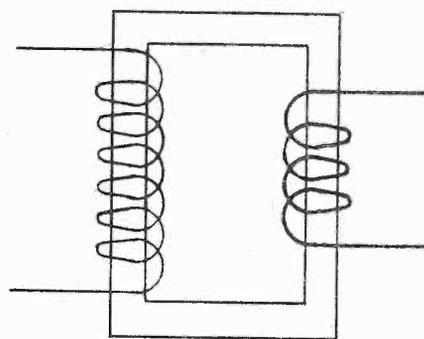
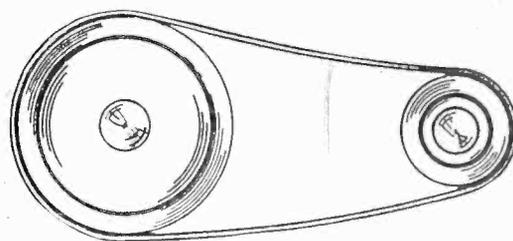
In transforming energy of any kind 100 per cent. efficiency can never be attained; and this also applies to electrical transformers. One form of loss is called copper loss, which is occasioned by the resistance of the wire. Another is core loss, or *hysteresis*, which results from the inability of the molecules of iron exactly to follow the rapid alternations of the current to which

a transformer is subjected. Ninety per cent. efficiency is considered very good in actual practice.

Transformers are usually used in receiving work in connection with vacuum tube amplifiers. They do not act as amplifiers themselves, but merely step up the voltage of the plate circuit of the preceding tube, or in some cases act simply to create two separate circuits, dividing the detector from the amplifier. Where the step-up principle is used, the increased voltage applied to the grid of the amplifier tube controls a relatively larger current in the amplifier plate circuit.

Practically the same action takes place in the radio-frequency air core transformers. Loose couplers and variocouplers are forms of air core transformers. Also, high frequency coils of the Tesla and Oudin types work on the same principle.

Larger iron core step-up transformers are used in spark transmitting stations to produce the high voltage necessary to jump the gap and charge the condensers.



Analogy between two pulley wheels of different diameters and the two coils of a transformer.

Still larger ones are used on alternating current transmission lines. By this means the voltage can be boosted and the amperage reduced with the result that a very large power can be sent out over comparatively small wires. There are step-down transformers at certain distributing centers, where the voltage may be cut and the amperage boosted for local consumption.

Step-down transformers are sometimes used in radio receiving work, to cut down the house current before going into the rectifier which supplies the current for vacuum tube filaments. Step-up transformers are used in the same manner to supply the plate current for transmitting tubes.

## Beware of Oil Cloth!

Do not use oil cloth as a covering for your radio cabinet or as a cover for the table on which the set stands. Oilcloth holds atmospheric charges and will cause numerous clicks in your set. Silk has the same properties and should not be used to clean rubber panels or cabinets. The best material for this purpose is a soft woolen rag duster or feather duster.

# New Regulations Benefit Amateurs

WASHINGTON, D. C.—The Department of Commerce has authorized a broader band of wave lengths for general and restricted amateur radio stations, and created a new class of amateur operator's license to be known as Amateur Extra First Class. The new regulations sent to all District Supervisors of Radio read:

Supervisors of Radio and Others Concerned:

Licenses will be issued permitting the use of any type of transmitter (CW, Spark, AC-CW, ICW, unfiltered CW and phone) with the restriction that when using pure CW they are authorized to use wave lengths from 150 to 200 meters and when using spark, AC-CW, ICW, unfiltered CW and phone the wave lengths from 176 to 200 meters only can be used. The types of transmitters must be specified in the application and the license.

Special Amateur Radio Station Licenses will be issued permitting the use of pure continuous wave transmitters only, authorizing the use of wave lengths from 150 to 220 meters.

For the purpose of application to amateur stations, pure CW is defined as follows: A system of telegraphing by continuous oscillations in which the power supply is substantially direct current as obtained from (1) a generator, (2) a battery, or (3) a rectifier with an adequate filter. (A filter is not deemed adequate if the supply modulation exceeds five percent.)

General Restricted and Special Amateur Stations are not permitted to use a transformer input exceeding one

kilowatt, or equivalent of this power based upon watt input to plates if tubes are used. (When input rating of tube is not specified by manufacturer this rating will be considered as double the manufacturer's output rating.)

On licenses issued for amateur stations you will include the following: "This station is not licensed to transmit between the hours of 8:00 and 10:30 P. M., local standard time, nor Sunday mornings during local church services."

Special Amateur stations must be operated by persons holding an extra first grade amateur operator's license, or a commercial first class operator's license, or a commercial extra first class operator's license. Applicants must also meet the requirements of regulation 63.

A new class of amateur operator's license is hereby established to be known as "Amateur Extra First Grade." Licenses of this grade will be issued to persons passing the required special examination with percentage of at least seventy-five and code speed in sending and receiving at least twenty words a minute, five characters to the word; who have had at least two year's experience as a licensed radio operator; and who have not been penalized for violation of the radio laws subsequent to the date of these regulations.

Respectfully,

Approved:

S. B. DAVIS,

Acting Secretary of Commerce.

A. J. TYLER

Acting Commissioner

## The Radio Woman

THE Editor has shown me a letter from Miss May Clough, of New York State, who encloses a check for a renewal of her subscription for RADIO WORLD and in which she says: "I appreciate the paper very much and greatly enjoy keeping up with the new developments and news of radio. I have constructed the Sorensen set, described in your issue of January 20, using a U. V. 199 tube, and it proves very satisfactory. Your last number gives me an idea and I am going to replace the variocoupler arrangement with a coil mount to facilitate changing coils."

This is a fine letter and I'm tickled to death to hear from a woman radio enthusiast. I would like every woman who has built a set to write and tell me her experiences.

\* \* \*

Granny Tector recently made one of her long-promised trips down from the farm to see us. I guess it is nearly four years since she was here last, and she is the dearest thing ever. Even though four score and seven years old, she boasts the fact that she has never missed a single Sunday at church. Out where she lives it is a two hour ride in the "buggy" to church, but that doesn't detain that dear old lady. Seeing as how we were getting ready for a picnic in the woods that afternoon, we thought that we would take our church via radio, and accordingly made our plans. Granny prettied up and waited patiently for us to start, and when we told her that we were going to church by radio she was all a-flutter, but later on after she had sat through the entire service with a pair of phones on her ears she remarked in a quavering voice, "Well, I never! I often heard tell of 'tending meetin's'

by proxy, but this is the first time I ever thought of being in church by turning on a light."

\* \* \*

That afternoon we went out in the woods, of course, taking our set along with us, and turned on the beautiful organ music from one of the big broadcasters. She listened intently, often following the well known strains by humming in a high pitched voice, and after we had turned it off and started back home, she insisted that we must take her out and get one of these. "It'll be such a help to pa now. You know he still has rheumatics, and that two hour ride to church don't help him digest his Sunday dinner any—and I suspect that he sleeps in church anyhow, and this will keep him from sleeping, 'cause I can set right opposite him and keep him 'wake."

## Try This on Your Set

SOME time or other in the life of the average radio fan, he hears some little weak station which is just beyond the range of audibility. He knows it is there and can very faintly distinguish music or voice but he cannot bring it in. He fiddles, fusses, fumes and curses, getting gradually hot under the collar. Eminent scientists tell us that getting mad is very injurious to the liver and should not be indulged in.

The next time that you hear one of those "whispering stations" instead of getting sore, just place a crystal detector in your grid lead between your grid condenser and the tube, then turn on your tube, find a sensitive place on the crystal and try and get him again. You will be surprised to find the station that whispered before is plainly audible now. You may not notice much change in volume in local stuff, but for distance it is just a different thing.

# Transformers in Theory and Practice

By Charles Byrnes, A. I. R. E.

**T**O the uninformed mind, transformers are little double coils with or without an iron core, that are put in the circuit because the diagram calls for them. Some people credit them with amplifying signals, and others have gone even so far as to accuse them of changing an alternating current to a direct current. In reality they do neither, but serve to change an alternating current from a higher to a lower or from a lower to a higher voltage. In the first case the current is increased, in the second case the current is decreased, and each in direct proportion to the decrease or the increase of the voltage.

A transformer usually has two distinct windings which are not connected to each other in any way, except through magnetic lines of force. The resistance of the magnetic circuit is reduced, in low frequency work, by the presence of an iron core. Transformers for very high frequency, however, have no cores other than air. The winding at which the current to be transformed enters is called the *primary* and the other winding is called the *secondary*.

The theory of the transformer is based on the theory of coils of wire in a changing magnetic field. In a given field, the greater the number of turns of wire the higher the voltage and the lower the amperage will be across the terminals. If one coil, energized by an alternating E.M.F., is allowed to act upon another coil within the field, it will be found that the voltage and amperage of the second coil will be in direct proportion to the number of turns which it includes, in relation to the number of turns in the first coil.

As an illustration let us assume that the primary coil is wound with 100 turns, and the secondary coil with 1,000 turns, or ten times as many turns as are in the primary. We exert an alternating pressure of 10 volts on the primary with a current strength of five amperes. If the transformer was 100 per cent. efficient we could expect a current of .5 of an ampere at a pressure of 100 volts in the secondary. If the number of turns was reversed and there were 1,000 turns on the primary and 100 turns on the secondary, we could expect a voltage of one, and an amperage of 50 at the secondary.

To impress the relationship more clearly we can find an analogy in mechanics that is first rate. Let us belt together two pulleys, as shown in the accompanying drawing, the larger pulley to be just twice the diameter of the smaller. If a turning force of 10 pounds is applied to the large wheel, which revolves at the rate of 100 revolutions per minute, a turning force of five pounds may be had from the small wheel, but at a rate of revolution of 200 a minute. That is, of course, assuming that the belt transmits the entire energy without loss.

If we now link turning force with voltage, and revolutions with amperage, we have a parallel in the action of a transformer and the action of belted pulleys. The larger the wheel, in proportion, the greater the turning force and the lesser the speed. The greater the number of turns, the greater the voltage and the lesser the amperage; and vice versa.

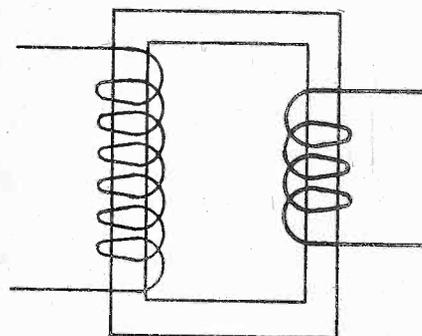
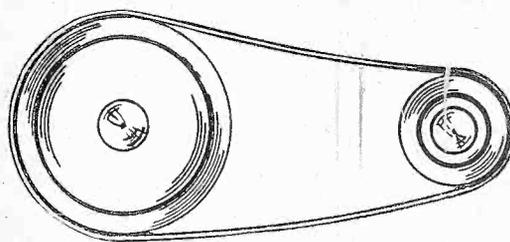
In transforming energy of any kind 100 per cent. efficiency can never be attained; and this also applies to electrical transformers. One form of loss is called copper loss, which is occasioned by the resistance of the wire. Another is core loss, or *hysteresis*, which results from the inability of the molecules of iron exactly to follow the rapid alternations of the current to which

a transformer is subjected. Ninety per cent. efficiency is considered very good in actual practice.

Transformers are usually used in receiving work in connection with vacuum tube amplifiers. They do not act as amplifiers themselves, but merely step up the voltage of the plate circuit of the preceding tube, or in some cases act simply to create two separate circuits, dividing the detector from the amplifier. Where the step-up principle is used, the increased voltage applied to the grid of the amplifier tube controls a relatively larger current in the amplifier plate circuit.

Practically the same action takes place in the radio-frequency air core transformers. Loose couplers and variocouplers are forms of air core transformers. Also, high frequency coils of the Tesla and Oudin types work on the same principle.

Larger iron core step-up transformers are used in spark transmitting stations to produce the high voltage necessary to jump the gap and charge the condensers.



Analogy between two pulley wheels of different diameters and the two coils of a transformer.

Still larger ones are used on alternating current transmission lines. By this means the voltage can be boosted and the amperage reduced with the result that a very large power can be sent out over comparatively small wires. There are step-down transformers at certain distributing centers, where the voltage may be cut and the amperage boosted for local consumption.

Step-down transformers are sometimes used in radio receiving work, to cut down the house current before going into the rectifier which supplies the current for vacuum tube filaments. Step-up transformers are used in the same manner to supply the plate current for transmitting tubes.

## Beware of Oil Cloth!

Do not use oil cloth as a covering for your radio cabinet or as a cover for the table on which the set stands. Oilcloth holds atmospheric charges and will cause numerous clicks in your set. Silk has the same properties and should not be used to clean rubber panels or cabinets. The best material for this purpose is a soft woolen rag duster or feather duster.

# New Regulations Benefit Amateurs

WASHINGTON, D. C.—The Department of Commerce has authorized a broader band of wave lengths for general and restricted amateur radio stations, and created a new class of amateur operator's license to be known as Amateur Extra First Class. The new regulations sent to all District Supervisors of Radio read:

Supervisors of Radio and Others Concerned:

Licenses will be issued permitting the use of any type of transmitter (CW, Spark, AC-CW, ICW, unfiltered CW and phone) with the restriction that when using pure CW they are authorized to use wave lengths from 150 to 200 meters and when using spark, AC-CW, ICW, unfiltered CW and phone the wave lengths from 176 to 200 meters only can be used. The types of transmitters must be specified in the application and the license.

Special Amateur Radio Station Licenses will be issued permitting the use of pure continuous wave transmitters only, authorizing the use of wave lengths from 150 to 220 meters.

For the purpose of application to amateur stations, pure CW is defined as follows: A system of telegraphing by continuous oscillations in which the power supply is substantially direct current as obtained from (1) a generator, (2) a battery, or (3) a rectifier with an adequate filter. (A filter is not deemed adequate if the supply modulation exceeds five percent.)

General Restricted and Special Amateur Stations are not permitted to use a transformer input exceeding one

kilowatt, or equivalent of this power based upon watt input to plates if tubes are used. (When input rating of tube is not specified by manufacturer this rating will be considered as double the manufacturers output rating.)

On licenses issued for amateur stations you will include the following: "This station is not licensed to transmit between the hours of 8:00 and 10:30 P. M., local standard time, nor Sunday mornings during local church services."

Special Amateur stations must be operated by persons holding an extra first grade amateur operator's license, or a commercial first class operator's license, or a commercial extra first class operator's license. Applicants must also meet the requirements of Regulation 63.

A new class of amateur operator's license is hereby established to be known as "Amateur Extra First Grade." Licenses of this grade will be issued to persons passing the required special examination with percentage of at least seventy-five and code speed in sending and receiving at least twenty words a minute, five characters to the word; who have had at least two year's experience as a licensed radio operator; and who have not been penalized for violation of the radio laws subsequent to the date of these regulations.

Respectfully,

Approved:

S. B. DAVIS,

Acting Secretary of Commerce.

A. J. TYRER,

Acting Commissioner.

## The Radio Woman

THE Editor has shown me a letter from Miss May Clough, of New York State, who encloses a check for a renewal of her subscription for RADIO WORLD and in which she says: "I appreciate the paper very much and greatly enjoy keeping up with the new developments and news of radio. I have constructed the Sorensen set, described in your issue of January 20, using a U. V. 199 tube, and it proves very satisfactory. Your last number gives me an idea and I am going to replace the variocoupler arrangement with a coil mount to facilitate changing coils."

This is a fine letter and I'm tickled to death to hear from a woman radio enthusiast. I would like every woman who has built a set to write and tell me her experiences.

\* \* \*

Granny Tector recently made one of her long-promised trips down from the farm to see us. I guess it is nearly four years since she was here last, and she is the dearest thing ever. Even though four score and seven years old, she boasts the fact that she has never missed a single Sunday at church. Out where she lives it is a two hour ride in the "buggy" to church, but that doesn't detain that dear old lady. Seeing as how we were getting ready for a picnic in the woods that afternoon, we thought that we would take our church via radio, and accordingly made our plans. Granny prettied up and waited patiently for us to start, and when we told her that we were going to church by radio she was all a-flutter, but later on after she had sat through the entire service with a pair of phones on her ears she remarked in a quavering voice, "Well, I never! I often heard tell of 'tending meetin's'

by proxy, but this is the first time I ever thought of being in church by turning on a light."

\* \* \*

That afternoon we went out in the woods, of course, taking our set along with us, and turned on the beautiful organ music from one of the big broadcasters. She listened intently, often following the well known strains by humming in a high pitched voice, and after we had turned it off and started back home, she insisted that we must take her out and get one of those. "It'll be such a help to pa now. You know he still has rheumatics, and that two hour ride to church doesn't help him digest his Sunday dinner any—and I suspect that he sleeps in church anyhow, and this will keep him from sleeping, 'cause I can set right opposite him and keep him 'wake."

## Try This on Your Set

SOME time or other in the life of the average radio fan, he hears some little weak station which is just beyond the range of audibility. He knows it is there and can very faintly distinguish music or voice but he cannot bring it in. He fiddles, fusses, fumes and curses, getting gradually hot under the collar. Eminent scientists tell us that getting mad is very injurious to the liver and should not be indulged in.

The next time that you hear one of those "whispering stations" instead of getting sore, just place a crystal detector in your grid lead between your grid condenser and the tube, then turn on your tube, find a sensitive place on the crystal and try and get him again. You will be surprised to find the station that whispered before is plainly audible now. You may not notice much change in volume in local stuff, but for distance it is just the thing.

# Transformers in Theory and Practice

By Charles Byrnes, A. I. R. E.

TO the uninformed mind, transformers are little double coils with or without an iron core, that are put in the circuit because the diagram calls for them. Some people credit them with amplifying signals, and others have gone even so far as to accuse them of changing an alternating current to a direct current. In reality they do neither, but serve to change an alternating current from a higher to a lower or from a lower to a higher voltage. In the first case the current is increased, in the second case the current is decreased, and each in direct proportion to the decrease or the increase of the voltage.

A transformer usually has two distinct windings which are not connected to each other in any way, except through magnetic lines of force. The resistance of the magnetic circuit is reduced, in low frequency work, by the presence of an iron core. Transformers for very high frequency, however, have no cores other than air. The winding at which the current to be transformed enters is called the *primary* and the other winding is called the *secondary*.

The theory of the transformer is based on the theory of coils of wire in a changing magnetic field. In a given field, the greater the number of turns of wire the higher the voltage and the lower the amperage will be across the terminals. If one coil, energized by an alternating E.M.F., is allowed to act upon another coil within the field, it will be found that the voltage and amperage of the second coil will be in direct proportion to the number of turns which it includes, in relation to the number of turns in the first coil.

