

The Solution of Selectivity Problems

RADIO

Reg. U. S. Pat Off.

WORLD

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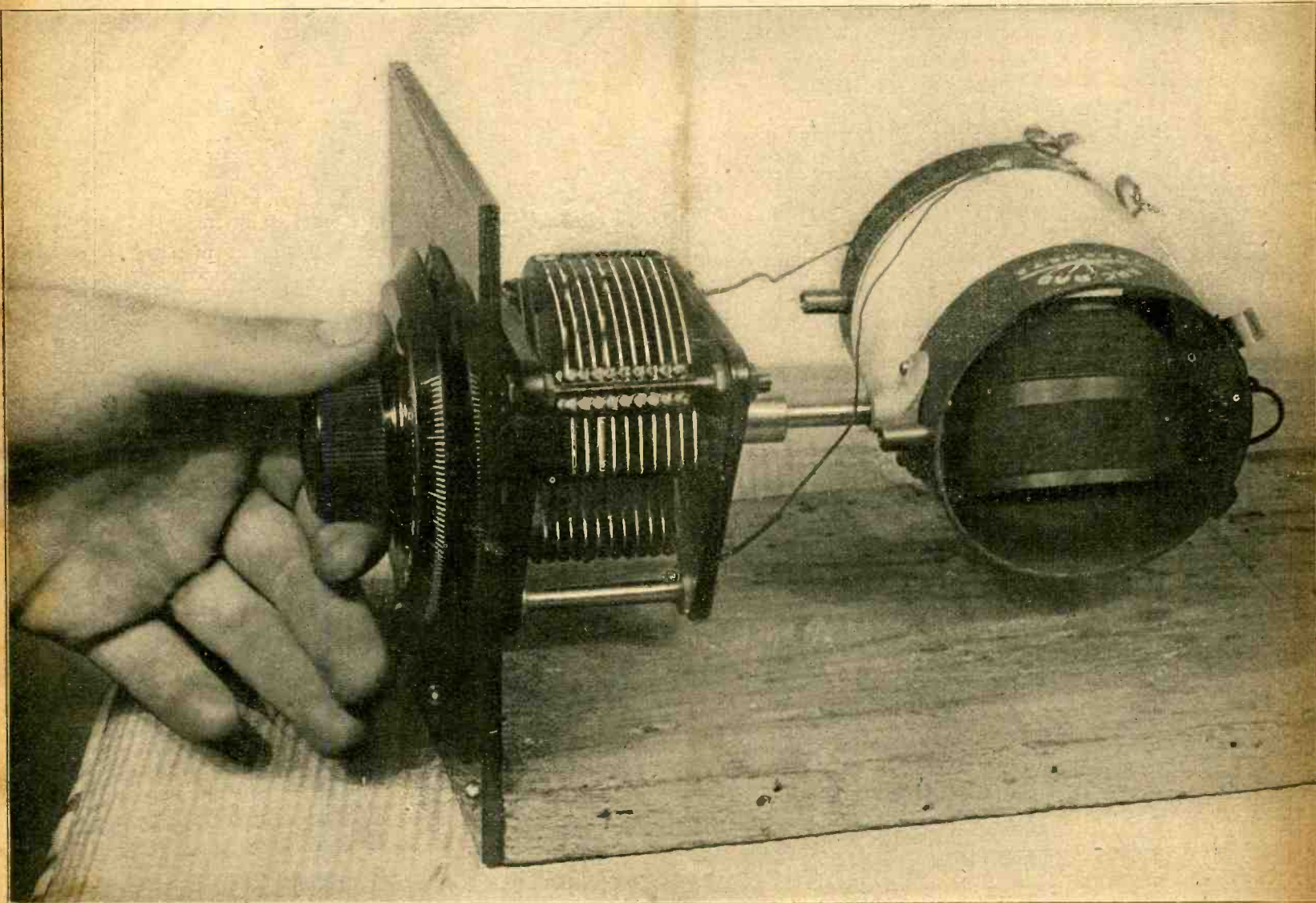
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**Get Yourself
A Laboratory**

*Interesting Tests and Measurements
May Be Made With Simple Appa-
ratus. See Article on Oscillators,
Pages 6 and 7.*

**Hoover Plans to Withdraw
Federal Control of Radio**



Herbert Photos, Inc.

SELECTIVITY may be correctly apportioned by connecting the shaft of a variable primary coil to the back of the condenser shaft. The condenser tunes the secondary. The lower the wave-length the greater the selectivity, due to looser coupling. Logging is preserved. See page 3.

The Choice of An Audio Frequency Amplifier

Bridge Method Used to Balance Oscillations

How to Prevent Stray Magnetic Coupling in Sets



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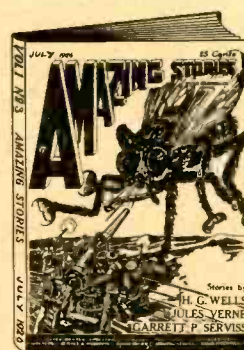
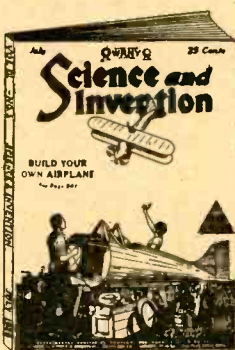
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Selectivity's Amazing Toll

For An Effective Selectivity of 500 on WEA F's Wave the Suppression of Side-bands at 10,000 Cycles is 99.6%, and at 50,000 Cycles Is 98.5% — These Figures Represent Actual Conditions in Sets and Account for Distortion — How to Measure Selectivity

By *J. E. Anderson*
Consulting Engineer

SELECTIVITY is the most abused term in the radio vocabulary. Selectivity usually is considered a desirable property of a receiver, and for that reason the term is applied to every part that enters into a set, regardless of whether it has any meaning or not in the particular application. Thus the term has been applied to such parts as binding posts, jacks, audio transformers, panels, batteries, dials, sockets, by-pass condensers, grid leaks, baseboards and many others. To apply the term selectivity to these things is nonsense.

Sometimes one speaks of the selectivity of a tuning coil, meaning thereby that the coil has low resistance. Likewise one often speaks of the selectivity of a tuning condenser. Strictly the term can only be applied to tuned circuits consisting of an inductance coil, a condenser, and some resistance.

What Selectivity Is

Selectivity is the ability of such a circuit to discriminate between two waves of slightly different frequencies. Suppose the two frequencies are F and f . If we desire the signal which is carried on the frequency F we tune the circuit to that frequency by adjusting the capacity or the inductance in the tuned circuit. The undesired frequency, being different from the desired frequency, is then suppressed. If the two frequencies differ by only a small amount, and if the undesired frequency is suppressed to such a degree that it cannot be heard at all, then the tuned circuit is very selective. If the undesired signal which is carried by f is very nearly as strong as the desired signal, then the circuit is not selective, or only slightly selective. If the two frequencies differ by a large amount, the slightly selective circuit may have enough power of discrimination to suppress the undesired signal to the desired degree.