As an illustration let us assume that the primary coil is wound with 100 turns, and the secondary coil with 1,000 turns, or ten times as many turns as are in the primary. We exert an alternating pressure of 10 volts on the primary with a current strength of five amperes. If the transformer was 100 per cent. efficient we could expect a current of .5 of an ampere at a pressure of 100 volts in the secondary. If the number of turns was reversed and there were 1,000 turns on the primary and 100 turns on the secondary, we could expect a voltage of one, and an amperage of 50 at the secondary.

To impress the relationship more clearly we can find an analogy in mechanics that is first rate. Let us belt together two pulleys, as shown in the accompanying drawing, the larger pulley to be just twice the diameter of the smaller. If a turning force of 10 pounds is applied to the large wheel, which revolves at the rate of 100 revolutions per minute, a turning force of five pounds may be had from the small wheel, but at a rate of revolution of 200 a minute. That is, of course, assuming that the belt transmits the entire energy without loss.

If we now link turning force with voltage, and revolutions with amperage, we have a parallel in the action of a transformer and the action of belted pulleys. The larger the wheel, in proportion, the greater the turning force and the lesser the speed. The greater the number of turns, the greater the voltage and the lesser the amperage; and vice versa.

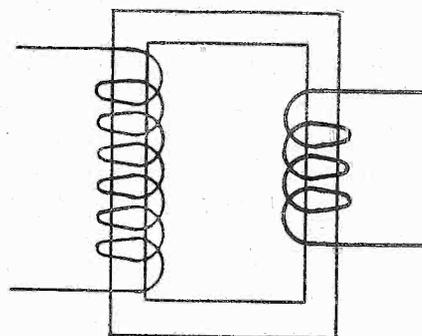
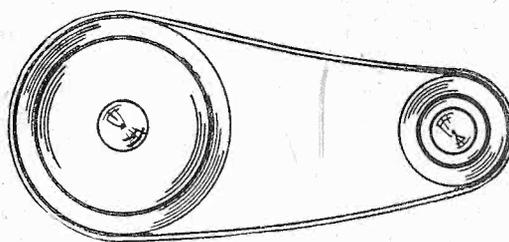
In transforming energy of any kind 100 per cent. efficiency can never be attained; and this also applies to electrical transformers. One form of loss is called copper loss, which is occasioned by the resistance of the wire. Another is core loss, or *hysteresis*, which results from the inability of the molecules of iron exactly to follow the rapid alternations of the current to which

a transformer is subjected. Ninety per cent. efficiency is considered very good in actual practice.

Transformers are usually used in receiving work in connection with vacuum tube amplifiers. They do not act as amplifiers themselves, but merely step up the voltage of the plate circuit of the preceding tube, or in some cases act simply to create two separate circuits, dividing the detector from the amplifier. Where the step-up principle is used, the increased voltage applied to the grid of the amplifier tube controls a relatively larger current in the amplifier plate circuit.

Practically the same action takes place in the radio-frequency air core transformers. Loose couplers and variocouplers are forms of air core transformers. Also, high frequency coils of the Tesla and Oudin types work on the same principle.

Larger iron core step-up transformers are used in spark transmitting stations to produce the high voltage necessary to jump the gap and charge the condensers.



Analogy between two pulley wheels of different diameters and the two coils of a transformer.

Still larger ones are used on alternating current transmission lines. By this means the voltage can be boosted and the amperage reduced with the result that a very large power can be sent out over comparatively small wires. There are step-down transformers at certain distributing centers, where the voltage may be cut and the amperage boosted for local consumption.

Step-down transformers are sometimes used in radio receiving work, to cut down the house current before going into the rectifier which supplies the current for vacuum tube filaments. Step-up transformers are used in the same manner to supply the plate current for transmitting tubes.

## Beware of Oil Cloth!

Do not use oil cloth as a covering for your radio cabinet or as a cover for the table on which the set stands. Oilcloth holds atmospheric charges and will cause numerous clicks in your set. Silk has the same properties and should not be used to clean rubber panels or cabinets. The best material for this purpose is a soft woolen rag duster or feather duster.

# New Regulations Benefit Amateurs

WASHINGTON, D. C.—The Department of Commerce has authorized a broader band of wave lengths for general and restricted amateur radio stations, and created a new class of amateur operator's license to be known as Amateur Extra First Class. The new regulations sent to all District Supervisors of Radio read:

Supervisors of Radio and Others Concerned:

Licenses will be issued permitting the use of any type of transmitter (CW, Spark, AC-CW, ICW, unfiltered CW and phone) with the restriction that when using pure CW they are authorized to use wave lengths from 150 to 200 meters and when using spark, AC-CW, ICW, unfiltered CW and phone the wave lengths from 176 to 200 meters only can be used. The types of transmitters must be specified in the application and the license.

Special Amateur Radio Station Licenses will be issued permitting the use of pure continuous wave transmitters only, authorizing the use of wave lengths from 150 to 220 meters.

For the purpose of application to amateur stations, pure CW is defined as follows: A system of telegraphing by continuous oscillations in which the power supply is substantially direct current as obtained from (1) a generator, (2) a battery, or (3) a rectifier with an adequate filter. (A filter is not deemed adequate if the supply modulation exceeds five percent.)

General Restricted and Special Amateur Stations are not permitted to use a transformer input exceeding one

kilowatt, or equivalent of this power based upon watt input to plates if tubes are used. (When input rating of tube is not specified by manufacturer this rating will be considered as double the manufacturers output rating.)

On licenses issued for amateur stations you will include the following: "This station is not licensed to transmit between the hours of 8:00 and 10:30 P. M., local standard time, nor Sunday mornings during local church services."

Special Amateur stations must be operated by persons holding an extra first grade amateur operator's license, or a commercial first class operator's license, or a commercial extra first class operator's license. Applicants must also meet the requirements of Regulation 63.

A new class of amateur operator's license is hereby established to be known as "Amateur Extra First Grade." Licenses of this grade will be issued to persons passing the required special examination with percentage of at least seventy-five and code speed in sending and receiving at least twenty words a minute, five characters to the word; who have had at least two year's experience as a licensed radio operator; and who have not been penalized for violation of the radio laws subsequent to the date of these regulations.

Respectfully,

Approved:

S. B. DAVIS,

Acting Secretary of Commerce.

A. J. TYRER,

Acting Commissioner.

## The Radio Woman

THE Editor has shown me a letter from Miss May Clough, of New York State, who encloses a check for a renewal of her subscription for RADIO WORLD and in which she says: "I appreciate the paper very much and greatly enjoy keeping up with the new developments and news of radio. I have constructed the Sorensen set, described in your issue of January 20, using a U. V. 199 tube, and it proves very satisfactory. Your last number gives me an idea and I am going to replace the variocoupler arrangement with a coil mount to facilitate changing coils."

This is a fine letter and I'm tickled to death to hear from a woman radio enthusiast. I would like every woman who has built a set to write and tell me her experiences.

\* \* \*

Granny Tector recently made one of her long-promised trips down from the farm to see us. I guess it is nearly four years since she was here last, and she is the dearest thing ever. Even though four score and seven years old, she boasts the fact that she has never missed a single Sunday at church. Out where she lives it is a two hour ride in the "buggy" to church, but that doesn't detain that dear old lady. Seeing as how we were getting ready for a picnic in the woods that afternoon, we thought that we would take our church via radio, and accordingly made our plans. Granny prettied up and waited patiently for us to start, and when we told her that we were going to church by radio she was all a-flutter, but later on after she had sat through the entire service with a pair of phones on her ears she remarked in a quavering voice, "Well, I never! I often heard tell of 'tending meetin's'

by proxy, but this is the first time I ever thought of being in church by turning on a light."

\* \* \*

That afternoon we went out in the woods, of course, taking our set along with us, and turned on the beautiful organ music from one of the big broadcasters. She listened intently, often following the well known strains by humming in a high pitched voice, and after we had turned it off and started back home, she insisted that we must take her out and get one of those. "It'll be such a help to pa now. You know he still has rheumatics, and that two hour ride to church doesn't help him digest his Sunday dinner any—and I suspect that he sleeps in church anyhow, and this will keep him from sleeping, 'cause I can set right opposite him and keep him 'wake."

## Try This on Your Set

SOME time or other in the life of the average radio fan, he hears some little weak station which is just beyond the range of audibility. He knows it is there and can very faintly distinguish music or voice but he cannot bring it in. He fiddles, fusses, fumes and curses, getting gradually hot under the collar. Eminent scientists tell us that getting mad is very injurious to the liver and should not be indulged in.

The next time that you hear one of those "whispering stations" instead of getting sore, just place a crystal detector in your grid lead between your grid condenser and the tube, then turn on your tube, find a sensitive place on the crystal and try and get him again. You will be surprised to find the station that whispered before is plainly audible now. You may not notice much change in volume in local stuff, but for distance it is just the thing.

# Transformers in Theory and Practice

By Charles Byrnes, A. I. R. E.

TO the uninformed mind, transformers are little double coils with or without an iron core, that are put in the circuit because the diagram calls for them. Some people credit them with amplifying signals, and others have gone even so far as to accuse them of changing an alternating current to a direct current. In reality they do neither, but serve to change an alternating current from a higher to a lower or from a lower to a higher voltage. In the first case the current is increased, in the second case the current is decreased, and each in direct proportion to the decrease or the increase of the voltage.

A transformer usually has two distinct windings which are not connected to each other in any way, except through magnetic lines of force. The resistance of the magnetic circuit is reduced, in low frequency work, by the presence of an iron core. Transformers for very high frequency, however, have no cores other than air. The winding at which the current to be transformed enters is called the *primary* and the other winding is called the *secondary*.

The theory of the transformer is based on the theory of coils of wire in a changing magnetic field. In a given field, the greater the number of turns of wire the higher the voltage and the lower the amperage will be across the terminals. If one coil, energized by an alternating E.M.F., is allowed to act upon another coil within the field, it will be found that the voltage and amperage of the second coil will be in direct proportion to the number of turns which it includes, in relation to the number of turns in the first coil.

As an illustration let us assume that the primary coil is wound with 100 turns, and the secondary coil with 1,000 turns, or ten times as many turns as are in the primary. We exert an alternating pressure of 10 volts on the primary with a current strength of five amperes. If the transformer was 100 per cent. efficient we could expect a current of .5 of an ampere at a pressure of 100 volts in the secondary. If the number of turns was reversed and there were 1,000 turns on the primary and 100 turns on the secondary, we could expect a voltage of one, and an amperage of 50 at the secondary.

To impress the relationship more clearly we can find an analogy in mechanics that is first rate. Let us belt together two pulleys, as shown in the accompanying drawing, the larger pulley to be just twice the diameter of the smaller. If a turning force of 10 pounds is applied to the large wheel, which revolves at the rate of 100 revolutions per minute, a turning force of five pounds may be had from the small wheel, but at a rate of revolution of 200 a minute. That is, of course, assuming that the belt transmits the entire energy without loss.

If we now link turning force with voltage, and revolutions with amperage, we have a parallel in the action of a transformer and the action of belted pulleys. The larger the wheel, in proportion, the greater the turning force and the lesser the speed. The greater the number of turns, the greater the voltage and the lesser the amperage; and vice versa.

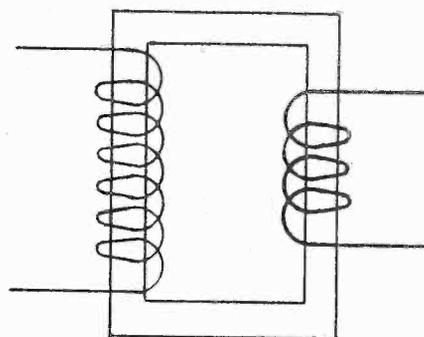
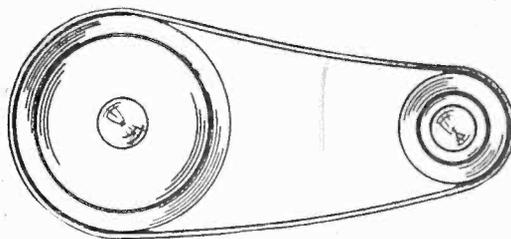
In transforming energy of any kind 100 per cent. efficiency can never be attained; and this also applies to electrical transformers. One form of loss is called copper loss, which is occasioned by the resistance of the wire. Another is core loss, or *hysteresis*, which results from the inability of the molecules of iron exactly to follow the rapid alternations of the current to which

a transformer is subjected. Ninety per cent. efficiency is considered very good in actual practice.

Transformers are usually used in receiving work in connection with vacuum tube amplifiers. They do not act as amplifiers themselves, but merely step up the voltage of the plate circuit of the preceding tube, or in some cases act simply to create two separate circuits, dividing the detector from the amplifier. Where the step-up principle is used, the increased voltage applied to the grid of the amplifier tube controls a relatively larger current in the amplifier plate circuit.

Practically the same action takes place in the radio-frequency air core transformers. Loose couplers and variocouplers are forms of air core transformers. Also, high frequency coils of the Tesla and Oudin types work on the same principle.

Larger iron core step-up transformers are used in spark transmitting stations to produce the high voltage necessary to jump the gap and charge the condensers.



Analogy between two pulley wheels of different diameters and the two coils of a transformer.

Still larger ones are used on alternating current transmission lines. By this means the voltage can be boosted and the amperage reduced with the result that a very large power can be sent out over comparatively small wires. There are step-down transformers at certain distributing centers, where the voltage may be cut and the amperage boosted for local consumption.

Step-down transformers are sometimes used in radio receiving work, to cut down the house current before going into the rectifier which supplies the current for vacuum tube filaments. Step-up transformers are used in the same manner to supply the plate current for transmitting tubes.

## Beware of Oil Cloth!

Do not use oil cloth as a covering for your radio cabinet or as a cover for the table on which the set stands. Oilcloth holds atmospheric charges and will cause numerous clicks in your set. Silk has the same properties and should not be used to clean rubber panels or cabinets. The best material for this purpose is a soft woolen rag duster or feather duster.

# Radio and the Traveler of 1930

*By Solon Crane*

**I**T is the year 1930. Our home is in New York. We are about to take a trip around the world.

There is not the usual excitement and flurry preceding the date of sailing as steamship passage, state-room accommodations and the many other attendant details have all been arranged beforehand by radio. Our passport has been secured on unusually short notice, due to verification and endorsement from Washington via the ether waves.

Wireless power transmission has been achieved. Our ship carrying us across the ocean is electrically propelled—receiving its power from a mammoth transmitter located on the mainland. We are guided safely past rocks and shoals by the warning signals sent out from radio-controlled sirens and lighthouses.

The second day at sea we receive a message stating that reservations have been made for our accommodation in a Paris hotel. The equipment of the vessel permits us to carry on telephonic conversation, en route, with friends in London, Paris, or New York. This is most convenient, as little matters of unfinished business may be consummated very satisfactorily; in many cases saving a disagreeable loss, both in time and money. The great expanse of water surrounding us does not disconnect us from the life of our home country, for news is constantly coming in over the invisible waves.

The evenings on the boat offer all the livelihood of the city and there is entertainment for all classes. To the aesthetic group comes the opera, "Pagliacci," as it is being broadcast from the Metropolitan Opera House. The young folks get the dance music from an orchestra conducted by a Vincent Lopez or a Paul Whiteman located somewhere in the Big City. The old fellows who refuse to leave their business at home stand around a horn from which pours an endless string of stock quotations and market reports. Others listen to lectures on their favorite subjects.

After passing the half-way mark on the ocean, things begin to pour in from the continent. The Europeans are wide awake regarding the possibilities of the radio-*phone* as an instrument for the dissemination of propaganda. Politics fly everywhere. Oh, what a conglomeration of jargon—English, French, German, Spanish, Russian, Greek, Italian—all trying to impress their views on the newcomers. The French conduct one commendable policy—that of offering a short speaking course in their language, for the benefit of tourists. It sounds queer to go into a room and hear a large group of people repeating, over and over, and each in his own way, "comment allez vous" "tres bien, mercie," and "Oui, monsieur," according to the instructions coming from the mouth of a tin horn.

Landing at Cherbourg, we take the first train to Paris. The trains now are not the slow, stuffy affairs of the past, but attain a truly creditable speed due to their electric motors supplied by radio power, and the air is kept in circulation by electric fans supplied from the same source.

During our stay at the French capital we have occasion to use our pocket receiving sets; and while walking the streets we can pick up time signals, announcements of the various features of current interest in the city and other reports, all being broadcast from the Eiffel Tower.

In most of the towns on the continent we notice a marked progress. This is chiefly due to the success of wireless power transmission. Electricity is found in the small hotels, and even in some of the peasants'

quarters, with its accompanying light, heated rooms and warm water.

We leave Europe for a little sight-seeing trip to Egypt. Even at Gizeh, in the shadow of the pyramids, a spot representative of silence and mystery, we are still sitting on the door-step of the world. While an aged muezzin in a towering minaret in Cairo calls the followers of his faith to prayer, we listen to the strains of a violin in the hands of a master of the period, being hurled to the extremities of space.

After a delightful trip down the Nile, we arrive at Khartoum; only to find to our dismay that we had miscalculated the expenses of the journey and are without money. A radiogram from Cairo extends our credit.

We learn that a trip down through the center of Africa, from Alexandria to Cape Town, is now perfectly safe. Radio "land-marks" have been set up at determined distances, and by the aid of a small receiving set, it is almost impossible for an explorer to get lost. However, we reserve that trip for another time, and start on our way for Suez.

The trip across the Syrian desert is no longer shrouded with terror, for the bandits are rather shy of the wirelessly equipped military airplanes that may be summoned on very short notice. So, light of heart, we take this route over to Bagdad.

Despite some modernizations, the city of the Arabian Nights has lost but little of its charm. However, the great arm of radio is in evidence. By its aid, modern entertainment is obtainable at numerous places. At one time, when listening in on our pocket receiver, we are astounded to hear a disciple of the Prophet calling the familiar "There is no God but Allah."

Proceeding on our journey we reach Bombay and go inland through the Indian jungle. One day we become separated from our guides and are apparently lost. Our pocket receivers again prove of value, for upon listening we hear the party sending instructions that will guide us to safety.

At Darjeeling we learn from returning travelers that Everest has been conquered—with the assistance of radio. Exploring and mountain climbing parties had kept in touch with each other by means of these all-pervading ether waves, and had worn electrically heated suits receiving their energy from radio power.

In China, by the messages flying through space, we learn that the nations of the world are disputing their rights to each other's claims in this country. In one province we are held, pending the radio visa of one of the consuls. The government weather reports are very useful, as the conditions at the present time are uncertain.

For several days after leaving the Hawaiian Islands the air continues to vibrate with the strumming of the ukeleles and guitars of those balmy isles.

Our ship is guided into the port of San Francisco by waves emanating from a submerged cable. Someone is taken very sick, before the boat docks, and the attention of a specialist is at once secured via radio.

After once more putting our foot on native soil we proceed by radio-controlled conductorless train to our home city, our friends learning of our arrival by radio, before the train has completed its journey.