We often hear of perfectly selective circuits, of 100% selective circuits, of razorlike selectivity. Very often the circuits so labelled have only the power of separating cash from the gullible. A perfectly selective circuit, if such a thing

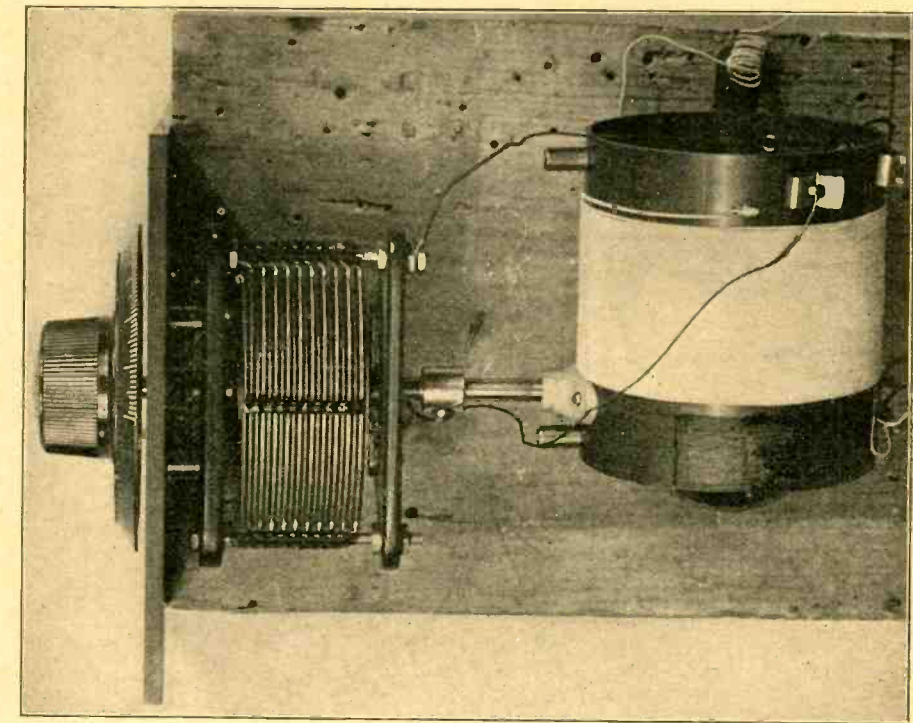


FIG. 1

How the end of a condenser shaft is connected to a variable primary in the aerial circuit. Note the bushing that binds the two shafts. If the two shafts are not exactly in line the stator coil form will give slightly, and the tolerance should be afforded by loose mounting to the baseboard. Use brass angles in such a case but do not drive the screws all the way home. In other words, let 'em walk a little. See other photo on front cover.

existed, would be infinitely selective. It would select the desired frequency and would exclude all others no matter how close to the desired frequency they may be, and it would exclude them absolutely.

Too Much Is No Good

Desirable as the property of selectivity may be, it is fortunate that we cannot attain perfect selectivity. If we could, some one would undoubtedly attempt to get something with such a circuit. To speak of the so-called 100% selective circuits merely indicates that the speaker has a broad mentality, that is, obtuse. To speak of razorlike selectivity with a favorable connotation indicates that the speaker has had an experience with a blade with an edge on it, which is rare in the lives of men.

In most cases a high degree of selectivity is desirable. There are so many broadcasting stations on the air at the same time, and their frequency separation is so small, that it is imperative to have a very selective circuit to eliminate all interfering stations. But the required degree of selectivity differs for different locations. A receiver located a considerable distance from any broadcasting stations does not need to be so selective as a receiver located in the immediate vicinity of a powerful station.

A receiver located within a few blocks of a high power station needs to be extremely selective if the signals emanating

from the local station are to be reduced to negligible strength and those coming from a distant station brought in with comfortable audibility. This is true even if the frequency difference between the two is quite great. In most cases the frequency separation is not at all great, and then a high degree of selectivity is essential.

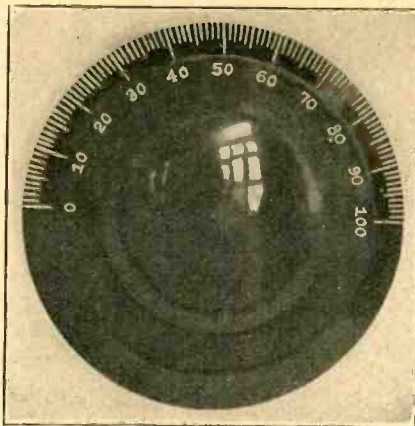
Measurement Methods

Most radio fans measure selectivity in terms of dial divisions on their tuning condensers. While this gives an idea of the selectivity of the set, it is not an accurate indication, and it often leads to erroneous conclusions. For instance, it leads to the idea that the set is more selective at the lower end of the dial scale just because the movement of one division will suffice to throw a given station in or out, while at the upper end of the dial it requires several divisions. The fact usually is that the set is less selective at the lower end of the scale, because for the higher frequencies there is more resistance in the tuned circuit or circuits.

This conclusion is verified by the fact that it is very difficult to separate signals on adjacent channels at the lower end of the scale, even though they may have the same absolute frequency difference as two adjacent channels at the upper end of the scale which may be easily separable. If a straight line frequency condenser or dial is employed, part of the illusion is re-

The Onslaught on Quality

High Notes Are Suppressed in a Selective Set and the Low Ones Brought Out Too Prominently — Engineers Solve the Problem by Establishing a Necessary Compromise — Rustling Paper, Hand-clapping, and Whispers Serve Test Purposes Well



MOST FANS measure selectivity in terms of dial divisions on their tuning condensers. While this gives an idea of the selectivity it is not accurate.

moved, although this does not in the least affect the selectivity of the set.

One of the best methods of measuring the selectivity of a circuit is to determine the ratio of the inductive reactance in the circuit to the resistance in the same circuit, assuming that the resistance of the condenser is negligible, which assumption is allowable in most cases.

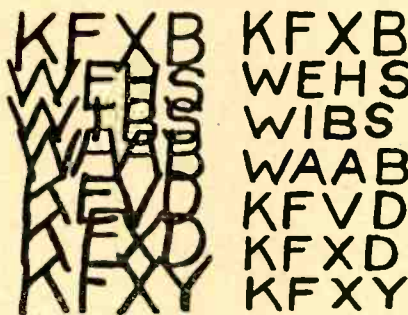
Formula for Computation

The inductive reactance in the circuit is the product of the inductance in henries and the frequency in radians, or if L is the inductance of the coil and f the frequency of the signal in cycles per second, then the reactance is $6.28Lf$ ohms. The resistance used is that of the coil at the frequency under consideration. This is not a constant of the coil but depends on the frequency, so that the ratio is $6.28Lf/R$, that is, the selectivity may be taken as a constant over small frequency intervals. It may not, however, be taken as a constant over the entire tuning range of an ordinary tuned circuit. The ratio $6.28Lf/R$ is often called the Q of the circuit, and it is a convenient measure of its selectivity. The higher the value of the Q of the circuit, the greater is the selectivity.

The value of Q in tuned circuits employed in radio receivers varies from about 5 up to 500. If the circuit is carefully isolated from all other parts Q has a very much higher value than if it is near metal bodies or absorbing dielectrics. Therefore if the Q is measured when the circuit is isolated, the value obtained is very much higher than when the same circuit is measured in place in the receiver. Of course, what are measured in the two cases are really two different circuits, because as soon as the given circuit is installed in a set, a thousand and one different things become part of the tuned circuit, wholly altering its characteristics. A circuit which has a Q of 500 when carefully isolated from other parts may have as low a value as 100 when installed.

Regeneration's Effect

The effective value of Q may be greatly increased by regeneration, intentional or accidental. Just how high the effective value may become when the regeneration is near the critical value is difficult to say, but whatever its value may be, it is usually much too high for good quality reception long before regeneration approaches the critical. The effective value of the selectivity may also be increased by tandem tuning, that is, by employing two or more circuits and tuning them all accurately to the same frequency. The effective selectivity does not increase very rapidly, however, when this method is adopted, mainly because of the difficulty of getting



A SET must be selective enough to suppress interference and this end must be gained at any price.

the different circuits in exact resonance with the same frequency, and also because voltages are induced in the second and third tuned circuits directly without having gone through the intended channel. That is, these circuits pick up the signals directly from the space or from common coupling media like the batteries and leads. If these circuits got their voltage from the tube preceding and through the primary only, then the selectivity would be very greatly increased.

I have intimated that unlimited selectivity is not desirable. There are several reasons. The main one is that to preserve the quality of the signal it is necessary to amplify all the frequencies in the sidebands to the same degree, and this is impossible if there is any selectivity at all in the receiver. Quality then demands that the selectivity be zero, while interference demands that the selectivity be very high.

Compromise Necessary

Obviously, both of these conditions cannot be satisfied at the same time, and it will be necessary to compromise. Now if only one station, nearby and powerful, is desired, it is practicable to build a receiver in which the selectivity is so low as to cause negligible distortion; for example, a single tuner with a crystal detector followed by a resistance coupled amplifier. But if distant stations are wanted through the locals, then a very selective receiver is required and quality must be sacrificed.

Just how will the quality be affected by an over-selective receiver? The high notes will be suppressed and the low notes will be brought out too prominently. By "low notes" is meant those lying below C' and by high notes those lying between C' and the upper limit of audibility. Some persons point with a sense of elation to their

Necessary Degree of Selectivity Depends Largely On the Location of the Receiver in Respect to Stations—Why Selectivity is Poorer in a Given Set at the Lower Wavelengths Than at the Higher Ones — Resistance is a Determining Factor

receivers when some soprano gets into the octave C' , saying, "See how it brings out the high notes." The trouble with most receivers is that they bring out notes in this octave much too strong. We are now talking of the frequencies much above this octave, say up to 10,000 cycles. Will the set bring them out in full force? A good way of judging is to listen to such noises as the rustling of paper, hand-clapping, hissing, whispering. Do these noises sound natural on your radio? Can you easily tell a b from a v or an f from a v , or a d from a th , without aid from the context or a draught on the imagination? These sounds and noises are rich in the higher audible frequencies, and a super-selective receiver suppresses them, in many cases as much as 99% as compared with the lowest audible note.

The Signal Wave Analyzed

It is easy to understand why these high frequencies are suppressed when it is remembered that a modulated wave signal is not a single frequency, but two bands of frequencies, each having a width equal to that of the audible scale, that is, about 15,000 cycles. Then the total signal is 30,000 cycles wide. But let us say that it is only necessary that each band be 10,000 cycles wide to make the signal sound natural. Then the tuner must pass with equal facility a band of 20,000 cycles width, 10,000 on each side of the carrier, or nominal frequency of the signal.

An audible frequency of 10,000 cycles will then be represented in the signal by two frequencies, one 10,000 cycles greater than the carrier and one less than the carrier by the same amount.

Take WEAFA as a concrete example. Its carrier is 610 kilocycles. In this signal a 10 kc audible frequency will be represented by 600 and 620 kilocycles. Now if the receiver is accurately tuned to the carrier frequency it is obvious that it will not be tuned to either of the two frequencies representing the 10 kc audible frequency. That is, it will not be tuned to either the 600 or the 620 kc frequencies. Hence these will be suppressed in the same way that interfering frequencies of the same values would be suppressed.

Suppression Proportionate

Then the 10 kc audible frequency which they represent will also be suppressed. The more selective the receiver, the greater will be the suppression, and the greater the side frequencies differ from the carrier frequency, for a given value of selectivity, the greater will be the suppression. The lower half of the piano are scarcely suppressed at all, even for the most selective circuits in use.

It may be well to call attention to a
(Concluded on page 26)

Taste in Audio Amplifiers

Many Like Two Transformers, Because of Economy and Improved Design of the Better Units—Resistance Coupling Has Splendid Purity, But Requires an Extra Tube—Choke Coil Popular — Push-Pull Has Advantages.

By Leon L. Adelman

The Chas. Freshman Co., Inc.

THE problem of audio frequency amplification is one of the main points in the design of a good radio receiver. The best tuning arrangement with a poor amplifier coupled to it makes for a very poor set indeed.

More and more as the quality of broadcasting programs improves, the critical radio listener judges the performance of radio receivers on quality of reproduction. And it may be safely predicted that this attitude will become more and more pronounced.

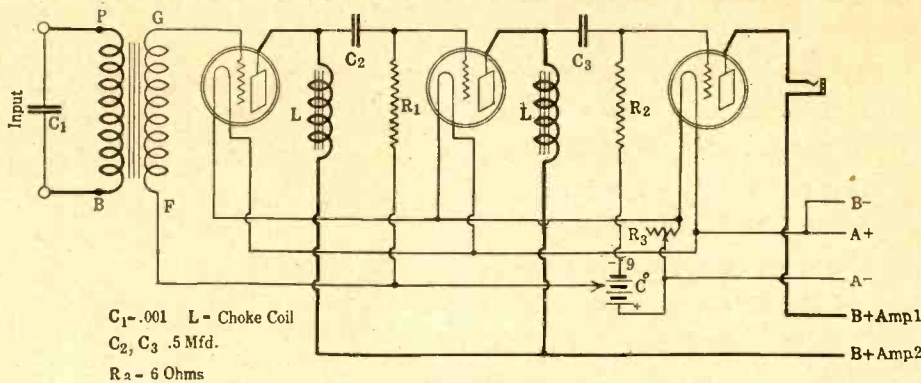
While it remains true, as ever, that the reception of distance always gives a thrill of accomplishment, the demand for quality grows more insistent.

For this reason quality in reproduction has been made the subject of intensive study and research.

Favorite Amplifiers

Several types of efficient amplifiers have found public favor. They are: the transformer coupled, resistance-coupled, choke-coil coupled and push-pull amplifiers, the latter type being available with either transformer, resistance or impedance coupling.

The majority of radio sets on the market use transformer-coupling amplification. This is for the simple reason that two stages of amplification using this type of coupling give sufficient volume for ordinary purposes. Improvements in transformer design have allowed the construction of real good receivers which



C₁—.001 L - Choke Coil
C₂, C₃ .5 Mfd.
R₁ - 6 Ohms

FIG. 2

A combination of transformer and choke-coil coupled audio frequency amplification.

give fine quality. However, criticism, both good and bad, has been waged for and against the transformer-coupled amplifier. As a result, the resistance-coupled unit has appeared to lead the general public to believe that it is the supreme achievement in amplifiers. In truth, the resistance-coupled amplifier does all that is claimed for it. In its operation, however, it is necessary to employ a particularly high B battery voltage. This is perhaps, only a slight disadvantage in comparison with the fact that three tubes instead of the usual two must be used, to give the same volume as the transformer-coupled unit.

Choke Coil Method

As a happy medium, manufacturers have placed upon the market a unit which, although using three tubes, does not require the high B battery voltage necessary with the resistance-coupled amplifier. This is the so-called choke coil or impedance amplifier.

Of late, there has appeared in print, very little concerning the push-pull amplifier, the use of which allows excellent reproduction. It has the faculty of amplifying both negative and positive sides of the audio frequency cycle, thus giving true reproduction. The best arrangement to use with a push-pull amplifier in order to obtain the very best quality is resistance-coupling. Telephone repeater tubes which are not ordinarily available to the public are the best there can be obtained. They are known as the type 102D and are quite expensive. In conjunction with a cone type speaker, nothing

Variable Resistance May Be Used to Control the Volume and, to Some Extent, the Quality—The Transformer Goes Last When Combined With Resistance Stages, Says Author.

is left to be desired in the way of quality. Perfect fidelity of reproduction is the result.

As regards so-called high mu tubes, having amplification constants of 20 and upwards, their use will often enhance the volume from any amplifier unit. Then, too, it sometimes happens that C batteries must be used in order to get clarity. This point is desired to be stressed. The use of a "C" battery will afford a great gain in clarity, and it should be used in all cases, regardless of the type of amplifier. Instead of using grid leaks of depreciating values in the successive stages of a resistance or impedance coupled amplifier, use regular 1 megohm resistance throughout, but include a C battery whose voltage you can readily regulate. You will be surprised at the decided improvement.