Once more in New York, we sit down and ponder. We have travelled around the world, but our home and friends were always with us. We are now at home, but, thanks to radio, the world is at our door.

# Safety in the Use of Terminal Blocks

By Arthur S. Gordon

**W**HENEVER a panel is in danger of being overcrowded, the thing to do is to shift the battery terminals around to the rear of the receiver. This is done by employing a small strip of hard rubber or other insulating material drilled so as to take the number of binding posts necessary, which is usually four in the case of a single tube receiver and five in the case of multitube outfits. This strip is known as a "battery terminal block" and is generally screwed on the rear edge of the baseboard, either in an upright or horizontal position. It is usually upright when the instruments are not to be enclosed in a cabinet, and horizontal when they are to be so enclosed. Fig. 1 shows the two applications of the terminal block idea, A and B, the latter sketch

panel is somewhat cleared out. This shortening and separating of leads makes for greater efficiency. Moreover, the appearance of the receiver is enhanced because the battery leads approach the set from the rear, instead of from the front. Because of these points the use of the terminal block is especially recommended for amplifier units, where there is a limited panel space and where there is need for a device of this sort to lessen the chance of a wrong connection.

While on this subject of A and B battery connections, some radio enthusiasts may have noticed with surprise that some of their more advanced radio friends use three binding posts instead of four. Most hook-ups call for four binding posts, and the majority of sets use them, but as a matter of fact, only three are necessary. (See the single circuit regenerative hook-up, Fig. 2) *The extra binding post, while not needed at all,*

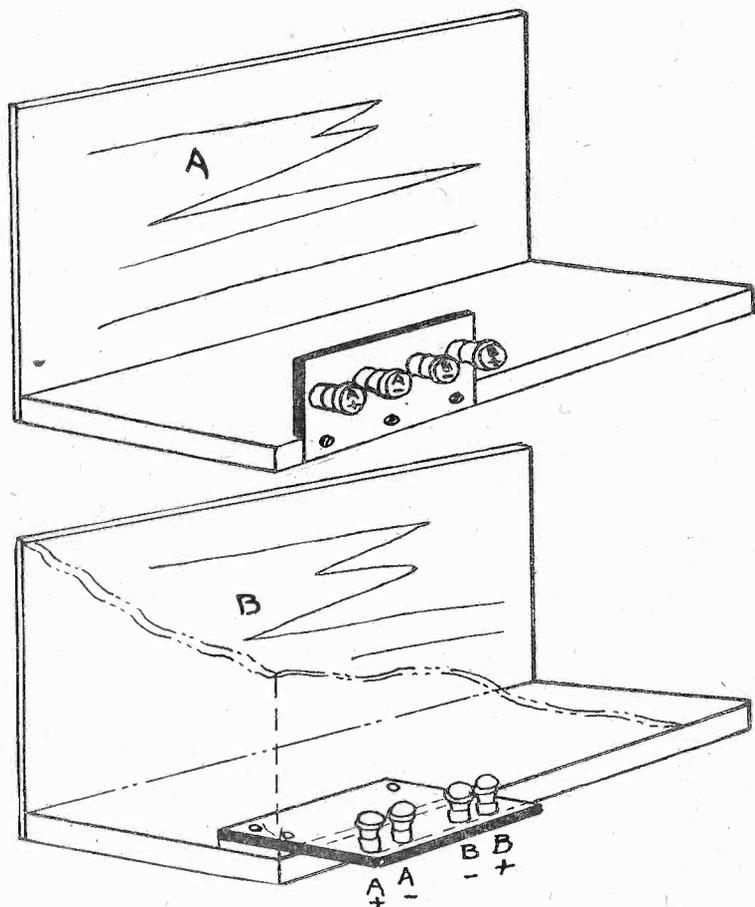


Fig. 1—Two methods of using a terminal battery block on your panel. It simplifies connections and keeps unsightly wires and connectors from the front of the panel.

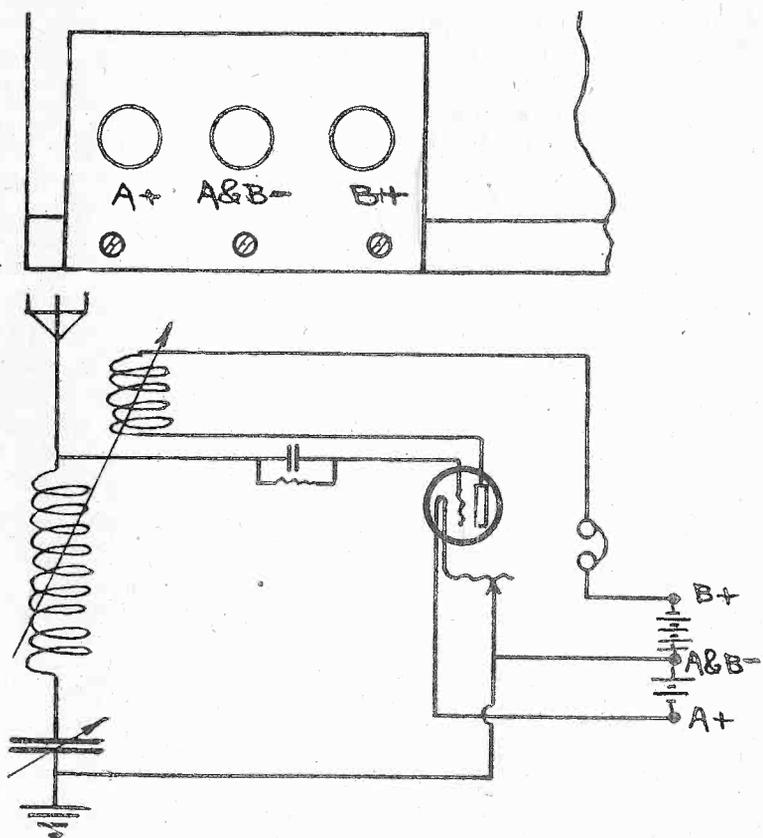


Fig. 2—Suggested method of using the terminal block. Note that one binding post serves for both the A and B minus.

also indicating the manner in which a cabinet may be built over the block.

The advantages of having the battery connections go to a terminal block in this manner are many. Not only is the panel simplified, but the task of wiring the set is made much easier. The leads are shorter, for one thing, and for another the grand mixup of wires rushing to eight terminals on the face of the

is added to minimize the chance of burning out your tube by wrongly connecting the B battery terminals to the A battery binding posts. In the case of only three binding posts, this can be done very easily by merely touching the A+ terminal with the B+ lead, provided, of course, that the rheostat is turned on. Amateurs who disregard the safety check afforded by the fourth binding post do so at a risk that most of us do not care to take.

## Watch Out!

**M**ANY constructors intend using the new U. V. 199 tubes but do not take into consideration that a six ohm rheostat will not efficiently operate these tubes. The resistance should be 30 ohms—not 6, and care should be taken that not over three dry cells in series are used.

## A Little Now and Then

**D**O not forget to occasionally oil the moving parts of your set. Shafts of the rheostats, couplers, variometers and condensers need oil, and a drop of light machine oil sometimes adds to the ease of working these parts and keeps them in good working order.

# RADIO PRIMER

## For the New Army of Radio Beginners

By Lynn Brooks

**SOLDERED CONNECTIONS:** In radio circuits all connectors should have as low resistance as possible. Therefore large sized wire is used in connecting and all connections are soldered. You not only assure yourself of low resistance joints where this is done, but you prevent any of the connections working loose or corroding.

Few people know how to solder correctly, and while it is an art in itself it is simple if it is once understood. In order to correctly work with a soldering iron, certain apparatus is necessary. The first is a well tinned soldering copper. For radio work this should be a light iron, as it is often necessary to get in small corners, and the regulation tinner's iron is incapable of doing this. Therefore if you cannot obtain an electric soldering iron, of the kind specially made for radio work provide yourself with a four ounce copper one.

The next important accessory to a successful soldered job is a good non-corrosive flux. Do not make the mistake of using an acid base flux, for if you do, it will corrode the copper wire and cause you no end of trouble. About the best flux for radio work is a resin base flux, with powdered resin as a close second choice. As the iron will have to be tinned before it will flow solder properly into a joint, it is next necessary to tin the iron. Place some of the flux, or resin on a tin plate. Heat the copper until it begins to show green flames around the edge. Do not make the mistake of

burning the iron by letting it get red hot. When it is sufficiently hot take a piece of solder (wire solder is best as it is easier to work with) and rubbing the iron gently in the flux, melt the solder and rub the iron around in it until the solder coats the surface. When all four sides of the tip of the iron have a nice coating of solder you are ready to solder any joint.

Before soldering a connection, see that all the surfaces are clean and free from any grease or dirt. It is best to scrape the surface of each piece with emery paper to make sure. Then apply a light coat of the flux. Do not use much, but just enough to allow the solder to flow freely. If too much is used it will spread and cause a dirty looking connection and dust and dirt will stick to it. Have the soldering iron hot (*not red hot*) and apply the tip of it to the joint, to allow the parts to get warm. Then still holding the iron to the joint, apply the solder. When a small amount of solder has melted and run to the joint, remove the solder and leave the iron there a few seconds until the solder runs into every crevice and a nice smooth joint is made. If the iron is not hot enough this will not happen, and a dirty lumpy joint will be the result, but never let the iron get so hot that it burns the tinned surface off.

The iron should frequently be scraped with the emery paper and retinned. A connection should never be attempted unless the surface of the iron is bright and shiny with a good coating of solder.

**SOLDERING OUTSIDE WIRES:** Where work has to be done in the open, such as soldering the outside wires of an antenna, it is best to use a gas torch and a special paste. Because of the fact that copper dissipates heat quickly, a soldering iron will not hold the heat long enough to properly solder it. Therefore make up a paste of your regular soldering paste and pour plenty of finely filed solder into it. Mix enough of this to make a thick lumpy material, and when ready, place it all around the connection and apply the heat of the torch until it melts and flows into the joint.

## Amateur Gets First News from Arctic Ship

**H**ARTFORD, Conn.—Old IZE, the amateur radio station operated by I. Vermilya of New Bedford, Mass., who is claimed to be the first transmitting amateur in the United States, was the first to receive an authentic press report from the MacMillan Arctic expedition after the schooner "Bowdoin's" departure from the Maine coast.

The previous day a personal message was sent by Donald H. Mix, radio operator on the schooner, to Mr. Vermilya, who is manager of the New England Division of the American Radio Relay League. This radiograph, telling how the New Bedford station's signals were received, read:

"We are now in Boothbay and expect to leave for Sidney. Your signals very strong, will reach Pole easy. The MacMillan Arctic ship spent the day preparing for sea, adjusting compass, lashing deck cargo, etc. Captain MacMillan expects to put out to open sea."

The first message from WNP received by any amateur station was picked up by 1CKP, at South Manchester, Conn., owned by George H. Pinney of that place and operated by Charles A. Service, assistant secretary of the A. R. R. L. Mr. Pinney was thanked for a gift of silverware.

These are two of the most powerful amateur stations in New England and both owners expect to maintain constant communication with WNP. Mr. Vermilya is so anxious to have his transmitter reach the

"Bowdoin" that he has sought permission of the management of the New Bedford hotel to erect a "super-antenna" on the roof of the building.

He maintains an experimental license, IXAL, which enables him to operate with extra high power. His station will be equipped eventually with four 250 high tubes, giving it a total power of 1,000 watts. With this outfit he believes it is an easy jump from New Bedford to the North Pole.

## New Broadcasting Stations

(Licensed Week Ending June 29, 1923.)

Call	Station	Frequency Kcys.	Wave	
			Length, Meters	Power, Watts
<i>New Class A Stations</i>				
WSAK	Daily News, The, Middleport, Ohio.	1,160	258	20
WTAB	Fall River Daily Herald, Fall River, Mass. ....	1,210	248	10
KFHS	Nelson, Robert Washington, Hutchinson, Kan. ....	1,310	229	50
WHAR	Paramount Radio & Elect. Co., Atlantic City, N. J. ....	1,300	231	15
<i>Transferred from Class C to Class A</i>				
KRE	Berkeley Daily Gazette, Berkeley, Cal. ....	1,080	278	50
WKAR	Michigan Agricultural College, East Lansing, Mich. ....	1,070	280	100
XFAR	Studio Lighting Service Co., Hollywood, Cal. ....	1,070	280	200

# RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY  
PHRASED FOR OUR BUSY READERS

Major General James G. Harbord, president of the Radio Corporation of America, sailed for France last week on the "Paris."

The maximum daily light requirement of an average American home is 460 candles, or eighteen times that of a century ago, and the cost is only two-thirds of what it was then.—*Floyd W. Parsons.*

Increases in wages of deck and engineer officers, radio operators and members of the stewards' department on Shipping

## General Gouraud Addresses America Over Radio



(C. Photonews)

General Gouraud, the one-armed hero of France, who recently spoke to the radio audience through Station WJY, from the 69th Regiment Armory, New York City, where he reviewed the veterans of the Rainbow Division. As the General does not speak English, it was necessary for his aide-de-camp to translate the speech. The General was amazed at the enormous strides we have taken in radio, and was duly impressed when told that hundreds of thousands of unseen but intent listeners were hearing his praise of the American troops that were under his command during the war.

Board vessels ranging from \$7 to \$20 a month are announced by Vice-Chairman T. V. O'Connor of the board. The increases are effective immediately.

Every up-to-date ship in the bootlegging fleet in "rum row," off the New Jersey and Long Island shores, is said to be equipped with a wireless set, which is used for both entertainment and business purposes.

The recent radio fair held in Mexico City aroused considerable interest, and there has been an increase in sales of radio telephone apparatus. Some low-priced German equipment is now coming on the market, the Department of Commerce has been advised.

David Sarnoff, vice-president and general manager of the Radio Corporation of America, is famous as the man who, eleven years ago, received in New York, from the S.S. "Olympic," 1,400 miles at sea, the message confirming the sinking of the S.S. "Titanic."

The Shipping Board receiving station at London reports that, for the past two years, they have had much heavier static in winter than in summer, and that, although heavy static has been experienced during the past winter, receiving conditions have now greatly improved.

Radio and the phonograph are not really competitors, but complement each other in the public's purchasing mind, according to a phonograph sales manager. He claims that neither is a substitute for the other as far as public or household entertainment is concerned. In the case of a prominent after-dinner speaker the phonograph will not enable the public to hear him, but radio will. If a musical composition by a favorite performer is desired at a specific time the phonograph record is ready to reproduce it. The sales manager says his company is erecting a new record-making building, which he hopes will enable him to catch up with his demands.

Radio communication between Singapore and Christmas Island was established recently, a report to the State Department advises.

During a single day, May 25, 1923, the Navy Department Communication Office handled a total of 858 messages. This was the "high mark" in two years' service.

The United States has in nightly service nearly twice as many electric lights as the people of the next seven most important countries combined, according to the New York State Committee on Public Utility Information.

Henry A. Stone, of Roselle Park, N. J., since 1909 chief electrician of the New York Stock Exchange, died last week in the Bonnie Burn Sanitarium at Scotch Plains, N. J., aged 57. He was one of Edison's early electrical lieutenants.

Arthur T. Nelson, commissioner of the Missouri Board of Agriculture, informs RADIO WORLD that Station WOS, owned by the state of Missouri and operated by the State Marketing Bureau, Jefferson City, Mo., has changed its wave length from 360 to 441 meters, or 680 kilocycles. The station's slogan is "Watch Our State."

Leonard E. Curtis died at his home at Colorado Springs, Colo., last week at the age of 75. He was born at Norwalk, Ohio; was graduated at Yale College and practiced law in New York City till 1896, when he removed to Colorado. He was distinguished as an electrician. He was author of a volume of world-wide travel and reminiscences of Edison, the Maxims, Westinghouses, Tesla, and other electrical notables.

James H. McGraw, president of the McGraw-Hill Company, publishers of New York City, has presented to Princeton University a valuable library of 3,000 volumes on the French Revolution. The books were assembled by the late William D. Weaver, of Charlottesville, Va., a naval and electrical engineer who was for many years editor of the *Electrical World*. In making the donation Mr. McGraw said that he was prompted by his high regard for Mr. Weaver and "to show my appreciation of what Princeton University has done for the higher education of young men of our time, including three of my own sons."

## Radio Public Hears President Harding's St. Louis Speech

Last week the entire country was enabled to be a part of the vast audience that heard President Harding speak from the St. Louis Post Dispatch Radio Station KSD. Whereas you formerly had to wait for the papers and despatches in order to keep in touch with the activities of the President, you now can be right at his elbow by means of your radio set. Never before has the President been able to keep in such personal contact with the people of this nation as since the advent of radio. The illustration shows President Harding standing beside the two microphones that picked up his every word that it might be heard in the four corners of the United States.





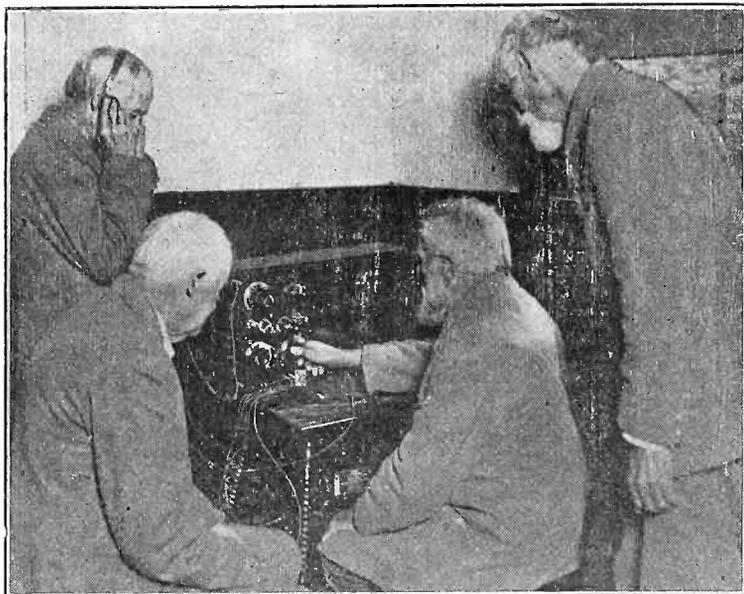
(C. Kadel and Herbert)

There are two ways of taking golf lessons, it would seem. One is by quite expensive instruction and the other method is by radio. The illustration shows three fair exponents of the game learning the gentle art of putting by means of a local broadcasting station and professional golfer, who is giving instructions via the ether waves. Wonder if instructions are necessary as to what to say when you muff one?



(C. Kadel and Herbert)

Many broadcast listeners will remember old Station WDT, the broadcast station of the Ship Owners' Radio Service. The illustration shows the new transmitter that is being used since the station has reopened and is operating on its new wave length. With the new equipment, this station radiates over ten amperes and is expected to establish some new distance records.