Control of Volume

Volume controls have lately come into vogue and are indeed a helpful agency in aiding to control the output from a set. A variable resistance of from 50,000 to 500 ohms, if placed across the output terminals, will give fine adjustment of volume and aid in clearing up noises to a small extent.

The clarity and volume output of the audio frequency amplifier should not be varied or altered by means of the filament rheostats.

The question of operating the audio amplifier on alternating current has been met with fair success and there are now obtainable several types of such amplifiers on the market.

Recently, discussion has come up as to the best manner of connecting low and high ratio transformers. Should the high ratio transformer be connected as the first one, or as the last one? Our first impression was and had been until lately that it is best to use the high ratio transformer in the first stage. However, it is better practice to use it in the last stage.

Again, in the combination amplifiers, such as those which include transformers and resistance-coupling, it is best to employ the transformer in the last stage.

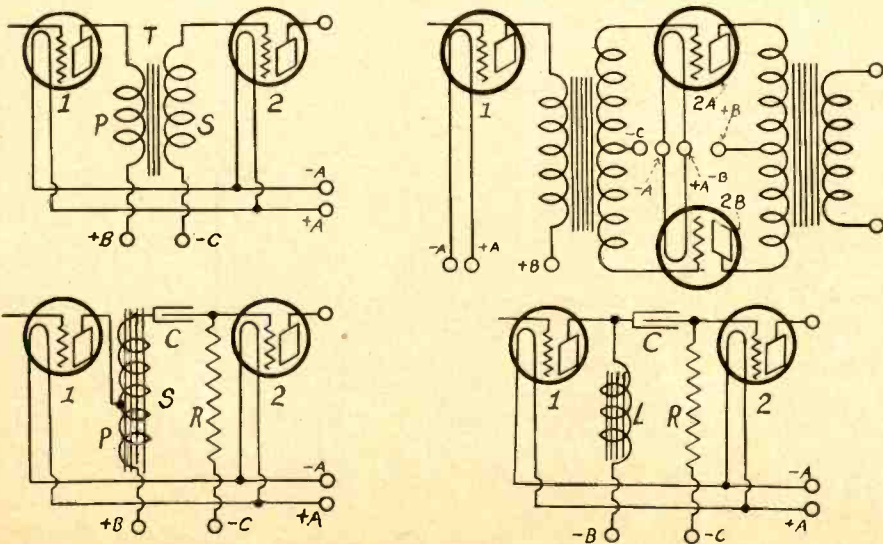


FIG. 1

Isolated audio circuits. Transformer, top, left; auto-transformer, lower left; push-pull, upper right; choke coil, lower right.

Start Your Own Laboratory!

Many Tests and Measurements May be Made With Simple and Inexpensive Equipment — Work Brings Joy to Those Advanced Beyond Stage of Trying Out the Standard Circuits to See If They Really Work

By John F. Rider

Member, Institute of Radio Engineers

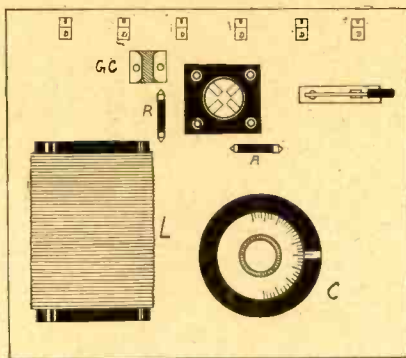
DATA that are the result of experiments conducted by others are always welcome to the radio fan, for many benefits accrue when these determinations are applied to ordinary receiver operation. But while complete details of the final conclusions are given, very frequently the method of making the determination is omitted entirely or just afforded cursory notice, and the fan who is interested in conducting experiments at home is without the desired information.

Contrary to general opinion, the financial expenditure necessary to start a small experimental laboratory at home is small. The reason is that the same equipment may be utilized for a multitude of purposes, it being necessary only to proceed in a methodical manner when carrying out experiments. And of the data which can be thus obtained, with even very little equipment, much need not be said, for while the results will not be of a revolutionary nature, they will afford sufficient information to the radio fan, to give him a greater insight into the phenomenon of radio transmission and reception in its various phases.

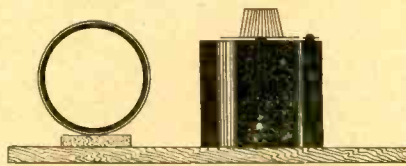
Interesting to All

I purpose to describe a number of experiments for the home experimenter, so that an interested person without equipment may visually follow the experiment and gain as much information as the man who is conducting the same experiment with his own apparatus. In other words, I will simulate a class room for the fans without equipment and who do not desire to construct the equipment, and a correspondence course for the fans who will follow the experiments with equipment of their own make. This means that the first step will be the construction of some of the units essential for all radio experiments.

Now, the heart of all radio work is the transmitter, for without transmission there would be no reception. And since we are going to conduct experiments on receivers and their various parts, it is essential that we have some signal to pick up. This signal we are going to generate right at home or in the laboratory, thus rendering us free of the sundry annoy-

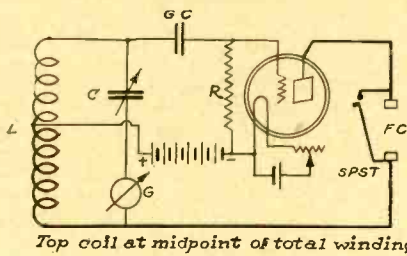


Top View



Side View

FIG. 1 The panel and side views of the RF oscillator.



Top coil at midpoint of total winding

FIG. 2 The circuit wiring.

ances which we would encounter if we depended entirely upon the reception of a signal propagated by an outside broadcasting station. Furthermore, by generating our own signal we may adjust the transmitter to any desired frequency and power output, which factors will be found to be of extreme importance in experimental work.

The Two Units

Two generating units will be constructed. The first is a radio frequency generator and the second an oscillator generating audio frequency currents. It is possible to construct a simple combination of the two by using a buzzer to modulate the output of the radio frequency oscillator, but since in our future work we will need a variable frequency audio oscillator, it will be better to construct this unit right at the start. Furthermore, the utility of a variable frequency audio oscillator is far in excess of a buzzer-modulation transformer outfit.

As the radio frequency generator (the parts for which are listed at A), will be calibrated, and will find very frequent use, make it a permanent installation, that is, the equipment utilized therein should

No Extensive Knowledge of Radio is Necessary, But Experimenters Who Know Hook-ups May Easily Take the Guesswork Out of Questions That Confound Them—How to Make Your Own Special Coils

remain intact. This means either fastening all the parts to a substantial baseboard or making a regular cabinet installation. The board is the cheaper and the handier, since it affords accessibility.

L is mounted on small elevating blocks as shown in the side view sketch in Fig. 1. SPST is a single pole single throw switch, used to short circuit the two Fahnestock clips located in the plate circuit. This switch is shorted, that is, placed in the "closed" position, when the radio frequency generator is used without any modulating signal. When the output of the radio frequency oscillator is to be modulated by the audio frequency unit, this switch is opened and connection from the audio oscillator made to the clips (FC) shown in Fig. 2.

The AF Oscillators

I will omit at this point the calibration of the radio frequency oscillator and proceed with the construction of the audio frequency oscillator.

This device is similar to the radio frequency unit, except that the inductances and the tuning capacities are many times greater. This is necessary so that the desired long waves be reached. In this unit the wavelengths are so high (frequencies so low) that they are within the range of audibility. With a maximum of 5,000 cycles the wavelength of the oscillating circuit is 60,000 meters, and with the minimum of about 150 cycles the wavelength is 2,000,000 meters. By tuning the oscillating circuit to a wave within this band the output becomes audible, since the frequency is within the range of the human ear.

This unit is slightly more complicated than the other, but is not difficult to construct. The parts are listed at B.

The wiring diagram of the audio oscillator is given in Fig. 3. With respect to the inductance unit, an iron core must be placed within the honeycomb coils. This is constructed from laminations of transformer iron, such as are used in any good grade of audio frequency transformer. These laminations are bent so as to fit within the inner radius of the coils, and sufficient laminations are used entirely to fill this opening.

It will be found that from 25 to 30 laminations will be plenty. Molten sealing wax is then poured over the entire unit, coils and core, so as to keep it rigid.

The Connection

The arrangement of the coils and the core is shown in Fig. 3A. To interconnect the audio oscillator and the radio frequency oscillator, use is made of a low ratio audio frequency transformer of the better grade. A suggestion is a 2-to-1 ratio unit. This is connected to the audio oscillator by means of the DPDT switch and the secondary connects to the two clips in the plate circuit of the radio frequency generating unit. The condenser across the secondary of the coupling transformer is .002 mfd. and is necessary

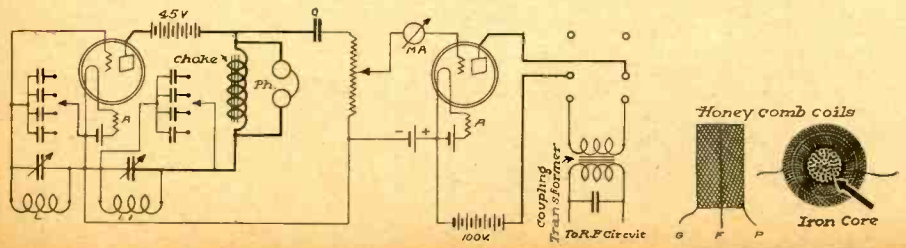


FIG. 3 The audio oscillator and view of the coils.

Oscillators Are First Need

Two Generating Units Start You Off Well—One is Radio, the Other Audio—Both May Be Combined In One, But Separation Yields Greater Flexibility, Often a Very Valuable Asset

when the audio oscillator is being used to modulate the radio frequency generator output. This entire outfit is also laid out on a baseboard. A suggested layout is given in Fig. 4. In its entirety, this audio oscillator and amplifier unit is slightly different than the conventional, but it serves its purpose very well.

The construction of a variable audio oscillator which would conform to the standard wiring connections, while not difficult for the higher frequencies, presents many difficulties when one is desirous of generating a wave with a frequency below 300 cycles. The unit shown herewith can be adjusted to generate a wave with a frequency of 125 cycles per second, and has been calibrated to as high as 7,000 cycles per second.

Calibrating the RF Unit

Now for the calibration of the radio frequency oscillator. If a wavemeter is handy much of the detail work is eliminated, but very few experimenters have a wavemeter, therefore I will assume none. The first step is to procure a broadcast receiver. This may be the receiver used for home reception, since it is no doubt logged insofar as the station settings are concerned, and the station settings of the receiver can be used as wavelength or frequency calibrations. The second step is to connect the audio frequency oscillator to the radio frequency generating unit, so that the AF output will modulate RF output.

The first adjustment on the audio oscillator is to determine the frequency of the output used for modulation. A 2,000-cycle note will be satisfactory. To obtain this output a .007 condenser is placed in shunt to the variable across the grid coil, and a .005 condenser is placed in shunt to the variable across the plate coil.

The radio frequency oscillator is set into operation. With the audio oscillator unit disconnected and the shorting switch in the plate circuit of the RF unit in position a definite output will be shown on the galvanometer in the RF circuit. Now the audio unit is set into operation and connected to the RF unit.

Reading Drops

A drop in the galvanometer reading

LIST OF PARTS (A)

- One thermocouple or hot wire galvanometer (G).
- One .001 variable condenser (C).
- One .00025 mfd. fixed condenser (GC).
- One 1 meg. grid leak and mounting (R).
- One vacuum tube socket.
- One 4" vernier dial.
- Six Fahnestock clips (FC).
- One No. 1-A Amperite (A).
- One 201A type tube.
- One inductance L (60 turns of No. 22 DSC wire on 3" tubing tapped at the 30th turn).
- One SPST switch.

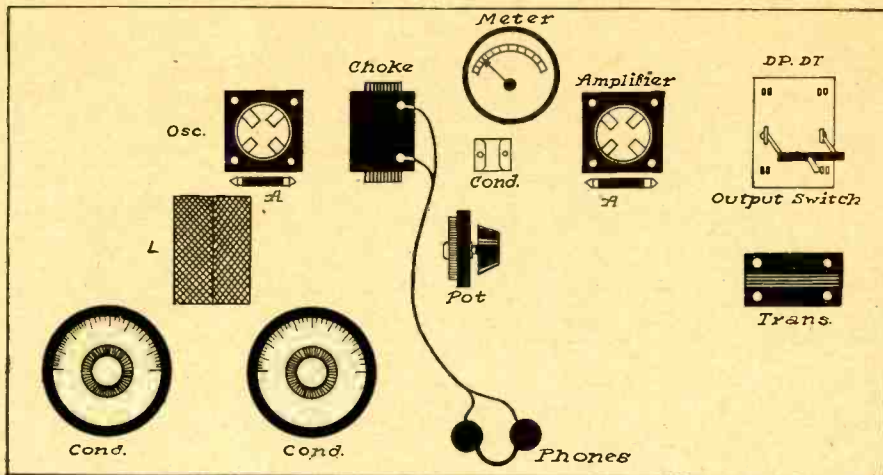


FIG. 4

should result. This drop shows that the output wave is being modulated. Due to the amplification obtained with the amplifier tube, the output of the audio frequency unit must be adjusted to minimum when being used to modulate the RF oscillator. This is accomplished by means of the gain control potentiometer.

The radio frequency unit being modulated, the dial settings of the receiver are set to the lowest known wavelength. Let us say this is 210 meters. The tuning control on the radio frequency oscillator is now manipulated until the 2,000 cycle note is heard on the receiver with maximum volume. If the tuning on the receiver dials is broad the distance between the receiver and the oscillator should be increased. I neglected to say that during this calibration work the receiver is free of an aerial or any pickup medium other than the coils themselves, and that the separation between the receiver and the oscillator should be approximately 3 to 4 feet. At this distance, and with the small output of the radio frequency oscillator, harmonics will not be troublesome.

Hence when the signal is tuned in on the receiver with reasonable volume and correct adjustment, it can be taken for granted that the wavelength of the generated signal is equivalent to the wavelength indicated by the dial settings on the receiver. Now the wavelength of the signal and the dial setting of the radio frequency unit are noted for future reference. The foregoing procedure is repeated with every known wavelength setting of the receiver until the radio frequency generator is calibrated from the lowest point of the tuning dial to the highest.

Example of a Curve

When the wavelengths for the RF oscillator have been obtained for various dial settings, the complete information is plotted on cross sectional paper, with the wavelengths as the vertical axis and the condenser settings on horizontal axis. A typical calibration curve is given in Fig. 5. In view of the discrepancies between coils built by different individuals and discrepancies in the capacitance value of different brands of condensers, the specific curve for the laboratory unit is not given, it being suggested that in this case individual curves be made. When the various points of wavelength against condenser setting have been plotted, a line is drawn through the points, and the calibration curve is completed. It is now possible to select any wavelength between the points calibrated, since the line is continuous.

To find the dial setting for any wave-

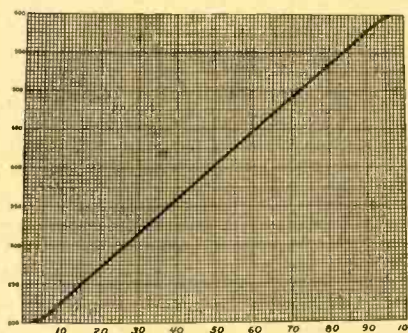


FIG. 5

length within the band covered by the unit, an imaginary horizontal line is drawn from the wavelength setting axis towards the calibration curve. Then a vertical line from the point of intersection of the horizontal line and the calibration curve is drawn until it intersects the dial settings axis. This figure is the dial setting equivalent to the desired wavelength. It must be stressed that the calibration holds true only if neither the inductance is changed or the dial removed and reset. If either change is made, a new calibration curve must be made. The same is true if a new inductance is used so as to extend the wavelength range of the radio frequency oscillator.