(C. Acme Service)

It was a great day for these grizzled Confederate Veterans when they were able to hear the decoration day services that were broadcast over Station WSB, the Atlanta "Journal's" broadcasting station. These old war horses were given a brand new radio set and shown how to operate it, and the first program that they tuned in was the reunion services from that famous Southern station.

## Two Kinds of Other New

*Captions by Rob*

## Winners of Non-Stop



(C. Kadel and Herbert)

Two entrants in the non-stop six-day radio golf contest tuning in KY members of a local radio club on

**R**ADIO fans who boast of their ability to get the distant stations will have to go some to beat the record of the team that won the six-day non-stop golf contest held by members of a girls' club in New York City. Working in relays for six days and nights these girls picked up every powerful broadcasting station in the United States, and heard and recorded every radio district. The total mileage was 132,000 miles, or 68,000 miles better than their nearest competitors.

Three sets were used in this work; a three-circuit regenerative, a radio-frequency set, and a neutrodyne receiver. The club announced the contest several weeks before the event, and by constant listening and careful tuning heard

# Radio Golf and vs Pictures

by L. Dougherty

## Radio Golf Contest

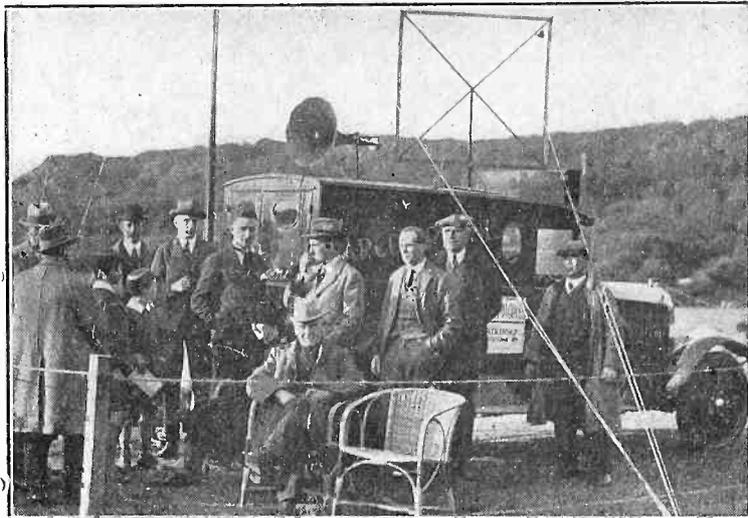


during the last few hours of the contest. The contestants are both  
Washington Heights, New York City.

stations that it was considered impossible for fans on the east coast to hear.

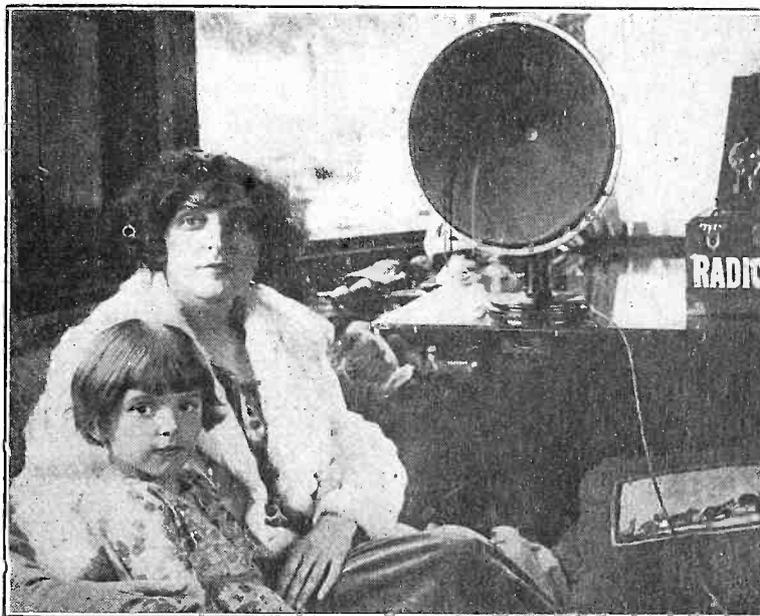
As every contest nowadays seems to run along the lines of endurance, it is not impossible for this record to be beat if you possess the "stick-to-it-iveness" necessary, but you must not record a station more than once, and even at that you will have to go some to beat the record of these feminine enthusiasts.

Now, Radio Golf Hounds, come on in and see if you can't give these girls a run for their money. Let some of you that have been asking about super-regenerative and six-tube radio-frequency amplifiers see if you can't make them step. It sounds pretty hard, but if they could do it, you can, too; so go to it and "let 'er rip."



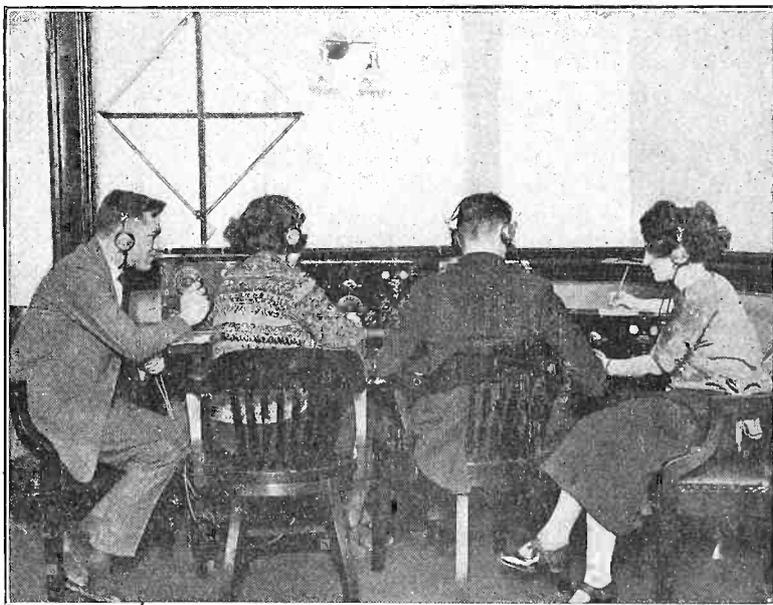
(C. Topical Press)

In order to popularize radio in England, the Marconi Company of Great Britain has equipped several motor cars with broadcasting equipment and is touring the countryside showing the people how easy it is to receive broadcast programs. The photograph shows one of the cars located at Peasholm Park, Scarborough, England, with an interested audience listening to the program on a loop receiver.



(C. Kadel and Herbert)

Mme. Marguerite Namara, American opera star, and her six-year-old daughter, who are touring France in a motor bungalow, listening to a radio program while traveling in their luxurious motor car. A loop antenna is used with a set using radio-frequency amplification and wonderful results are possible with this type of apparatus. Radio equipment is only one of the modern luxuries of this wonderful traveling home, which is as fully equipped as any modern bungalow.



(C. Kadel and Herbert)

The Federal Telephone and Telegraph Company staged a novel radio golf contest between employees of their several offices. Using the various types of sets that the company makes the employees set about to get the most stations. The contest was limited to one hour, and the winner was J. B. Ritchey, 90 Alexander Square, Newark, N. J., who won by copying 28 stations with a total mileage of 3,800 miles. Mr. Ritchey, the winner, is the man with the dark suit.

# Paris Has Boulevard Radio Concerts

By Carl H. Butman

THE well-known Parisian daily, *Le Matin*, is operating a concert radio receiving set in front of its office on a popular boulevard, where crowds gather to listen to news, concerts and statistics from fourteen amplifying horns. The amplifiers are sufficiently loud to be heard over the terrific traffic noises, Consul Ives reports from Paris.

The public listening-in station was installed by the Societé Francais Radio Electrique which broadcasts two concerts daily on 1,780 meters. Other broadcasting is done by the Eiffel Tower on 2,600 meters, and the Superior School of the Telegraph and Telephone Service of the Government on 450 meters.

No provision for a royalty to broadcasters has been made in France, beyond the payment of an annual fee of ten francs to the French Postal Service by owners of wireless receiving sets. The Eiffel Tower radiations are sent out for the general public, and the Superior School broadcasts are carried on in the interest of education and experimentation. The Societé Francais Radio Electrique, however, states that it obtains its

remuneration by the sale of the Radiola receiving sets adapted to the broadcasting system used by the Societé, explaining that in order to receive its wireless concerts properly it is essential that a Radiola set be used. The assertions of the company are borne out by private set owners who say that other receiving sets are unsuitable for the company's broadcasts, concerts being heard very indistinctly with other sets if at all.

Listening-in is becoming popular in France, it is reported, although not as extensively as in the United States. Anyone may own a receiving set there, but transmitting outfits must be licensed by the Government. French receiving sets are advertised for sale as low as 250 francs each. No specific import duties are prescribed for complete radio receiving sets, but the different parts are dutiable separately.

Most of the French broadcasts are on long wave lengths, except those of the Superior School. It was learned recently, however, that the French military authorities are experimenting in broadcasting on the 45 meter wave.

## Summer Tips to Summer Fans—No. II

By R. L. Dougherty

Another little point that will cause no end of trouble to the inexperienced fan who is radiovacationing is the dew. This is not meant as a pun or joke. A heavy fall of dew in the evening can practically ruin the receiving range of a receiver. The dampness will soak through the set and form numerous little short circuits. It will collect on the panel, between the switch points, on the coils of the rheostat, around the grid leak, and in fact every place that it is possible. Make sure when you take the set away with you that you have ample facilities to keep it dry. A good heavy cover the inside edge of which is lined with felt or rubber will suffice—if the cover is clamped on when the set is not in use. The dew will also spread over the insulators and coat them with a goodly layer of moisture which will short the insulator and you will be surprised when you find that your set will lose its sensitivity in the late evenings, just when the good programs start. In order to overcome this bugbear it is well to coat the insulators with paraffine, or even to shield them if they are strung in such a manner that they can be shielded. Good heavy wrapping paper dipped in oil or paraffine, formed into a tent-like shape and hung over the insulator will keep the insulator dry and serviceable, even through a heavy rain. When shielding it do not make the mistake of using something for a shield that will short the antenna itself. Tin or metal should not be used. Don't run your antenna through leafy trees or foliage.

As a hint to fans who take away crystal sets it will be well to caution them to carry plenty of spare crystals that have been tested for sensitivity, as well as an extra set of catwhiskers. While on the matter of crystal sets it would be well to tell the crystal fan to lightly oil all moving parts, such as sliders, with a good watch oil or sewing machine oil. Don't bathe the parts with it, but just use enough to keep them lightly lubricated and keep them from corroding or rusting.

One of the important details in a set is cleanliness, and this should not be neglected in the set that you take on your vacation. Dust will collect easier on a portable set in the country than on one that is left on the table and constantly cleaned. Do not let dust collect between switch points, binding posts or any other place. A light brushing every morning or evening with a fine brush will keep your set clean and you will not be hunting for trouble.

Finally, as an added caution if you intend taking a tube set with you it will be well to provide some method of keeping the tube safe. A box lined with cotton, and the tube carefully placed in this is the safest method, unless you desire to "chaw up the atmosphere" after a hike or ride when you find that your tube is "gone galley west." In line with this, it would also be well to incorporate an extra dry cell and small B battery as reserve supplies. Strange things happen to batteries in different climates, and in places like the seashore or mountains when it is extremely warm or hot in the day and cool in the evening you are liable to find your batteries die on you very quickly, or else they will get lumpy and "start shootin'" out of the cover. If you have an extra on hand which you have kept dry you will not have to miss an evening's fun just because you have to send to the city or the nearest town for a new one.

### Newsdealers, Attention!

Many newsdealers have found that there is a constant demand for back numbers of RADIO WORLD. If you have a copy or two of current issues over from week to week, keep them in stock and you will find that your customers will want them.

Back numbers of RADIO WORLD contain a wealth of information for everybody interested in radio.

# Latest Radio Patents

## Ringling Over Multiplex Transmission Channels

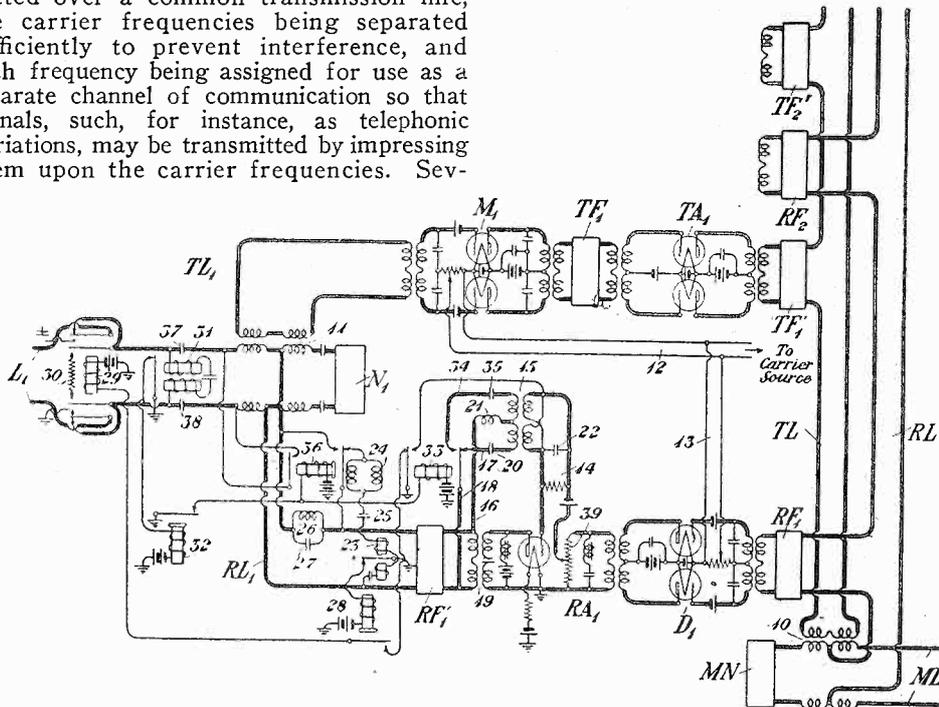
No. 1,454,159: Patented May 8, 1923. Patentee: L. Espenschied, Queens, N. Y.

This invention relates to transmission systems and more particularly to multiplex transmission systems employing carrier currents. The present application is a continuation as to common subject matter of applicant's prior application, Serial No. 314,074, filed July 29, 1919.

Where multiplex transmission is attained by the use of carrier currents a plurality of carrier frequencies are transmitted over a common transmission line, the carrier frequencies being separated sufficiently to prevent interference, and each frequency being assigned for use as a separate channel of communication so that signals, such, for instance, as telephonic variations, may be transmitted by impressing them upon the carrier frequencies. Sev-

for the purpose of signaling between operators in establishing connections. In order to obtain practical telephone service over each carrier communication channel, it is desirable that the channel be utilized for the transmission of such ringing or other signaling currents as well as for the transmission of ordinary telephone currents.

This invention, therefore, concerns means whereby ringing and other signals may be



Espenschied's method of duplex telephone transmission.

eral channels may thus be superposed upon a common transmission line and each channel performs the functions of an ordinary telephone transmission line.

In ordinary telephone transmission it is customary to transmit over the line, in addition to the telephone currents, ringing currents or other signaling currents,

transmitted for each carrier channel.

The invention likewise has reference to the provision of a transmission system having included therein a vacuum tube which normally acts to produce one desired result, but which under other conditions, operates as a generator of oscillations.

## Energization and Control of Vacuum Tubes

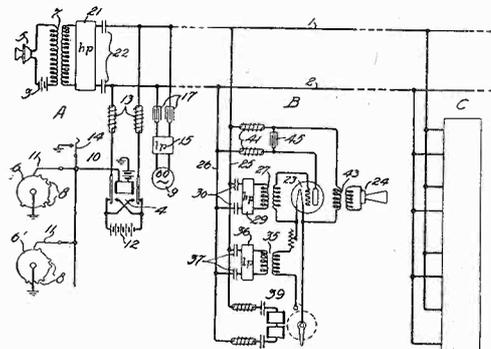
No. 1,456,520: Patented May 29, 1923. Patentee: Herbert E. Shreeve, Wyoming, N. J.

THIS invention relates to the control and energization of vacuum tube amplifiers, and aims to economically effect such control and energization from a distance.

Any or all of the quantities (a) input electro-motive force for the tubes, (b) plate current, and (c) filament current, may be supplied from a point remote from the tubes over a wire system being simultaneously used for intelligence communication purposes; and the amplifiers may, if desired, be selectively rendered operative and inoperative by means of impulse selectors or the like controlled over the same wire system.

The invention is especially useful in selective signaling systems, such, for instance, as train despatching systems employing loudspeakers at various stations along the right of way, and is disclosed hereinafter with

particular reference to such systems. However, the invention obviously may be employed in connection with other systems



Method whereby filament and plate current can be transmitted from a distant source.

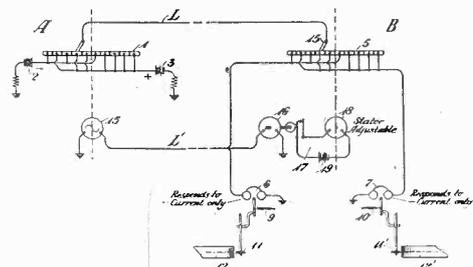
where distant control or energization of vacuum tubes is desirable without departing from the spirit of the invention or the scope of the appended claims.

With a large number of stations distributed over a long railway line, to supply batteries at the stations for energizing the amplifiers would be unduly expensive, especially since there are ordinarily no battery charging plants at the stations. According to this invention the undue expense is obviated by supplying energy to a number of such tubes from a distance, and using the signaling wires along the right of way to transmit this energy. Further, in accordance with the invention, the operation of the tubes is controlled from a distance by selectively controlling the filament current of the tubes, for instance, and the signaling wires along the right of way are employed for effecting this control.

## System for Measuring Distortion

No. 1,455,843: Patented May 22, 1923. Patentee: Maclean Kirkwood, East Orange, N. J.

THIS invention relates to telegraph systems and more particularly to the measurement of the distortion in telegraph signals due to the transmission over the line. Heretofore it has been cus-



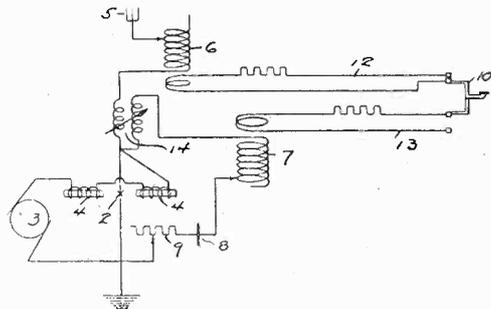
System by which it is possible to visibly measure distortion in telephone and radio signals.

tomary to judge the quality of telegraph signals by ear, an expert operator being able to distinguish between good and "clippy" or "heavy" signals; but the results of such tests are uncertain and unsatisfactory. It has also been proposed to make a record of the undistorted signal as sent out and a record of the distorted signal as received and to compute the distortion by comparing the lengths of corresponding spacing or marking impulses. It is the object of the present invention to provide means for indicating directly the distortion itself.

## Radiotelegraphy

No. 1,454,630: Patented May 8, 1923. Patentee: H. F. Elliott, Palo Alto, Cal.

The invention relates to radio telegraphy signalling systems and particularly to single wave signalling systems, in which the source of oscillations is connected to the antenna circuit and to a local oscillating circuit, the electrical constants of the two circuits being such that the oscillations may be caused to prefer



New system for the control of local oscillations.

one circuit to the practical neglect of the other. Systems of this nature are particularly advantageous in continuous undamped wave signalling, in which the source of oscillations is an arc or other continuous undamped wave generator.

# Answers to Readers of Radio World

Can Erla radio-frequency transformers be used in a two-tube reflex circuit in conjunction with Jefferson audio-frequency transformers? My set uses these transformers, and I get nothing but loud beat notes and squeals. Can the use of definite transformers cause this?—Jules F. Lavalette, Box 287, Lenox, Mass.

These transformers (both audio and radio) can successfully be used in reflex circuits. Be sure that you have the right connections, and that your transformers do not interfere with one another. A method of preventing this interstage coupling is to separate them a sufficient distance and, if possible, shield them by means of foil or screening. In the audio-frequency transformers it is sometimes helpful to ground the cores of each transformer to the ground post, but extreme care should be taken first in finding out whether the cores of the transformers are not used to make one of the connections. Go over your connections very carefully and make sure of all of them. In reflex circuit construction it is best to solder each connection.

\* \* \*

Will the circuit shown in the January 20 issue by Arthur Gordon work a loud-speaker? Can a Flewelling circuit be made with two steps of audio-frequency amplification, and where can I obtain the circuit diagram for the additional two steps? I have been thinking of trying the G. W. May circuit, in the February 17 issue. Can that circuit be accommodated to a loud-speaker?—G. W. Archer, Tabernash, Colo.

If you add two steps, or one step and a power amplifier, to these circuits they will all operate a loud-speaker. A suitable two-stage audio-frequency diagram for all of them appeared in RADIO WORLD for March 31 in answer to a question similar to yours. If the circuit is to be used with anything but a Flewelling it will be necessary to remove the grid leak that is hooked across the primary of the first transformer. If you desire to construct a power amplifier we refer you to RADIO WORLD for June 9, where you will find a suitable description and diagram by C. White, consulting engineer. This power amplifier, in conjunction with one stage of straight amplification, will allow tremendous amplification, and will suit your needs.

\* \* \*

In the use of a loop antenna, is it possible to tune out two stations when they are both on the same wave length? Will a loop antenna work on a crystal detector and one stage of audio-frequency amplification?—C. J. Dickenson, West New York, N. J.

When two stations are on exactly the same wave length it is not possible to tune either one out and get the other without interference. It is generally the case that, if the set is detuned a bit, or the loop turned at right angles and the set manipulated correctly, the stronger station will be heard the clearest; but the elimination of the other station entirely is impossible. It is not advisable to use a loop antenna on a crystal set as the results are so poor that it is just wasted energy in putting it up.

\* \* \*

Kindly inform me where the transformer T2 shown in RADIO WORLD for Feb. 27, in connection with the power amplifier of C. White, may be purchased.—E. K. Seibel, 317 Broadway, Hannibal, Mo.

Address a letter to the writer of the article, care of RADIO WORLD and re-state your question.

I have constructed a three circuit Armstrong regenerative set with two steps of audio-frequency amplification. I am continually bothered with a squeal. The apparatus is laid out as shown in the accompanying sketch. I do not have to throw the antenna switch to get the squeal started, as all that is necessary is to turn on the tubes. The detector and one step works quite well, but I cannot get any results out of the second stage.—Donald Edwards, Box 12, Callicoon, New York.

From your description and the sketch it is very easily seen that your transformers are entirely too close. There should be quite a bit of space between the first and second stage transformers and they should be placed at right angles. You state that you placed them close to save space. This is wrong. Suggest that you separate them at least six inches and place them at right angles. The trouble you are experiencing is due to magnetic coupling between the transformers. The trouble you notice when you place your plate variometer at zero is due to the fact that the set is oscillating. This will cause a howl because the set is tuned wrong. Re-wire your amplifying circuits and run your leads so that those of the first and second stages do not interfere, or run parallel for any distance. If possible it is good practice to ground the core of the second stage. When doing this, be careful that the metallic part of the core is not used as a connector for some part of the winding.

\* \* \*

Kindly explain how I can use the outside light wires as antenna. I notice that the Flewelling published in RADIO WORLD is different from one that I saw in another publication. Yours uses three condensers and the other one called the "Flivver" used but one. Which is the best?—Geo. Read, 1224 Plainfield Ave., Grand Rapids, Mich.

It is never advisable to use outdoor light wires as antenna. Where lighting wires are strung on poles, it is always best to leave them alone. They may be high tension and serious injury if not death will ensue if they are tampered with. Run your antenna away from them and take care that your antenna does not cross them. The circuit you mention is an adaptation of the original Flewelling as published in RADIO WORLD. It has been found that the circuit will function without the bank of three condensers, although not as much volume will be produced.

\* \* \*

Would the U. V. 201A tubes work as efficiently as the U. V. 199 in the Grimes inverse duplex circuit? Where can I get a blue print of this set in order to enable me to build it?—F. H. Gripp, Penokee, Kan.

These tubes will work in the circuit you mention. We do not carry blue prints of circuits or panel layouts. You do not need blue prints to build this set. Follow the diagram and plan your own panel layout. Care should be taken, however, to see that it is done correctly or the good results possible with this circuit will not be obtained. Follow the diagram exactly.

\* \* \*

I would like to know if I need a permit to operate the combined receiver and transmitter as shown in the accompanying sketch.—Jos. Rossi, 302 West 55th St., New York City.

A license is required for any transmitting station and you will have to obtain a license before you can operate such a set.

Will a WD-11 tube operate on a loop antenna in a house? Will it operate on a light socket antenna? Would there be any advantage gained in the use of both of them together? Kindly inform me of a good audio-frequency transformer to cost around \$5.00. What size and how much wire should wind on a good home-made loop?—A Constant Reader, 242 Mountain St., Montreal, Canada.

With a properly designed circuit it is possible to get a WD-11 tube to work on either a light socket antenna or a loop. A single tube reflex circuit with crystal detector is best adapted for this purpose. There would not be any decided advantage gained in the use of both together. See our advertising columns. There are several advertised. We cannot give the name of any make of competitive apparatus through this column. For the construction of a homemade loop about 10 turns of either stranded light cable, or No. 18 wire on a three-foot square frame will do for broadcast work.

\* \* \*

Can I construct the power amplifier described by C. White in RADIO WORLD for June 9, by the use of regular audio-frequency transformers hooked up as per sketch? If possible should I use the ratio as shown in the sketch? (Two low ratio and two high ratio). Can a Ford ignition coil be used for the purpose?—Edward H. Bitner, 1510 Catherine St., Harrisburg, Pa.

It is impossible for you to use transformers for such a purpose as you suggest. The transformer which has to be used is a special transformer made especially for that purpose, and the use of any other type will not be satisfactory. If you attempt to use two transformers hooked in series as shown you will generate a double frequency which will cause terrible howling, as the two transformers will virtually buck each other.

\* \* \*

I have the three circuit regenerative set as shown by the enclosed diagram. I cannot get any distance out of it, and it does not give me very good volume. The furthest station that I have received as yet is KDKA, and I have a hard time getting that. What can I do to improve my set?—Leslie Baverstock, 654 Humboldt St., Brooklyn, New York.

The three circuit regenerative set is somewhat tricky to manipulate and it is best to get thoroughly acquainted with it before trying for distance. You might put a 23 plate condenser in your secondary circuit which will help your selectivity somewhat. Outside of that there is nothing that can be done but getting used to the control and tuning of it. Make sure of your connections, and see that they do not run too far parallel, and that they cross at right angles.

\* \* \*

I recently purchased a set incorporating what was said to be a "German Mercury" tube. After about a week of use the tube did not work, although it lights very bright. Can anything be done to restore the sensitivity of the tube?—Carl Spangerberger, Woodstock Manor, Kansas City, Mo.

We have no knowledge of the tube you mention. If it is a make of tube imported, we advise you to get in touch with the party who sold it to you and make your report. There is no reason for a tube to stop rectifying as long as the tube lights up, unless you have injured the plate or grid by rough usage.

# An Extremely Selective Single Circuit One Tube Set

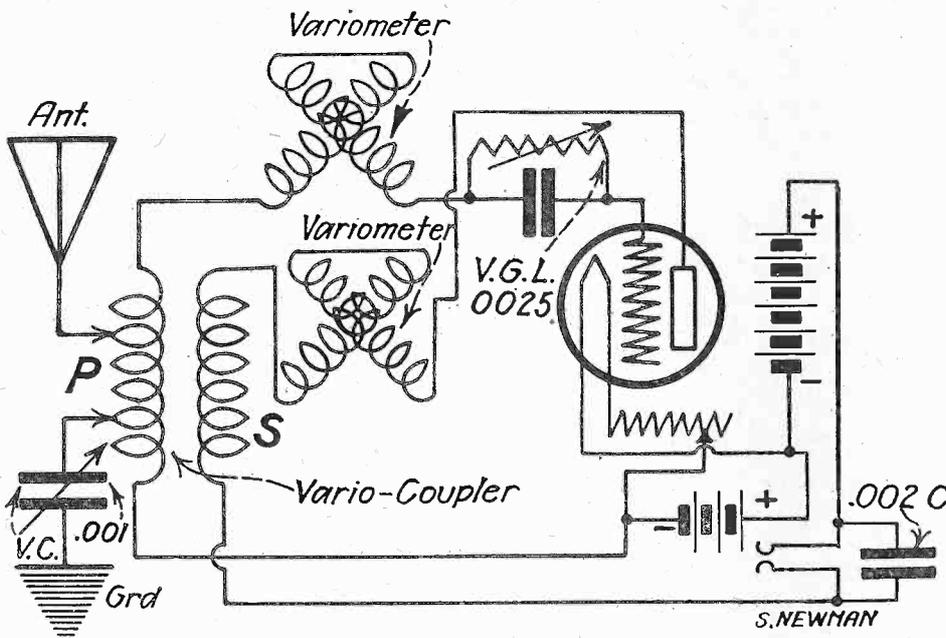
By A. Clapholtz

SINCE the allocation of new wave lengths in broadcasting, the interference between different stations has been almost entirely eliminated. At the same time there are a lot of single circuit receivers that are still bothered with interference. Owing one myself, and being able to hear the powerful broadcaster WEAJ over the whole range of my coupler on account of the fact that I live but a half mile from that station, and desiring to tune him out, I tried to develop a single circuit regenerative tuner that would enable me to get DX and at the same time hold the volume of the original circuit.

With this point in mind I thought of combining the three circuit and the single circuit, using the selectivity of the triple circuit and the volume of the single

point, and the music will be heard nice and loud, without any interference from any station. I can listen to WGY and not be bothered by any interference once the set is properly tuned, and because of the fact that the rotor of the coupler does not have to be bothered with much, the tuning is practically all done with the plate and grid variometers.

A word about capacity effects on this set would not be amiss. When shielding this set, I have found that better results have been obtained by grounding the shielding to the minus side of the A battery. The set should be shielded with either copper foil or gauze, because it is much easier to obtain good contact on copper than tin foil as tin foil corrodes quicker and good contact is harder to make.



Extremely selective circuit as described by A. Clapholtz.

circuit. I finally hit on the circuit described, and if a fan wants real selectivity and volume on one tube, the added expense of rebuilding his single circuit will be amply repaid the first time he turns on his tube and tunes in. For selectivity it can't be beat.

The only changes that will have to be made in any single circuit receiver that uses the rotor of a coupler as a tickler, will be to add two variometers, one in the grid circuit and one in the plate circuit.

The only change that will be noticed is the manner in which the set will be tuned. In tuning in a station with this new variometer single circuit, both variometers are placed at 100, and the rotor of the coupler turned to about 35 or 40. At this point, a squeal will be heard in the phones, and the grid leak is here used to diminish the squeal. When it is done, leave it alone, because the grid is then set, and does not need to be touched any more. Then setting the primary circuit into approximate resonance with the station desired (you can use the same setting that you do when using the regulation single circuit), rotate the plate variometer until the carrier wave of the station is heard. You will hear two squeals. It is directly between these two that the station is. When you have your receiver quiet, except for a frying spatter resembling fat in a pan, turn the plate variometer until it snaps out with a click. Then go back with the plate variometer and tune in until it is just below this

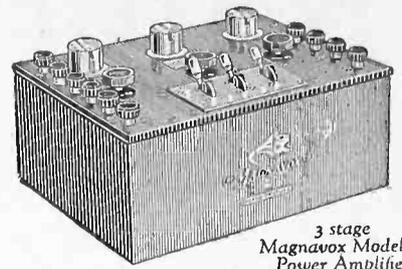
## Spread of Religion by Radio

SCHENECTADY clergymen whose services have been broadcast now look upon the radio station as a powerful gospel missionary. Words spoken in a church in the presence of a small group of people are given wings and travel to thousands of homes reaching the aged and the infirm and many who, but for the radio, would not hear a church service. Village churches, locked because of a shortage of ministers or inability to provide for a pastor regularly, now open their doors and the congregation worship with the Schenectady church membership via radio.

After every service letters reach the pastor from all parts of the country. One clergyman was recently told of two elderly women, too feeble to go to church, who dress each Sunday in their best finery and sit at their radio set, hats and gloves on, and devoutly listen to the service. During the scripture reading they follow the pastor in their Bibles and at the offertory they solemnly place a modest offering in a plate at their side. At the end of the service the money is sent to the pastor who has been speaking to them.

A lumberjack recently wrote one of the Schenectady ministers that he had heard a church service for the first time in eleven years, and that it had taken him back to his "Sunday School days."

**MAGNAVOX**  
Radio Products



3 stage  
Magnavox Model C  
Power Amplifier

## The Power Amplifier for your Magnavox Reproducer

The Magnavox Power Amplifier Model C, as illustrated, is a true Power Amplifier, and free from elements of distortion.

Switching from stage to stage is made easy by master switches. Any standard amplifying tube can be used.

Without Magnavox equipment, no Radio receiving set is complete.

**Magnavox R3 Reproducer and 2 stage Power Amplifier . . . \$90.00**

**R2 Magnavox Reproducer with 18-inch curvex horn: the utmost in amplifying power; requires only .6 of an ampere for the field . . . \$60.00**

**R3 Magnavox Reproducer with 14-inch curvex horn: ideal for homes, offices, etc. . . \$35.00**

**Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Reproducer.**

**AC-2-C, 2-stage, \$55.00**

**AC-3-C, 3-stage, \$75.00**

*Magnavox Radio products can be had of good dealers everywhere. Write for copy of our new booklet.*

**The Magnavox Co.**

Oakland, California

New York Office: 370 Seventh Avenue

THE RADIO BUSINESS IS GETTING INTO FINE SHAPE. AS FORBES SAYS: "THE BEST STEEL IS THAT WHICH HAS UNDERGONE THE HARDEST POUNDING."

# Radio Merchandising

Advertising Rates: Display, \$5.00 an inch, \$150.00 a page. Classified Quick-Action Advertising, 5 cents a word.

Telephone Bryant 4796

## Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

- W. H. Harmon, State Highway Dept., University of Tennessee, Knoxville, Tenn.  
 William J. Abele, 72 Alden Ave., Pittsfield, Mass.  
 C. M. Pinkerton, Radio Doctor, Box 103, Guthrie, Oklahoma. (Repairs and sells sets, supplies parts.)  
 C. G. Boyles, Box 288, Bellwood, Pa. (Retailer.)  
 H. B. Mockler, Colerain, Mass.  
 A. Browne, 3 W. 104th St., N. Y. C.  
 B. Hennessy, 30 5th Ave., New Rochelle, N. Y.  
 Richard B. Wilbur, P. O. Box 564, Peabody, Kansas.  
 A. J. Ingalls, North Granville, N. Y. (Radio supplies.)  
 E. Martineau, 334 Topping St., St. Paul, Minn.  
 John F. McManus, Haswell Park, Middleton, Mass. (Assembles sets for sale.)  
 Leon Pelcher, Jr., 230 Jackson Ave., Mineola, N. Y. (Wants names of firms that sell radio sets on weekly payments.)  
 Shirley I. Burke, 205 Bowers St., Jersey City, N. J.  
 Geo. M. Williams, Alverda, Pa.  
 Ernest C. Mohler, Whitewood, S. D.  
 Michael C. Quinn, 103 Rockland St., New Bedford, Mass.  
 W. N. McKee, Jr., Matthews, N. C.  
 Carl Fehr, 2506 N. Anthony St., Ft. Wayne, Ind.  
 J. B. Jamison, Radioman S. S. "M. A. Reeb," care Marine Post Office, Detroit, Mich.  
 H. Page Bailey, 646 West 9th St., Riverside, Cal.  
 I. H. Byrne, 330 Clementina St., San Francisco, Cal. (In market for reliable receiver.)  
 R. E. Schwartz, 206 Lake St., Buchanan, Michigan. (Dealer.)  
 Roselle Mfg. Co., radio apparatus, 215 Ninth Ave., Roselle, N. J.  
 Geo. Ennis, 183½ South Fitzhugh St. Rochester, N. Y.  
 M. & M. Electric Mfg. Co., radio apparatus, 5515 Spruce St., Philadelphia, Pa. (Make only high class sets.)  
 Joseph L. Sweeney, 26 Burgess St., Providence, R. I. (Wants a 10 ohm rheostat.)  
 E. C. Pumphrey, 2410 Olive St., Texarkana, Ark.  
 Walter Deming, High School, Belding, Mich.  
 Carl A. Schull, R. R., care of Tom Hicks, Mapleton, Minn.  
 Dunlap Tire Co., 95 Fourth St., Pratt City, Ala. (Dealer.)

## Ford Building Big Broadcast-Station

A PRESS dispatch from Detroit says that at Dearborn, Mich., the largest radio broadcasting station in the world is being erected.

Henry Ford, still declining to parley with Ford-for-President clubs beyond formal acknowledgment of their letters, and put into a bad humor by newspaper stories of the boom, has made up his mind, it is understood, to talk straight to the American people in the future.

A well-defined report has it that Mr. Ford is going to put up a new kind of Presidential campaign. He is not going to tour the country and make speeches or give interviews in the newspapers. He is going to use the air instead of special trains and printing presses, so it is said.

His radio broadcasting station will put him in direct touch with every part of the country, and he will tell the voters himself, the report continues, when the great moment arrives. From then on he is expected to wage his battle for the Presidency by wireless.