Behind the AF Scenes

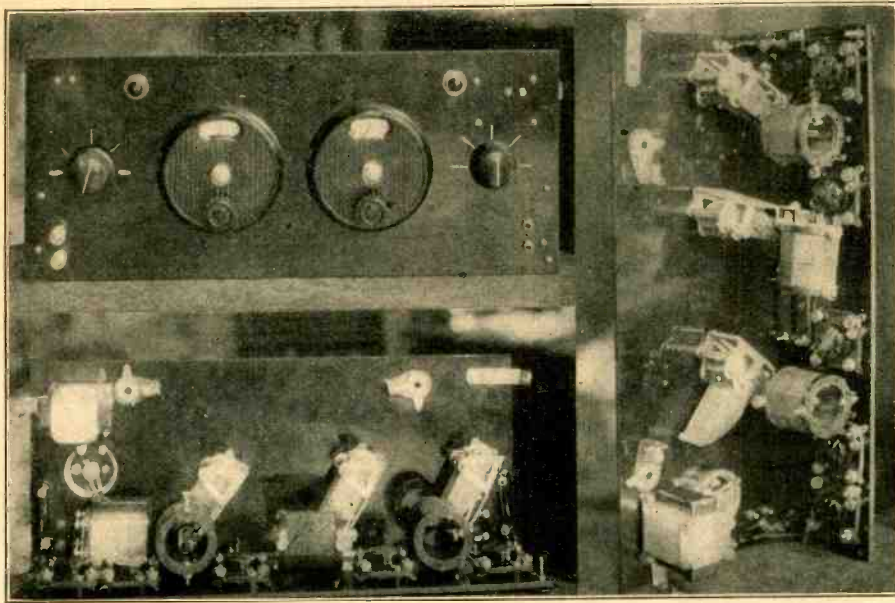
With the calibration of the radio frequency oscillator completed, we will devote our attention to the audio frequency unit.

(Continued next week)

LIST OF PARTS (B)

- Two vacuum tube sockets.
- Two No. 1-A Amperites (A).
- One 500,000 ohm modulator resistance with centre lever (R).
- One 100 henry choke.
- One pair of phones (Ph).
- Two 1,250 turn honeycomb coils (L, L1).
- One DPDT switch.
- One 0 to 1 milliammeter (MA).
- Four 1.0 mfd. fixed condensers.
- Two 0.5 fixed condensers.
- Five 0.1 fixed condensers.
- An assortment of .005 mfd. and .001 fixed condensers.
- Two .001 variable condensers.
- One 5.0 mfd. fixed condenser.
- 150 volts of B battery.

The Light 5 Portable Set



FIGS. 12, 13 AND 14.

The panel view, Fig. 12, shows the four screws for mounting one of the AF transformers directly thereon, and the other locations. The rear view (Fig. 13) discloses the method of mounting both AF transformers and other sub-panel parts. Note that the switches have been turned in opposite directions and that the rheostat is mounted with terminals on top. The brass angles, upper left and right, are secured to the case. The brackets that fasten the sub-panel to the front panel are at lower left and right. At right (Fig. 14) is an upright view. The two objects behind the central coil are the Amperite mountings. This view shows one AF transformer not yet in place.

Remarkable Compactness Achieved in Receiver That Fits in a Standard Carrying Case of the Week-end Variety—Full Data on Panel and Sub-Panel Work — Audio Transformers Ingeniously Mounted to Utilize The Only Remaining Space

[Part I of this article on the construction of the Light 5 Portable was published in the June 12 issue. The final instalment will be printed next week. After that there will be a discussion of trouble shooting.]

By Herman Bernard

Associate, Institute of Radio Engineers
PART II

THE outstanding fact to realize in constructing the Light 5 Portable is that the set proper is built into the following dimensions: $7 \times 16\frac{3}{4} \times 4$ ". The depth is 4", the other plane is the front panel. Therefore if you use as your carrying case something larger than $17\frac{1}{2} \times 11\frac{1}{2} \times 5\frac{1}{2}$ ", the outside dimensions of the case discussed last week, which is standard size, you will have all the more room for other equipment, and may go in for boards to act as braces. These are protective, but they are not necessary. The bottom board alone—for the batteries—should be used in any case.

We shall proceed, therefore, to build the set in the extraordinarily small space of $7 \times 16\frac{3}{4} \times 4$ ", for portables. Those who

prefer to build it for other than portable use may employ a 7×18 " front panel, not cut down to the stated $16\frac{3}{4}$ ", however, and equalize the extra room at the left and right at the front panel only.

Panel Data

On the front panel appear the following, which are located as defined:

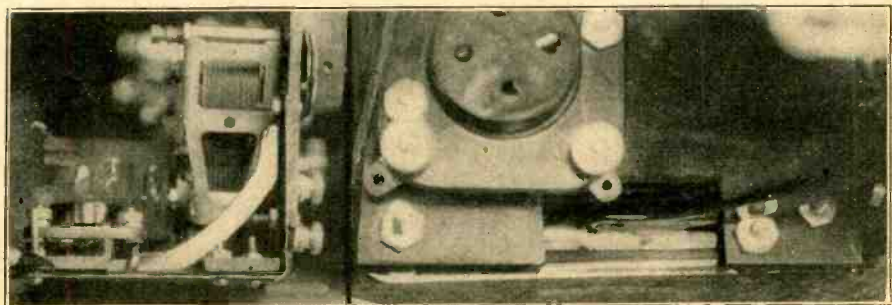
One .0005 mfd. variable condenser, with shaft $3\frac{1}{2}$ " up from bottom, and 2" in from left-hand panel side. This is C1 and it is turned with a knob, instead of with a dial. The knob should have a pointer. A scale reading 0, 20, 40, 60, 80 and 100 should be engraved on the panel, or some other indicating system used.

One .0005 mfd. variable condenser, with shaft $3\frac{1}{2}$ " up from bottom and 6" from left-hand side of panel. This is C2. A vernier dial is attached to this shaft.

A .0005 mfd. variable condenser, $3\frac{1}{2}$ " up and 6" from right-hand side of panel. This is C3 and it takes a vernier dial.

Two binding posts for antenna and ground. These are 1" from left-hand side of panel and respectively $\frac{3}{4}$ " and $1\frac{3}{4}$ " from bottom. The mounting hole centers are meant.

Two phone tip jacks, PTJ in Fig. 1, published last week, located at right-



FIGS. 15 AND 16.

The pencil at lower left points to the sub-panel where it is fastened to the brackets (Fig. 15), while the way the sub-panel is cut out, to enable mounting it on the brackets, is revealed at right (Fig. 16).

Preparation for the Wiring Is Set Forth With Great Lucidity — Laboratory Set Constructed by the Author is Used as Model — All Constructors Safeguarded Against Dilemma of "Not Enough Room"

hand side, 1" in and respectively $\frac{3}{4}$ and $1\frac{3}{4}$ " up from bottom.