## Westinghouse Wins Over De Forest—Latter Guilty of Contempt of Court

IN a decree recently handed down by the United States District Court of the Southern District of New York the De Forest Radio Telephone and Telegraph Company was found to have been guilty of contempt of court in further infringement of the Armstrong regenerative patent. This decree is as follows:

1. That the De Forest Radio Telephone and Telegraph Company, the defendant herein, has been guilty of contempt of court in that it, after due notice of the injunction herein of May 27, 1921, prohibiting infringement of the Armstrong Patent No. 1,113,149, has committed, without license or authority from the plaintiffs, or either of them, the following acts of direct and contributory infringement of the said patent; namely:

(a) Defendant has sold radio-receiving sets, adapted and intended by it to infringe said patent, such sets containing variometers made and sold to the defendant by the Chicago Radio Laboratory, a licensee under the said Armstrong patent.

(b) Defendant has sold radio-receiving sets, adapted and intended by it to infringe

said patent, such sets having been purchased by it from the Cutting & Washington Radio Corporation, a licensee under the same Armstrong patent.

(c) Defendant has sold radio-receiving sets, described as Type B in the order to show cause of April 19, 1922.

(d) Defendant has sold radio-receiving sets, described as Type J in the order to show cause of April 19, 1922.

2. That the De Forest Radio Telephone and Telegraph Company shall pay to the plaintiffs the sum of \$9,250 to reimburse plaintiffs for expenses connected with the presentation of said violations, and shall also pay to the plaintiffs the sum of \$750, which has been paid by the plaintiffs to the master as one-half of his fee.

According to the Westinghouse Electric & Manufacturing Company the above mentioned types—B and J sets—were non-regenerative as sold, but were made by the De Forest company in such a manner that they were adapted to be changed into regenerative sets, and, it is alleged, were sold by it with the intent that they be so changed.

## Mogul Electric Company Enjoined Under Armstrong Patent

ON June 13, 1923, the Westinghouse Electric & Manufacturing Company, owner of the Armstrong regenerative or feed-back Patent No. 1,113,149, brought suit in the United States District Court for the Southern District of New York with application for preliminary injunction against the Mogul Electric Company, of New York City, the infringements complained of being the sales of certain radio-

receiving sets made by the W. B. L. Radio Company, of Newark, N. J., which had been non-regenerative when obtained by the Mogul Electric Company, but were changed over by it to regenerative sets in violation of the Armstrong patent.

After the filing of the suit the Mogul Electric Company submitted to a decree enjoining it from further infringement of the patent.

## Radio Trade Notes

R. F. YATES, former radio editor of the New York *Evening Mail*, has been appointed sales and advertising manager of the Electrad Corporation, 428 Broadway, New York City.

\* \* \*

John C. Mitchell, 121 West 77th Street, Portland, Ore., has opened a manufacturing and distributing concern. He would like to represent eastern manufacturers on the Pacific Coast.

\* \* \*

Sicon Radio Mfg. Company, 19 South Wells Street, Chicago, Ill., is said to be ready to buy anything required in the making of crystal sets.

\* \* \*

General Supply Company, 144 North 13th

Street, Lincoln, Neb., is reported as being in the market for tubes and loop antenna.

A. E. Hancock Co., 908 Congress Avenue, Austin, Tex., now a radio retailer, will open a jobbing business next month.

## Injunction Secured Against Radioceive Company

THE International Electrical Supply Company, 29 Broadway, New York, has secured from Vice-Chancellor Badres an injunction against the Radioceive Manufacturing Company, 368 Jelliff avenue, Newark, N. J., prohibiting the latter from selling radio headsets in New England, New York and New Jersey. The New York company alleges that the Radioceive Manufacturing Company contracted, on April 27, to permit it to handle exclusively this territory.

## Next Program of WGY Is a Good One

WGY, the favorite radio station in the great vacation grounds of the Thousand Islands, the Maine coast and woods, the Adirondacks and the Catskills, has a good program to offer for the week of July 15.

Sunday morning and evening, July 15, the services of the First English Lutheran Church of Schenectady will be broadcast. The sermons will be delivered by the Rev. Herbert D. Shimer.

The Troy Music Study Club will offer the program for Monday night. Ruth Don, a concert pianist; Everett T. Grout, tenor, and Alice Clough-Wilsey, violinist, will give the Tuesday program, July 17.

The Salvation Army Band of Schenectady, N. Y., a favorite organization with WGY listeners, will give a concert Thursday night, July 19. Samuel Slater is the director. The band will be assisted by Mme. Chantemerle, reader, who will give readings from "Les Miserables" in French.

Two concerts will be broadcast by WGY Friday evening, the first at 7.45 and the second at 10.30, Eastern Standard Time. The early program will consist of piano, soprano and baritone solos. At the later concert the Solka Orchestra will give a program of Polish music. Miss Ethel Thomas, soprano, and James Early, pianist, will assist.

## Mail Service Radio Changes

THE Air Mail Service, Post Office Department, has ceased to utilize the radio circuit between Reno and the naval radio station at San Francisco, a leased wire service having been inaugurated by the Post Office Department between those points. In discontinuing use of the radio circuit the Air Mail Service expressed its thanks to the Navy Department for the efficient service rendered them for the past three years. Air Mail Service traffic previously handled by the naval radio station at Chicago has been taken over by the Post Office Department station at Maywood, Ill.

## Wired Wireless in Germany

EXPERIMENTAL work in wired wireless is progressing in Germany, Consul Richardson advises the Department of Commerce. Recently communication was effected between Berlin and Stolp on the Baltic coast over a 400-kilometer line. This high-frequency telephone line has been turned over to the federal post authorities by the firm of Lorenz A.-G. Three calls at a time were put through successfully—one on the normal wave length, another on a 45-kilometer wave and a third on a wave of 25 kilometers. Instead of cathode tubes a special high-frequency generator was used.

## Spielman Company Moves

THE Spielman Electric Company, Inc., New York City, are moving into larger and more convenient quarters at 311 West 59th street. The move was necessary because of the greatly increased demand for the firm's line of Seco radio products. A new set is the latest addition to their line of specialties. M. H. Spielman is president of the concern, and John J. Monahan is sales manager.

## What Radio Enthusiast Is Going to England?

RADIO WORLD would like to get in touch with a radio enthusiast, professional or amateur, who intends to visit England this summer. Please address Editor, RADIO WORLD, 1493 Broadway, New York City.

## Give It to the Sick Veterans, Doctor!

DR. DONALD M. GILDERSLEEVE, a radio enthusiast, of 169 Prospect Park West, Brooklyn, N. Y., informs RADIO WORLD that he has a six-tube receiving set which he is willing to donate to a worthy cause.

RADIO WORLD suggests that the doctor present the set to the Veterans' Mountain Camp, Paradise Point, Big Tupper Lake, N. Y. This is a hospital home for veterans of the World War who have incurred disability since their honorable discharge from the army, and, due to government red tape, are barred from treatment in government hospitals. The Veterans' Mountain Camp movement was started by several posts of the American Legion, and is sponsored by them. It is now a going outfit, and is doing great good to men who otherwise would have to suffer in silence. Radio supplies, clothing, books, magazines, sweaters, etc., will be received with gratitude by the doctors in charge for the use of their patients.

For the information of Dr. Gildersleeve and other readers of RADIO WORLD donations should be addressed as follows: Veterans' Mountain Camp, Horseshoe Station, N. Y.

## "Leviathan's" Shore Telephone Service

THE S.S. "Leviathan" includes in her remarkable electrical equipment a three-position private branch exchange switchboard capable of serving 600 telephones placed in the cabins and at convenient points about the vessel. When the big ship is moored to her New York dock those on board may communicate with all points covered by the Bell System, which is nation wide.

The telephones will be placed in service as soon as the vessel is moored to her pier, and they will not be disconnected until the order comes to cast off. The New York Telephone Company explains that, while telephone connections have been made heretofore between shipboard and shore, nothing quite so elaborate as the apparatus on the "Leviathan" has ever before been attempted.

## Help for Charley Barrett

A LETTER signed Charley Barrett and bearing the address of 36 Broadway, Saranac Lake, N. Y., was published in Radio World for June 30. Mr. Barrett, who is living at Saranac Lake because of tubercular trouble, requested that some one donate to him a radio set outfit in order to make life more interesting.

Theodore Seebach, of 53 St. James Street, Elmhurst, Long Island, N. Y., telephoned Radio World just as it was going to press saying that he had a radio set that he will contribute if some one will supply three tubes for it.

Now let us see if we can't get Charley Barrett in a happy mood right away.

## Coming Events

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, October 6 to 13, 1923. J. C. Johnson, general manager.

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits, Atlantic City, N. J., June 16 to September 8, 1923.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEER, Pacific Coast convention, Del Monte, Cal., Oct. 2-5. F. L. Hutchinson, 33 West 39th St., New York.

## Manufacturers, Here's An Itinerant Salesman!

EDITOR, RADIO WORLD: I am contemplating traveling by auto from here, going west and return. Having had all kinds of experience with radio outfits and instruments I believe I am well qualified to sell the same to retailers. Here is my plan: I make no city over 50,000 inhabitants down to 1,000. With my auto I stop on the street of a city at night, light my lamps and demonstrate the set I sell and the parts, too. I also give a lecture on radio. When I am through I take the names of prospective buyers and turn the same over to some retailer who handles the parts I sell. I then go to the next town and repeat the above. I expect to start the first week in August. I have the backing of the Bureau of Standards here, as well as recommendations from the best business men in this city.

What I want you to do is to get my name before reputable radio manufacturers.

I am a great booster for RADIO WORLD, which I have taken for over a year. I still have every issue, and would not take a fortune for same unless they could be replaced.

Faithfully yours,

FREDERICK BUTTS.

604 Q St., N. W.,  
Washington, D. C.

## Mr. Hovey, of Oklahoma, Says Business Is Good

MR. O. H. HOVEY, manager of the Southern Radio Supply Company, Perry, Okla., got out a circular last week. It was printed in two colors on letter-size sheets. It carried Mr. Hovey's dignified portrait and this bald assertion:

"It would make a cat laugh to hear some of the radio manufacturers and dealers joining in the song 'Business is going to be good this fall after the static and hot weather is over.' Oh, hell! Business is good right now if you have any 'pep' and know how to use it. Right now I am selling and installing more radio outfits each week than any other one man in the state of Oklahoma. The reason? Because I advertise right."

And to prove the last assertion Mr. Hovey is sending out copies of the Perry *Republican* carrying two ads from his firm—one of them six inches, three columns wide.

## New Radio and Electric Firms

Quinplex Radio Corp., New York City, \$500,000; M. L. Lewis, A. Wellman, M. Christeleit. (Attorney, C. Milliken, 36 West 44th St.)

Consolidated Radio Call Book Co., New York City, has changed its name to Conrad Co.

The Shiloh Light & Power Company, Statesville, N. C., has been incorporated with a capital stock of \$10,000 by H. M. Morrison, G. W. Nash and S. G. Caugill.

The Bancroft Light, Heat & Power Company, Ltd., Bancroft, Ontario, Canada, has been incorporated with a capital stock of \$1,000,000. Donald L. Cameron is director.

## Don't Try It!

Mr. D. F. Hamm, Cor-sur l'Andouillette, Kan., inquires:

Q. 1. I have read in your columns of using a transformer instead of batteries. There is a transformer on the electric light pole back of our house. If I connected my set to this would it carry farther?

A. 1. Fine dust from the eruption of Mount Krakatoa fell 3,000 miles at sea.—*De Forest Stand-By.*



**Pruden Reliable  
Radio Specialties  
For Good Results**

Dealers write today for  
our interesting proposition.

**FREDERICK H. PRUDEN, Inc.**  
993 Bergen Ave., Jersey City, N. J.

**Extra Sensitive  
Tested Radio Crystal  
PREPAID 30 CENTS**

Each One Tested and Guaranteed

**RADIO PARTS COMPANY**  
Lock Box 56 DUNELLEN, NEW JERSEY



## Sell Shirts

Sell Madison "Better-Made" Shirts, Pajamas, and Nightshirts direct from our factory to wearer. Nationally advertised. Easy to sell. Exclusive patterns. Exceptional values. No experience or capital required. Large steady income assured. Entirely new proposition. **WRITE FOR FREE SAMPLES.**  
**MADISON SHIRT CO., 503 B'way, N.Y. City**



Send us your Burnt-out  
Tubes

We Repair

U. V. 200..... \$2.75  
U. V. 201..... 2.75  
C. 300..... 2.75  
C. 301..... 2.75  
W. D. 11..... 3.50

Fine Workmanship Quick Service  
Mail Orders Promptly Attended to

**Badger Radio Tube Repair Works**  
4913 North Ave. Milwaukee, Wis.



## WE REPAIR

**WD-11, \$3.50**

AND POSTAGE

Also other vacuum  
tubes, excepting  
VT-1 and VT-2.

Mail orders solicited and  
promptly attended to.

**H. & H. RADIO CO.**

514 Clinton Avenue Newark, N. J.

# PATENTS

## To the Man with an Idea

I offer a comprehensive, experienced, efficient service for his prompt, legal protection, and the development of his proposition.

Send sketch or model and description, for advice as to cost, search through prior United States patents, etc. Preliminary advice gladly furnished without charge.

My experience and familiarity with various arts frequently enable me to accurately advise clients as to probable patentability before they go to any expense.

Booklet of valuable information, and form for properly disclosing your idea, free on request. Write today.

**RICHARD B. OWEN**  
Patent Lawyer

32 Owen Building, Washington, D. C.  
2276-P Woolworth Bldg., New York City

# RADIO WORLD

TELEPHONE, BRYANT 4796

PUBLISHED EVERY WEDNESDAY (Dated  
SATURDAY OF SAME WEEK)  
FROM PUBLICATION OFFICE,  
1493 BROADWAY, NEW YORK, N. Y.  
BY HENNESSY RADIO PUBLICATIONS  
CORPORATION

**BOLAND BURKE HENNESSY,**  
President and Editor

**M. B. HENNESSY,** Vice-President

**FRED S. CLARK,** Secretary and Manager

1493 BROADWAY, NEW YORK, N. Y.

European Representative: The International News  
Co., Breems Bldgs., Chancery Lane, London, Eng.  
Paris, France: Brentano's, 37 Avenue de l'Opera.

Managing Editor

Stephen L. Coles

Technical Editor

Robert L. Dougherty

### Field Representatives:

New York—Arnold D. Friedman, W. H. Oke.

Chicago—Stevens & Baumann, Inc., First National  
Bank Building.

Los Angeles—Stevens & Baumann, Inc., Higgins  
Building.

San Francisco—Stevens & Baumann, Inc., Holbrook  
Building.

### SUBSCRIPTION RATES

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

Receipt by new subscribers of the first copy of  
RADIO WORLD mailed to them after sending in  
their order, is automatic acknowledgment of their  
subscription order.

### ADVERTISING RATES

One page: One time—\$150.00.

Half, Quarter, Third and Two-thirds pages at  
proportionate rates.

One inch, one time—\$5.00. Per agate line  
\$0.40.

On four consecutive issues, 10% discount.

On thirteen consecutive issues, 15% discount.

Cover and preferred-position rates made known  
on application.

Terms: 30 days net. 2% 10 days.

### CLASSIFIED ADVERTISEMENTS

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

Entered as second-class matter, March 28, 1922,  
at the Post Office at New York, New York, under  
the act of March 3, 1879.

### IMPORTANT NOTICE

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

## Sweden's Strong Position in Telephone Industry

AN illustration of Sweden's strong position in the telephone market of ten countries is provided by the annual report of the L. M. Ericsson Telephone Company and affiliated concerns. This gives the net profits of the parent company for 1922 as approximately \$600,000 and a dividend of 5 per cent. was declared.

Among the subsidiary concerns the British company declared a dividend of 8 per cent. and the Finnish, 15 per cent. The plant in Petrograd has been nationalized and is still in control of the Soviet. In Austria and in Hungary the Swedish telephone industry has been particularly active. In Vienna the capital stock has been increased from 3,000,000 Austrian kronen to 150,000,000, and last year's dividend on the new capital was 50 per cent. on the old capital.

The Warsaw company has increased its equipment to 37,000 instruments, and last year's business showed good returns. The Ericsson-Mexico system now has nearly 17,000 subscribers, and the dividends were 12 per cent., the net profits amounting to more than \$180,000. In Buenos Aires and in Entre-Rios, Argentina, the two newly organized affiliated concerns, while showing excellent prospects, have not been operating long enough to bring any great profit. The profits of the Dutch company have been added to the reserves, while the companies in France and America have been holding their own.

## "RADIO TUBES REPAIRED"

Work Guaranteed

W. D. 11 and 12 \$3.25  
U. V. 201 A

SIX VOLT TUBES  
DETECTORS ..... \$2.75  
AMPLIFIERS ..... \$3.00

**Radio Tube Laboratories**

776 Broad Street Newark, N. J.

## FROM 180 to 700 METERS

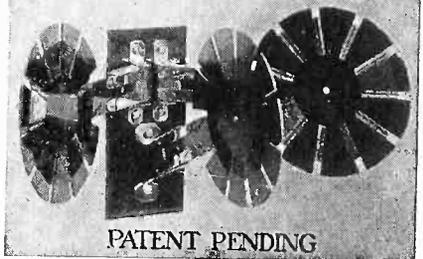
Have you that range of selectivity? With a COAST COUPLER as part of your equipment it is easy. Why don't you try it? By sending \$5.00 you will receive postpaid a COAST COUPLER and one of our famous hook ups which we guarantee will do all that is claimed for it.

DEALERS

INVESTIGATE

**THE COAST COUPLER COMPANY**  
245 East 7th St. Long Beach, California

## THE GOODMAN



PATENT PENDING

The Niftiest Short Wave Tuner on the Market  
Only \$6.00 & PP on 1 lb. Send for pamphlet.

**L. W. GOODMAN**  
DREXEL HILL, PA.

The GOODMAN is really a high grade instrument, well and sturdily constructed. The PANEL and FANS are GENUINE BAKELITE—the best material known for the purpose.

## Cram's Radio Broadcasting Map of United States and Canada

With all the new allocations and changes recently brought out. Scale, 100 miles to the inch; in two colors—Size 8 1/2 x 28.

PRINTED ON HIGH-GRADE MAP PAPER WITH ALL UP-TO-THE-MINUTE INFORMATION BY WHICH YOU CAN LOCATE ANY BROADCASTING OR HIGH POWER STATION. A COMPLETE INDEX OF THE ARMY, NAVY AND BROADCASTING STATIONS.

The Most UP-TO-DATE MAP out!  
35c. (Postpaid)

**THE COLUMBIA PRINT**

1493 BROADWAY, NEW YORK CITY

## HOOK-UP AND CIRCUIT HOUNDS

Did you miss it? Do you want it? If you do you can get it by writing in to Radio World for any one of these back numbers, as per dates:

Reinartz circuit for 2 tubes.....Jan. 13  
Good 2 tube WD-11 Circuit for DX.....Jan. 27  
Satterlee Circuit.....Feb. 3  
G. W. May's Wonder Circuit.....Feb. 17  
Power Amplifier Circuit.....Feb. 24  
Reflex Circuits.....Feb. 24  
Flowelling Super Circuit.....Feb. 24  
Multi-tube Reflex Circuits.....March 3  
One tube Superregenerative.....March 3  
Lewis Three Tube Circuit.....March 10  
Regenerative Radio Frequency Circuit for 5 tubes.....March 24  
Hazeltine Neutrodyne Receiver.....March 31  
2VK'S Transmitter circuit.....April 21  
Compact Universal Receiver.....April 28  
Stockelburg Pup receiver.....May 5  
Cockaday receiver.....May 12  
Improved Grimes Circuit, A. D. Turnbull's Long Distance Circuit, Combined Receiver and Transmitter, Improved 1 tube Reinartz.....May 19

Any number for 15c. Any 7 numbers for \$1.00. All 14 numbers for \$2.00. Or start subscription with any number. Radio World, 1493 Broadway, New York City.

## WGY Players Reach Tremendous Audience

By C. D. Wagoner

A TURN of the dial gains you admission to the radio drama. Tune your radio set to station WGY and at least one evening a week you will hear an entire play, sometimes a comedy drama, a farce or melodrama.

For nearly a year now the General Electric Company station at Schenectady, N. Y., has been offering dramas by radio one night a week and during that period the little group of actors making up the WGY Players has had the largest audience ever before accorded dramatic offerings. Just how large that audience is is difficult to estimate. There are at least 2,000,000 radio sets in the country and of that number 1,500,000 are almost nightly within range of WGY. Many of these sets have loud speakers or extra phones enabling groups to listen-in. The number of people who have heard the WGY Players in the continuous run of 43 weeks is anybody's guess.

Edward H. Smith and a half dozen actors were engaged about a year ago to produce Eugene Walter's play "The Wolf" at WGY. It was something entirely new; it was contended by many that the radio audience would be unable to follow the play with any degree of interest because of the absence of scenery and because they could not see the players. Voice alone, it was contended, would not be sufficient to put over dramatic climaxes.

From the very first the radio drama was a success. Letters veritably poured into the station asking for more. Mr. Smith, formerly an actor and director on the professional stage, was engaged to produce one show a week.

This work was undertaken in a serious and thorough manner and for months many of the greatest successes of the stage have been going into the air reaching untold thousands who, but for radio, would never have had an opportunity of hearing the plays. During the past winter when farmers in many parts of the country were snowed in, cut off from the mails, the village and in many cases their nearest neighbors, radio programs went out to relieve their loneliness. The farmer, the woodsman, the keeper of the lighthouse along the Atlantic coast, were enthusiastic in expressing their appreciation of the dramas.

Mr. Smith and his players have pioneered in the art of the radio drama; they have had to develop a new technique. It was found necessary to make occasional changes in play manuscripts especially where a climax depended upon sight for its appreciation. The entrance to or departure from a room by one of the characters had to be indicated by sound, as a closing door. A bell helps somewhat in announcing a newcomer to the invisible stage. Various sound devices were created to produce atmosphere. A telegraph key and an imitation of an engine whistle were simulated by devices similar to those used on the stage.

The performer was greatly handicapped at first because he had depended a great deal upon the presence of his audience. Facial expressions were no help in interpretation; strong emotion could be conveyed only by vocal tone. To help the performer to a realization that his work was heard and appreciated WGY requested the radio audience to write their "applause" and this they have done by the thousands. The radio actor now "sees" his audience but an audience made up of all conditions of men, and finds inspiration for his work in applause, not of hand-clapping, but words written.

## "B" BATTERIES

Depleted "B" Batteries are usually the cause of your trouble in receiving. Eliminate it. Buy your "B" Batteries direct from Manufacturer. No old stock batteries, but fresh tested batteries, with a 100 per cent. efficiency, at the following low prices, which are 50% less than list price.

	Large	Medium	Small
22½ Volt plain .....	\$1.25	\$1.00	\$0.70
22½ Volt variable .....	\$1.38	\$1.13	\$0.75
45 Volt plain .....	\$2.50	\$1.75	—
45 Volt variable .....	\$2.75	\$2.00	—

Any other type of battery made to order. Send Money Order or Order for C.O.D.

ROSENDAL & CO., 2 Stone Street, New York

## KELLY WAVE SUSTAINING COIL

Eliminates Aerials, Loops and Danger from Lightning

Fit Inside Set

The Kelly Wave Sustaining Coil will work perfectly in any tube set. The coil being sealed under a vacuum, it eliminates STATIC and all interferences.

Price \$4 Each



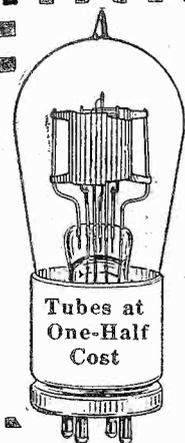
Makes It Portable

Simple to connect. One lead to terminal marked aerial, the other to A or B battery—That's all.

Dealers, write for special terms.

Manufactured by

JOS. GELB COMPANY, 250-258 West 54th Street, New York



Tubes at One-Half Cost

## It has happened to all of you in a fraction of a second!

WHEN that filament burns out, at least \$5.00 goes with it to put the set in operation again. WHY not save nearly one-half the cost of a new tube by sending us your burned out tube to be repaired? We REPAIR EVERY TYPE of tungsten wire filament receiving tube. All our tubes are TESTED and GUARANTEED to function as well as when new.

All tubes returned P. P., C. O. D.

HARVARD RADIO LABORATORIES  
BOSTON P. O. BOX 1781 MASS.

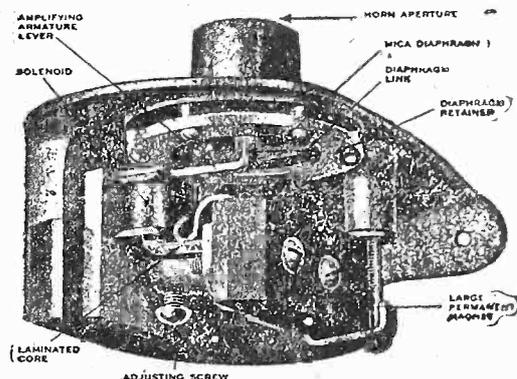


## The Trinity Loud Speaker

TYPE "A1"  
\$25.00

21-in. Fiber Horn

The only device of its kind in the Radio field



Type "B" \$12.50

Study the illustration carefully and you will understand why it produces full, clear, natural tones with perfect reproduction of all vocal and instrumental music. May be used with phonograph. No storage battery required.

The Trinity Loud Speaker is an instrument that combines the best qualities of a phonograph reproducer in combination with electro magnetic principles best fitted for radio amplification. Absolutely perfect reproduction of all music and speech without distortion. The volume may be regulated from that required for a room in your home to a tremendous output that can be heard hundreds of feet out of doors by simply increasing "B" battery voltage. No storage batteries required. The instrument is of a heavy duty type and is guaranteed fully by the manufacturers.

Ask your dealer for demonstration—if he cannot we can.

TRINITY RADIO CORP.

168-"B" DARTMOUTH STREET

BOSTON, MASS.

DO YOU WANT TO BUY, SELL OR EXCHANGE RADIO OR OTHER GOODS? TRY THIS  
DEPARTMENT AT 5c A WORD

# RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

**HONEY COMB COILS**—35, 50 or 75 Turn, 40c. Each Mounted, \$1.25; Special Windings to Order. Tapped Honey Combs, 3c per Tap. Crystals—Honest John's Old Fashioned Crystals. "Thunder Note" (Pyrites) and "Wonder Rock" (Galena). Tested, guaranteed and individually boxed. Each Crystal as big as a walnut. Biggest value in radio, 25c each. Small Pyrites or Galena Crystals for mounting, 75c per pound. Dealers and jobbers, write for special quotations. Factory agents wanted in some States. HONEST JOHN MFG. CO. (Dept. RW.), 1509 East 11th Street North, Portland, Ore.

**CASH FOR OLD GOLD**, Platinum, Silver, Diamonds, Liberty Bonds, War, Thrift, Unused Postage Stamps, False Teeth, Magneto Points, Jobs, Any Valuables. Mail in today. Cash sent, return mail. Goods returned in ten days if you're not satisfied. OHIO SMELTING CO., 337 Hipodrome Bldg., Cleveland, Ohio.

**OLD MONEY WANTED**—\$2.00 to \$500.00 EACH paid for hundreds of Old and Odd Coins. Keep all old money. Send 10 cents for New Illustrated Coin Value Book, 4x6. You may have valuable coins. Get posted. We pay CASH. CLARKE COIN COMPANY, Ave. 83, Le Roy, N. Y.

**SUPER-SIMPLICITY CIRCUIT**—1,000 to 1,500 miles on one tube, one control, 150 to 25,000 meters. No rheostat, storage battery, vario coupler, variometer, 3-coil mounting, variable inductance, taps or radio frequency. Nothing to guess about. Complete hook-up and particulars, \$1.00. No checks. Build your own. Save 50% and get better results. RADIO EXPERIMENTAL LABORATORY, Box 194A, Berkeley, Calif.

**FOR SALE**—Regenerative Radio Receiver, used 30 hours. Reiser, Maybee, Michigan.

**FORMS** to cast Tin Soldiers, Marines, Indians, Trappers, Hunters, and my Air Pressure Cannon Machine. Moulds from \$1.25 up to \$3.50, casting 3 to 4 pieces at once. Write for catalogue. Ht. Schiercke, 1304 72nd St., Brooklyn, N. Y.

**SELL GREBE RORK** Amplifier with 2 VT2 tubes, \$40.00. General Radio Wavemeter, type 191, \$40.00. Other bargains. SCHUCK, 1411 Avenue A, New York City.

**VACUUM TUBES REPAIRED.** Reasonable. Send for our price list. Vacuum Electric, Station C, Toledo, Ohio.

**CHEAPEST TO BUILD**—Easiest to tune. Get particulars Rokay Single Control Hook-up. Describe your set. Rokay Electric Company, Ingotar, Ohio.

**IF YOU WANT** to save and make money, join National Supply Co. and buy anything in hardware line at reduced prices. Write immediately for particulars. Combination Box 254, New Alexandria, Pa.

**EVERY RADIO FAN** should have these two books, "101 Receiving Circuits" and "Six Successful Receiving Sets." By M. B. Sleeper. They are the most up-to-date radio books for the fan who likes to make his own, and will help you out and save you many times their cost. Both books are full of illustrations. Price, 50c. each, with 10c. extra for postage, or both for \$1.00 sent postpaid. COLUMBIA PRINT, 1493 Broadway, New York City.

**DYNAMO BUILDING FOR AMATEURS**—Or How to Construct a Fifty Watt Dynamo.—By Arthur J. Weed. A practical treatise showing in detail the construction of a small dynamo or motor, the entire machine work of which can be done on a small foot lathe. Dimensioned working drawings are given for each piece of machine work, and each operation is clearly described. This machine, when used as a dynamo, has an output of fifty watts; when used as a motor it will drive a small drill press or lathe. It can be used to drive a sewing machine on any and all ordinary work. The book is illustrated with more than sixty original engravings, showing the actual construction of the different parts. Price, \$1.00. THE COLUMBIA PRINT, 1493 Broadway, New York City.

**GET OUR PRICES** on Plate and Filament Heating Transformers. L. Werts, 409 St. Julian St., Pekin, Ill.

**SPRINGS** made to order. Wright Bros. Spring & Wire Works, 5616 Huron St., Chicago, Ill.

**AMRAD NO. 3500 BROADCAST TUNER, ONE-STEP RADIO, DETECTOR, TWO AUDIO**—List, \$125.00; sell, \$80.00. Also complete specified parts Mawhinney circuit, includes panels, \$50.00. Both sets never used. Struller, 6 Fuller Place, Brooklyn, N. Y.

**MAGNAVOX TYPE R3**—Latest curves, improved acoustic models, in original sealed factory cartons. List \$35. Introductory offer \$25. RADIO CENTRAL, Dept. W, Abilene, Kans.

## RADIO DEALERS ! ! !

Have you seen the list of Camps and Camp Directors which started in the MAY 12 issue of RADIO WORLD? Here is a list of all the Camps and Directors of camps in the United States, and is of essential value to any Radio Merchant who is anxious to enlarge his summer business. Get these people interested in installing radio sets in their camps for the benefit of the campers. Any single copy, 15c; or the four issues for 60c. RADIO WORLD, 1493 Broadway, New York City.

**TWO FOR THE PRICE OF ONE**—Send \$3.00 now for six months' subscription (26 numbers) for Radio World during the coming month and we will send you also Popular Radio or Wireless Age or Radio for six months without any extra charge. Or send \$6.00 now and we will send you Radio World for one year (52 numbers) and Popular Radio, or Wireless Age or Radio for one year. These offers not good after July 23, 1923. If you are already a subscriber you can take advantage of this offer by renewing from the end of your present subscription. Sub. Department, RADIO WORLD, 1493 Broadway, New York City.

## Construction of New Type Transatlantic Receiving Sets

By M. B. SLEEPER

Fully Illustrated. Price 75 Cents

**I**N addition to the listening to ships and broadcasting stations on short wave lengths there is a peculiar fascination about listening to the high-power telegraph stations of England, France, Germany, Russia and Italy as well as those located in the Pacific Ocean and the Oriental Countries. It is much easier to do this than most people imagine. The sending is very slow, a feature of assistance to the beginner in telegraphy. Several types of receiving sets for this task are described. Detectors, amplifiers, oscillators, etc., for long distance reception are also described. Suggestions for the operation of relays by the signals and the reproduction of them on a phonograph are given. In addition there is some valuable data on home made wavemeters for testing and experimenting.

Sent P. P., prepaid, on receipt of price, by  
**THE COLUMBIA PRINT**

1493 BROADWAY, NEW YORK CITY

## RADIO BROADCASTING MAP

**F**OR the benefit of those interested in Radio and those who are becoming interested, Rand McNally & Company have prepared a publication containing a wealth of information of greatest value. It shows, in the most comprehensive way, the location of the broadcasting stations, gives their classification, the call letters, wave lengths, ownership, etc., of each.

The Rand McNally Radio Map of United States is 28x30 inches in size. The locations of broadcasting stations are shown by distinctive symbols. The call letters of each station are given, also the wave lengths of each. The Radio Districts with numbers are shown in red and the Radio Relay Divisions are in blue. Time zones are included. Alphabetical lists of stations and alphabetical lists of call letters are in the margins. Convenient pocket form with cover.

Price 35c Each

**THE COLUMBIA PRINT**

1493 BROADWAY NEW YORK CITY

## RADIO FANS

Do you want to sell your old set?

Do you want to exchange anything for something?

Do you want to buy something?

If so, why don't you use the Classified Department of Radio World? You can get fine results for five cents a word, minimum ten words. Your message will reach thousands including other fans, dealers, etc., etc.

Try Radio World's Classified Department  
for your personal radio and other needs.

**RADIO WORLD, 1493 Broadway, New York City**

## REPRESENTATIVES WANTED BY RADIO WORLD ALL OVER THE UNITED STATES AND CANADA

Send us your name and address and say that you want to become our representative. We will show you how you can represent RADIO WORLD in your locality and at the same time make money for yourself. We would particularly like to hear from those who are handling the "Saturday Evening Post."

Address Circulation Dept., Radio World, 1493 Broadway, New York

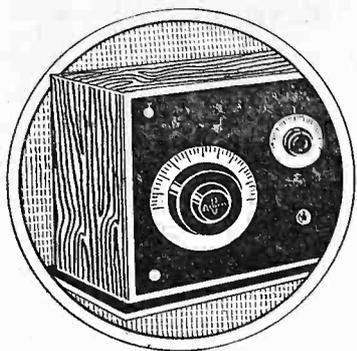
## RADIO WORLD IN THE PUBLIC LIBRARIES

Many public libraries throughout the country are sending in their subscription orders for RADIO WORLD.

Librarians evidently have made up their minds that the visitors to their libraries are anxious to read articles about and see pictures of the latest developments in radio when they are news.

If your library has not placed RADIO WORLD on file, tell your local librarian how interesting and important is this once-every-seven-day radio paper.

Address: RADIO WORLD, 1493 Broadway, New York, N. Y.



**ABSOLUTE TUNING  
PRECISION  
with**

**ACCURATUNE  
MICROMETER CONTROLS**

An accurate tuning instrument ten times more efficient than any vernier device. Micrometer control within the dial itself permits hair splitting adjustments never before possible. Operates every plate of condenser and eliminates necessity for vernier plate. Fits any standard 3/16" or 1/4" instrument shafts. Attractive and durable. Silvered dial with neatly engraved graduations. Black or brown bakelite knobs. If your dealer cannot supply you send \$3.50 direct to us for this wonderful instrument. Fix-Post Inductance switch and Rheostat dials to match.

**MYDAR RADIO CO.**  
9-B Campbell St., Newark, N. J.

**Radio Enthusiasts Tie Up  
French Wire Service**

"Listeners in" who daily hear the concerts broadcast by the Eiffel Tower wireless are accused of adding to the already great confusion and disorganization of the telephone and telegraph service of France, according to a press despatch.

Officials of the Telegraph Administration assert as an excuse for the irregular service that wires are being grounded everywhere by amateur wireless enthusiasts who do not know better than to connect their listening apparatus to telegraph and telephone wires.

The result, the officials state, is grounding and endless trouble for the Telegraph Administration. There is talk of issuing an order requiring everybody applying to the Administration for permission to install a wireless outfit to keep the official wires free.

**American Radio Exports**

**D**URING April, radio manufacturers shipped \$224,195 worth of apparatus to foreign countries, an increase of \$31,000 over March exports, according to compilations of the Department of Commerce. The total volume was over 64 tons, most of which went to Quebec and Ontario. These two provinces lead, receiving \$65,325 worth, while the Virgin Islands stood second with \$42,448 worth of apparatus. England was third and Mexico and Cuba followed. Thirty-four countries purchased radio equipment in the United States during the month, varying in value from \$11 upward.

A report from the Netherlands shows that that country imported \$59,280 worth of radio goods against imports valued at \$27,300 during the first quarter of 1923. The trade in radio materials and equipment in the Netherlands has increased both in imports and exports over the first quarter of 1922 by several thousands of dollars.

**YOU SAVE 50% OF THE USUAL COST**

**WORLD BATTERIES FOR RADIO**



6 Volt	<b>\$10.00</b>
60 Amps.	
6 Volt	<b>12.50</b>
80 Amps.	
6 Volt	<b>14.50</b>
100 Amps.	
6 Volt	<b>16.00</b>
120 Amps.	

**A Better Battery Cannot Be Built**

The best of material—careful construction by skilled mechanics—makes a battery that will give a long life of hard service.