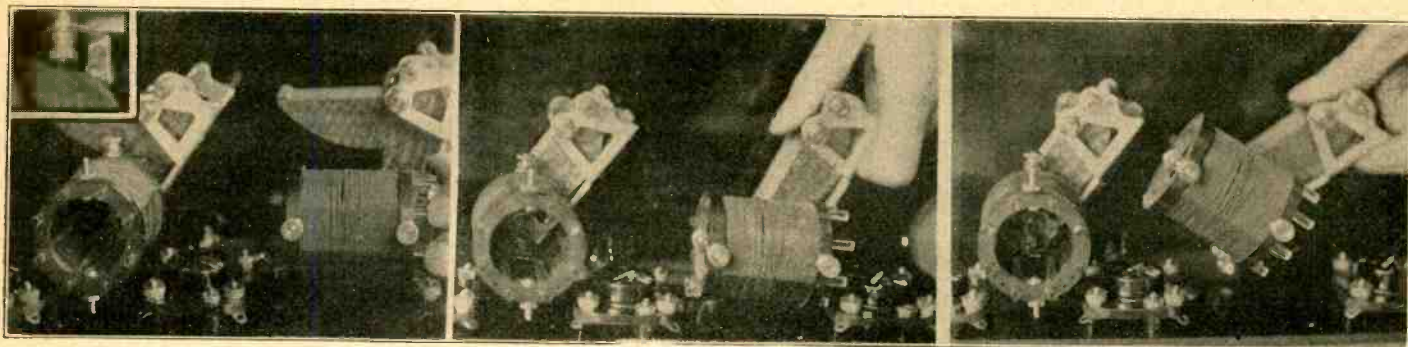
Two switches. One is S1 and is located $3\frac{3}{8}$ " from left-hand side of panel and 1" down from top. For the other, S2, the point is $3\frac{3}{8}$ " from right-hand side of panel and 1" down from top.

One rheostat, R1, located with central hole 2" from right-hand side of panel and $3\frac{1}{2}$ " from top or bottom.

On the panel also are screw heads showing where the brackets are fastened to the panel, where two brass angles are likewise secured, and where the second audio transformer is mounted. These positions may be located by experiment, but the dimensions taken from the laboratory set follow: $15/16$ " down from top, and, respectively, 1 and $1\frac{1}{2}$ " from left-hand side of panel. These holes coincide with others in a brass angle having two arms, each $1\frac{1}{2}$ " long, the right-angle being bent flat, then rebent into a right angle $\frac{7}{8}$ " from the end that's on the panel. This makeshift was used, and very successfully, because it was difficult to get brass angles with the bend in the correct place, to enable the free end to be secured to the carrying case when the set was inserted therein. The other angle holes are $15/16$ " down from top and 1 and $1\frac{1}{2}$ " from right-hand panel side, respectively. The holes for mounting the first AF transformer to the panel, this transformer being Thordarson 6-to-1, are 1" down from top, and, for this plane, $\frac{3}{4}$ and $2\frac{5}{8}$ " from right, and for the next plane, which is $2\frac{1}{4}$ " down from top, the same distance from the right as the previous two. Thus there are four holes for mounting this transformer, which should have its secondary posts on top (B and plate).

Mount these parts. Attach the knobs to the first condenser and the rheostat, also the dials to the two remaining condensers, and secure the brackets to the panel. The Bruno dials require a small hole for preventing shifting. The brackets are so placed that their horizontal level fits right on a table and enables the complete support of the panel on the table. In other words, the bottom of each

New Kink in Coil Mounting



FIGS. 6, 7 AND 8.

Notice how the relative position of one of the coils (L2 L3) may be shifted by moving the variable condenser to which it is attached. Fig. 6, at left, shows this coil being placed exactly at right angles to the next RF coil (L4 L5). But if stray inductive coupling exists between stages, the coil may be put at the proper angle. Fig. 7 (center) shows a slight change in position of L2 L3, while Fig. 8, an exaggerated position, merely proves the latitude this system possesses. It is applicable to any receiver in which this coil is mounted on the condenser frame. The inset at upper left is the brass angles used for mounting.

bracket is flush with the top of the table and with the bottom level of the panel. The brackets used are obtainable in a hardware store and measure 3x4". The 4" dimension is used horizontally.

Watch the Rheostat, R1

The holes for mounting the rheostat and for mounting the variable condensers, will be obtained from the instruments, or from templates furnished for them by the manufacturer. Remember to mount the rheostat with terminals of the winding pointing to panel top.

Now, turning the panel around, to look at the back, the two switches, if of the Bruno manufacture, will have their light socket bases facing each other. No lamps will be put into these instruments. Indeed, while the A battery switch, S2, may have a lamp, it is better not to use the juice in a portable, although if for a home set, the lamp should be included, for it beautifies the set to see the lamp glow through the red window. The aerial switch, S1, is of the same kind as S2 simply to preserve identity of appearance.

The rear view of the panel will show the rheostat mounted upside-down, so to speak, this being necessary so that the first audio transformer will not be obstructed by the terminals of the winding on the rheostat.

The sub-panel is 16 $\frac{3}{4}$ x4" and may be hard rubber or Bakelite, indeed, wood, for that matter. It is notched at both ends, to permit its placement. Otherwise the sub-panel would not pass the brackets. The brackets used consisted of the angle with supporting arc. Only by cutting U-shaped holes it is possible to mount the sub-panel.

The brackets used called for a notch 1" in from one long side, 1 $\frac{1}{2}$ " in from the opposite long side, and 1" from the short side at which you are working. Hence the slot is 1 $\frac{1}{2}$ x1".

The same operation is repeated at the other end. The measurements may be made experimentally simply by placing the brackets on the sub-panel, which means resting the construction work on it, so far as that work has progressed. Then locate the drill holes from bottom up. However, actually to mount the sub-panel it is necessary to remove one of the brackets from the front panel, and attach it to the sub-panel. This is due to the impossibility of bending the sub-panel to get the notched part into one end. Hence, mount one bracket on the sub-panel and complete the work by mounting the sub-panel on the other bracket.

The Socket Mounting

Next mount the sockets. These are

Coils Are Placed at Right Angles, and the Position of L3L4 May Be Varied With Ease to Get Rid of Stray Inductive Coupling, a New and Valuable Kink For Home Constructors

Benjamin Clear-a-tone. They have full floating spring action, excellent for portables especially. Each socket has two mounting holes. The sockets are mounted with the plate and grid lugs flush with the back of the sub-panel. The arrows on the sockets point to right, 45° from front panel. Measuring from right to left, as you look at the back of the panel, that is, with sub-panel rear nearer you, the dimension for one hole of each pair on a socket is as follows: socket 1 has its right-hand hole 1 $\frac{1}{8}$ " from right; socket 2 is 5" from right; socket 3 is 9 $\frac{5}{8}$ " from right, socket 4 is 4" from left, and socket 5 is 1 $\frac{1}{8}$ " from left. Only one socket hole is meant. The other hole in each socket locates itself, as an awl may be used, the point being driven into the sub-panel through the socket hole. The sockets are mounted with 1" screws of the 6/32 variety, the nuts being on top of the sockets. Use small nuts, as large ones will obstruct the socket binding posts.

The Amperite mountings are placed with the holes 8" from left, the mountings being side by side, lengthwise on the sub-panel, one mounting hole $\frac{1}{2}$ " back from the front, the other 1 $\frac{1}{2}$ " back. These positions are between condensers C2 and C3.

Now place an audio transformer in position under the rheostat, on the sub-panel, with binding posts pointing to the right (not left) of rear of panel. A piece of wood is cut the size of the mounting base of the transformer (1 $\frac{3}{4}$ x2 $\frac{1}{4}$ ") and one or two brass angles are mounted to this block, using machine screws with flat heads. The holes are countersunk in the wood where they are to accommodate the brackets on the transformer base side, to economize space. Mount the brackets in the wood. Then small wood screws are used to mount the transformer onto the wooden base. Owing to the small room it is not handy to use machine screws here, as they would necessitate drilling holes at points quite

ACCESSORIES

(For Panel and Sub-panel)

Three dozen 6/32 machine screws or bolts, 1" long.

Three dozen small nuts to match.

Two 3x4" brackets.

Four brass or other metal right angles, each arm 1 $\frac{1}{2}$ " (for securing the case and for mounting second AF transformer).

Four brass or other metal right angles, each arm $\frac{3}{4}$ " (for mounting coils).