A written two (2) year guarantee. You take no chances with a World Battery—it is the most satisfactory battery you can get and you save 50%.

Mail Your Order Today

We ship C. O. D. subject to inspection, or will allow 5% discount for cash with order. All orders shipped same day as received.

**WORLD BATTERY CO.**  
Dept. 17, 1219 So. Wabash Ave.  
Chicago, Ill.

**GUARANTEED 2 YEARS**



**ON APPROVAL FOR 30¢**  
**ZOBEL-STEIN LABORATORIES**  
322 9TH ST. BROOKLYN, N.Y. SOUTH 2650

Fifty-two issues for \$6.00. Subscription Department, RADIO WORLD, 1493 Broadway, New York City.

**PATENTS**  
promptly procured. Trade Marks designed & registered  
**FREE INVENTION RECORDING BLANK**  
Phone Vanderbilt 7212

REF. MANUFACTURERS  
**PATENT CO., INC.**  
800K 520 FIFTH AVE  
NEW YORK

**Six Months Subscription for Radio World and Popular Radio or Wireless Age, or Radio (San Francisco) for the Price of a Subscription for Radio World Alone**

*This Is a Special Offer for the Summer Only:*

**DO IT NOW!**

Radio World for six months (26 numbers) is.....	<b>\$3.00</b>
Popular Radio at 20c a copy for six months would be.....	<b>1.20</b>
	<b>\$4.20</b>
	<b>or</b>
Radio World for six months.....	<b>\$3.00</b>
Wireless Age (or Radio) at 25c a copy, for six months.....	<b>1.50</b>
	<b>\$4.50</b>

Send us remittance for \$3.00 and we will send you Radio World for six months and Popular Radio, or Wireless Age, or Radio (San Francisco) for six months, to one or different addresses, or send through your newsdealer.

This offer is good only for one month from date.

Take advantage of this offer today and send in the accompanying subscription blank. If you are already a subscriber you can take advantage of the offer by sending us \$3.00 and renewing your subscription for six months beyond your present date of expiration.

**Special Combination Offer of Radio World and Popular Radio or Wireless Age or Radio**  
**RADIO WORLD, 1493 Broadway, New York City.**

Enclosed find remittance for \$3.00, for which send me Radio World for six months, beginning with issue dated ..... and Popular Radio, or Wireless Age, or Radio for six months beginning with issue dated.....and it is understood that there is to be no extra charge of any kind. Please mail copies to the following address:

If you wish you may send us \$6.00 for Radio World for one year (52 issues), and Popular Radio or Wireless Age or Radio for twelve months, both postpaid. This offer good only if mailed by August 10, 1923.

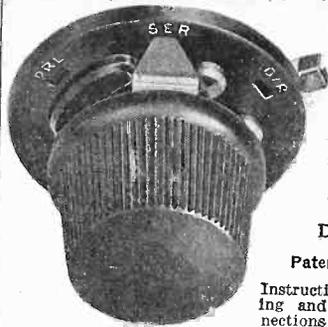
Name .....

Street Address .....

City and State.....

## Marvel - Capacity - Switch

Receives long waves in the parallel position; short waves in the series position; and waves of medium length by eliminating the condenser entirely.



THREE-WAYS  
Series,  
Parallel,  
Direct-Ground

Patents Pending

Instructions for mounting and for wire connections given with each instrument.

dial-mounted

List Price \$1.25

Attractive discounts for dealers and jobbers. Write for descriptive circular.

**MARVEL-SWITCH CO.**

28 WEST 25TH STREET NEW YORK



Sunbeam  
Customers  
Are

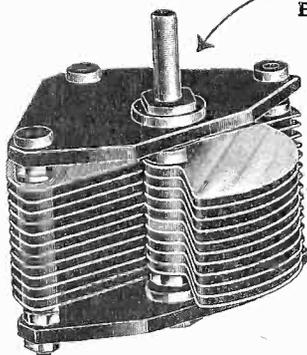
**SUNBEAM Satisfied**

Ask us about our plan to send you a 3-tube Cockaday set on approval!

We will supply information and prices on any set you may want to build, or we will build from your plans.

SUNBEAM ELECTRIC CO.

71 THIRD AVENUE NEW YORK



Special  
Bushing

## Aetaco Condensers

Are made with just the one purpose in mind of giving you the most serviceable condensers obtainable. Fine adjustment. Accurate spacing.

43 Plate Condenser.....	\$1.75
23 Plate Condenser.....	\$1.35
17 Plate Condenser.....	\$1.25
11 Plate Condenser.....	\$1.00
3 Plate Condenser.....	60c.

**AETACO**

Back Mounting Inductance Switch... 75c.

## Two-Tube Portable Set

(Tubes Included)

Consisting of 1 23 P Condenser and Dial, 1 150 to 600 Meter Inductance Coil, 1 8 Ohm Rheostat with Automatic Control for Amplifying Tube, 1 Audio Frequency Amplifying Transformer, 1 Standard Double Socket, 1 Mica Grid Condenser, 1 Tubular Grid Leak and Holder, 1 Detector Tube, 1 Amplifying Tube, 1 Pair Federal Phones, A and B Batteries.

All Connections Automatic. Enclosed in 7x7½ Mahogany Finished Cabinet and Formica Panel.

A Real Bargain at..... **\$30.50**

**American Radio Stores**

235 Fulton Street New York City

Fifty-two issues for \$6.00. Subscription Department, RADIO WORLD, 1493 Broadway, New York City.

## "Jimmie" Listens In



(C. Fotograms)

"Jungle Jingles" were made expressly for this particular audience, who is shown heartily laughing at a joke cracked by one of the members of the Anti-Saloon League at a banquet of the Master Brewers' Association on the advent of the repeal of the Mullan-Gage Law. The illustration shows Jimmie all decked out in his best Sunday suit. He has two—his Sunday suit and his birthday suit.

## Effect of the Weather on Radio

AS the warm days of summer come you will probably notice that some of the stations you have been hearing at a distance will come in weaker, and perhaps you will cease to hear some of them for a time. Like some of us poor mortals, says the director of Station WOC, the radio waves do not travel so far on the hot, sunny days as they do on the crisp, cool ones, and they prefer travel by night rather than by day. You can make an interesting study and at the same time contribute something to the knowledge of radio telephony if you will keep a record of the weather on days when your reception is exceptionally good or when you have difficulties. Such a study, continued for a considerable length of time, may lead to the solution of some of your difficulties. It should be worth trying.

## Try This Next Time

A READER has written a nice little note to us, telling us that we may read it and publish it at our own discretion. He states that he will not be responsible for the consequences, and will absolutely refuse to pay our hospital bills in case we come in personal contact with any of our readers. We never did like to take a dare—from any one; so here goes!

"And, furthermore, I have found out that if you start to chew on celery or a nice, hard apple while receiving a church sermon that you will not be bothered by any interference. As a matter of fact the sermon will not bother you either—if you chew vigorously enough."

**Radio World, 52 issues, \$6.00.**

Subscribe direct or through your news dealer. **\$6.00 a year, \$3.00 six months, \$1.50 three months.** Radio World, 1493 Broadway, N. Y. C.

## Something New in Batteries

Exceptionally good proposition.  
Assigning Territory Rapidly.

**JOBBERS and DISTRIBUTORS**

Write or Wire  
**SIDBENEL**

25 Mt. Eden Ave. New York

## WD-11 and WD-12 TUBES REPAIRED

WD-11 or WD-12.....	\$3.50
C-300 or UV-200.....	2.75
C-201 or UV-201.....	3.00
C-302 or UV-202.....	3.50
C-201A or UV-201A.....	3.50
Moorehead Detectors.....	2.75
Moorehead Amplifiers.....	3.00
DV-6 or DV-6A.....	3.00
Also the new UV-199.....	3.50

All tubes guaranteed to work like new.  
Mail Orders Given Prompt Attention  
"24 Hour Service"

NEW DX 1½ VOLT TUBES..... \$4.00

**RADIO TUBE CORP.**

55 Halsey Street Newark, N. J.  
TUBES SENT PARCEL POST, C. O. D.

## THE COMO

## DUPLEX TRANSFORMERS

Something really new in Audio Amplification. (See article in RADIO WORLD, June 9, by C. White, on "A Super Amplifier.") We guarantee more volume and infinitely better quality than is possible with any other transformer on the market.

Sold only in matched pairs

PRICE \$12.50 PER PAIR

Send for descriptive literature

**Como Apparatus Company**

168 DARTMOUTH STREET  
BOSTON, MASS.

Why are so many

**Public Libraries**

**Y. M. C. A's.**

**K. of C's.**

**Y. M. H. A's.**

**Army Posts**

**Social Clubs**

**Industrial Libraries**

And others in this subscription group ordering subscriptions for Radio World from all parts of the U. S., Canada and foreign countries?

## THE REASON

Because so many  
Of their members  
Are interested in Radio  
That they want to read  
RADIO WORLD every seven days.  
Ask the Association or Club  
To which you belong  
To subscribe for

**RADIO WORLD**

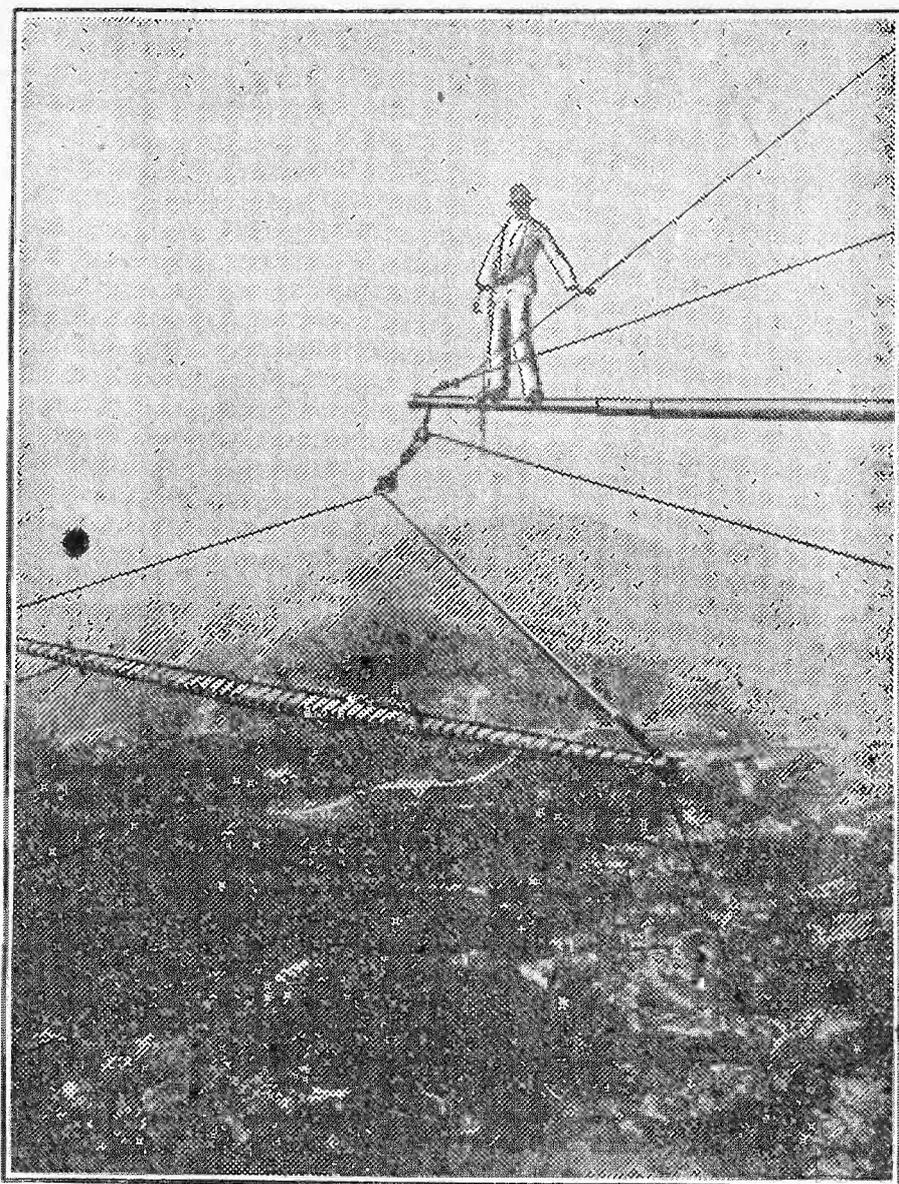
The Great Illustrated National Weekly

(\$6.00 a Year, 52 Numbers  
\$3.00 Six Months; \$1.50 Three Months)

**RADIO WORLD**

1493 Broadway New York City

# The Highest Radio Station in the World



One Antenna Spreader of Station SPC

SPC, the radio telephone station recently installed by the Westinghouse Electric International Company, on the peak of Mt. Corcovado, overlooking the city of Rio de Janeiro, Brazil, enjoys the distinction of being the highest radio station in the world. The peak of the mountain is more than 2,100 feet above the city and from the station one may have a most wonderful view of the country for miles around.

While erecting the antenna for the station workmen were given many thrills and many times faced death when the slightest misstep would have meant a plunge into the depths below. The illustration herewith shows a workman standing out on one of the poles to which the antenna spreaders are attached.

SPC was the feature of American exhibits at the Brazil Centennial.

## Radio World "Doubled Value of My Set"

EDITOR, RADIO WORLD: I desire to say that I am extremely well pleased with RADIO WORLD. Mr. C. White's Wave Trap, described in the issue of April 21, 1923, has doubled the value of my set; not only doing that for which it was designed, but giving me distance and clearing up all distortions of sound. Therefore I accept with alacrity your offer to send RADIO WORLD, 52 issues, and *Radio*, a San Francisco magazine, for one year for \$6.00, in accordance with the enclosed slip.

Yours very truly,

W. G. LITTLETON.

329 Chestnut St.,  
Philadelphia, Pa.

Don't ask for Rheostat—Say

## FIL-KO-STAT

FOR REAL FILAMENT CONTROL

### T. P. C. Filament Protectors

This is the cheapest and best tube protection you can buy. Two for a detector, one for each amplifier. 30 cents each. Size ½ in. in diameter and 1 ¼ in. long. Unlike a fuse, it does not destroy itself while protecting your tube. Money back guarantee.

TUBE PROTECTOR CO.

31 Liberty Street San Francisco, Cal.

Remarkable  
Regenerative  
Receivers



Ace Model V  
\$20

Formerly known as  
Crosley Model Vc

This one tube receiver is astounding the radio world with its wonderful achievements. Stations more than 1000 miles away are being regularly copied on this set. In comparison to its price, there is no receiver on the market today to equal it in performance.

Licensed under Armstrong U. S. Patent No. 1,113,149. The trade name Crosley is used by permission of the Crosley Mfg. Co.

Live Jobbers and Dealers are eagerly taking advantage of the sales this instrument and the rest of the Precision instruments and parts bring them.

Free Catalog on Request.

THE PRECISION EQUIPMENT CO.

*Powel Crosley Jr. President*

7402 GILBERT AVENUE CINCINNATI, OHIO

*Young Simons*  
**Greenwich Radio Co**

185 GREENWICH STREET

NEW YORK, N. Y.

U. S. L. 24 Plate Vernier Bakelite Ends CONDENSER.....\$2.95

U. S. L. 46 Plate Vernier Bakelite Ends CONDENSER..... 3.25

PATHE Moulded Variometer, Guaranteed 600 Meters..... 2.25

PHONES

Murdock.....\$2.95

Nerco..... 2.55

CROWN Amplifier Transformers Ratio 5 to 1 adapted for WD 11 and 12 or for 6 Volt Tubes ..... 2.95

SEND MONEY ORDER INCLUDING POSTAGE—PROMPT AND CAREFUL ATTENTION

## Manufacturers and Dealers, Attention!

If you can use a great list of names of people who want radio goods throughout the country you will find them in the Merchandising Department of Radio World, starting with our issue of April 14 and in every issue to date. Any copy mailed you for 15c. each from April 14 to July 7 or the entire twelve for \$1.50; or send \$6.00 for a yearly subscription starting with our issue of April 14. RADIO WORLD, 1493 Broadway, New York City.

SEND US THE NAME

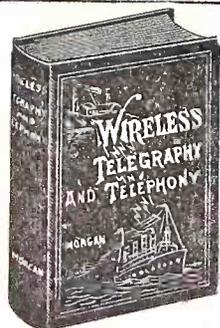
### OF YOUR RADIO CLUB

Also the names of your president and other officers. We want to add these to a list of radio clubs and officers we are preparing for publication in an early issue. RADIO WORLD, 1493 Broadway, New York.

IF YOU ARE INTERESTED IN RADIO YOU NEED THESE BOOKS

# Radio Books for Your Vacation

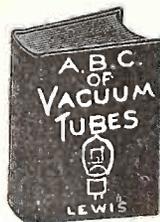
Telling How to Operate a Radio Set—How to Build a Set—Principles of Vacuum Tubes and Other Radio Problems



## Wireless Telegraphy and Telephony Simply Explained

By ALFRED P. MORGAN

One of the most complete and comprehensive treatises on the subject ever published. A study of its pages will enable one to master all the details of the wireless transmission of messages. The author explains in simple language the theory and practice of wireless telegraphy and telephony. 154 pages, 156 engravings.....PRICE \$1.50



## The A B C of Vacuum Tubes Used in Radio Reception

By E. H. LEWIS

Assoc. I. R. E., and Radio Instructor

Written particularly for the person who "knows nothing about radio," but who would like to gain an understanding of the elementary principles of operation of vacuum tubes and various circuits in which they are used for the reception of radio-telegraph signals and radio-telephone music and speech. Illustrated.....PRICE \$1.00



## Experimental Wireless Stations

By P. E. EDELMAN

Tells how to make apparatus to not only hear all telephoned and telegraphed radio messages, but also how to make simple equipment that works for transmission over reasonable long distances. Then there is a host of new information included. The first and only book to give you all the recent important radio improvements, some of which have never before been published. 392 pages, 167 illustrations....PRICE \$3.00

The 3 Books for \$5.00 to One or Different Addresses  
Any of These Books Sent Prepaid on Receipt of Price

ADDRESS **THE COLUMBIA PRINT**  
ROOM 326, NO. 1493 BROADWAY, NEW YORK

## Sleeper's Two Latest Radio Books

Two new and remarkably good radio books by M. B. Sleeper—one is entitled "Six Successful Radio Sets," with design data and instructions for receiving sets specially selected for exceptionally long distance reception. The other is "101 Receiving Circuits," being a most complete compilation of diagrams including circuits for a generative, superregenerative, Reinartz, Flivver, Flewelling, super-heterodyne, reflex and radio frequency sets. Each book mailed on receipt of fifty cents and ten cents extra for postage. Both books for \$1.00 and no extra charge for postage. The Columbia Print. 1493 Broadway, New York City.