ACCESSORIES

(Other than for Panel and Sub-Panel)

One week-end carrying case, 17 $\frac{1}{2}$ x11 $\frac{1}{2}$ x5 $\frac{1}{2}$ ", outside dimensions.

Six wing nuts with $\frac{3}{4}$ " bolts.

One reel aerial.

One wing nut with 1 $\frac{1}{2}$ " bolt (to fasten reel aerial to case).

One Tower Midget speaker.

Five 4 $\frac{1}{2}$ -vo't Eveready C batteries (No. manufactured by National Carbon Co.

Four Eveready Midget size B batteries, 22 $\frac{1}{2}$ vo'ts each (No. 763), manufactured by National Carbon Co.

One 4x16" board for battery block support.

One 2-ft. aluminum strip, 1" wide.

LIST OF PARTS

Three Bruno straight line frequency condensers, .0005 mfd. each (C1, C2, C3).

Two Bruno vernier dials.

One 30-ohm rheostat (R1).

One pointer knob for $\frac{1}{4}$ " shaft to match rheostat.

One .00025 Aerovox grid condenser with 5-meg. leak (C4, R4).

Three Bruno Light 5 coils (L1, L2L3, L4L5).

Two phone tip jacks (PTJ).

Two binding posts.

Six feet of flexible wire, insulated.

One Aerovox .001 mfd. fixed condenser (C5).

Two 6-to-1 Thordarson transformers (PBGF).

Five Benjamin Clear-a-tone X sockets.

Two 4v-99 Amperites, R2, R3.

Set of tags for battery leads.

Two Bruno switches.

Panel, subpanel.

close to the ends of the wooden block. However, by exercising care, even this may be done.

The remaining open ends of the brass angles, which are of the 1 $\frac{1}{2}$ x1 $\frac{1}{2}$ " variety, are secured to the sub-panel. If the angles have two holes, as usual, at one point only one of these two may be used, as there is nothing but air at the point under discussion.

Radio University

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When writing for information give your Radio University subscription number.

I WOULD like to build the 1-tube DX set, described by Herman Bernard in the Oct. 24 issue of RADIO WORLD, as a 4-tube set, wherein a stage of radio frequency amplification is placed ahead of the detector and three stages of audio frequency amplification are placed ahead of the detector. The first audio stage should employ a transformer, while in the last two audio stages resistance coupled AF should be used. Complete coil data, wiring directions, specific constants of all parts used and description of a panel layout would be very much appreciated.—James Gordon, Long Island City, N. Y.

The primaries, which will be called L1 and L3, consist of 8 turns, wound on a 3" diameter tubing. The secondaries, which will be called L2 and L4, consist of 58 turns wound upon the same tubing. The secondary winding of the detector coupling RFT is tapped at the 8th turn from the beginning of the winding. No. 24 double cotton covered wire is used. Between the primary and the secondary windings, on both tubings, a ¼" separation is made. Variable condensers, having a capacity of .0005 mfd., which will be called C1 and C2, shunt the secondaries of these RFT. A .00025 mfd. variable condenser is used as the plate control condenser. If you wish to use a .00035 mfd. variable condenser, you will have to tap the coil at the 6th turn, instead of the 8th. This condenser will be called C3. The .00025 mfd. fixed grid condenser will be called C4. The 2 megohm grid leak will be called R1. The audio frequency transformer will be called AFT. The resistor in the plate circuit of the first audio tube, will be called R5 and has a resistance of 100,000 ohms. The resistor in the grid circuit of the next audio tube, will be called R6 and has a resistance of 500,000 ohms. The fixed resistor in the plate circuit of the same audio tube will be called R7 and has a resistance of 100,000 ohms. The last resistor in the grid circuit of the last audio tube, has a resistance of 250,000 ohms and will be called R8. The two blocking condensers, which will be called C5 and C6, have a fixed capacity of .25 mfd. As to the wiring of this set. The beginning of the primary winding of the first RFT is brought to the antenna post on the terminal strip. The end of this winding is brought to the ground post on this same strip and to the A minus post. This same connection is also brought to the variable plate connection of C1 and to the beginning of the secondary winding, L2. This same connection is also brought to one terminal of the rheostat, R2, terminal connecting with arm, which has a 10 ohm resistance. The end of secondary winding is brought to the grid terminal on the first socket and to the stationary plate connection of C1. The plate post on this same socket is brought to the beginning of the primary winding, L3. The end of this winding is brought to the B plus post on the terminal strip, labelled 67½ volts. The beginning of the secondary winding, L4, goes to the rotary plate connections on both C2 and C3. The tap on this winding is brought to the A plus post on the terminal strip and the socket. The end of this winding is brought to the stationary plate connection on C2 and to one terminal of the leak-condenser combination, R1C4. The other terminal of this combination is brought to the grid post on the second socket. This socket will hold the detector tube. The stationary plate connection of C3 is brought to the plate post on this same socket. It

also goes to the P post on the AFT. The B plus post on this AFT is brought to the B plus post on the terminal strip labelled 45 volts. This is the detector B voltage. The grid terminal on this AFT is brought to the grid post on the third socket. This socket will hold the first audio tube. The F terminal on this AFT is brought to the A minus post on the strip. The plate terminal on this socket is brought to one terminal of R5. The other terminal of this resistor is brought to one terminal of R7 and to the bottom terminal of a single circuit jack. This common lead is brought to the B plus post on the terminal strip, labelled 135 volts. One terminal of R6 is brought to the grid post on the fourth socket. This socket will hold the second audio tube. It also is brought to one terminal of the fixed condenser, C5. The other terminal of this condenser is brought to the plate post on the first audio socket. The other terminal of R6 is brought to the A minus post on the strip. The other terminal of R7 is brought to the plate post on the second audio socket. This terminal is also brought to one terminal of C6. The other terminal of C6 is brought to the grid post on the last audio socket and to one terminal of the fixed resistor, R8. The other terminal of this resistor is brought to the C minus post on the strip, not the A minus post. The plate post on this last socket is brought to the top terminal on the single circuit jack. As to the filament connections. The F plus posts on all the sockets are connected together. They are then brought to a terminal of a filament switch. The other terminal of this switch is brought to the A plus B minus post on the strip. The resistance terminal of R2 is connected to the A minus post on the first socket. The resistance terminal of R1 is brought to the A minus post on the detector socket. The other terminal arm of this 6 ohm rheostat is brought to the A minus post on the strip. All the F minus posts of the three audio tubes are connected together. They then are brought to the one terminal of a ¼ ampere ballast resistor, which may be called R3. The rheostat controlling the filament of the detector tube may be called R1. The core of the audio frequency transformer is brought to the ground and to the A minus post. This is the same lead that the end and the beginning of the primary and the secondary windings of the first RFT, respectively are brought to, etc. As to the layout of the parts. A 7x24" panel and a 7x18" baseboard are used. The radio frequency transformers should be so mounted that they are about 2 or 3" from the variable condensers. The first RFT should be mounted so that is about 4" from the other RFT. The best way to do this is to mount the first RFT on a separate board. It will be noted that the baseboard is 6" shorter than the panel. This leaves the extra portion for this special board, on which the first RFT is to be mounted. A piece of copper or other metal should be then placed between these RFT and grounded. Mount the second RFT so that it is also at right angles to the first RFT. That is, mount the first RFT perpendicularly and the second RFT horizontally. The socket holding the first RF tube should, of course, be mounted so that it is near the first RFT. The four sockets for the detector and the AFT are mounted in a row, with the detector socket nearest the second RFT. The audio frequency transformer should be mounted nearest the socket

which holds the first audio tubes. The resistor units, then, should be mounted nearest the other two sockets. Although the two RFT are separated, the condensers which shunt their secondaries should be directly in front. That is, the centers of the variable condensers should be approximately 8" distant. This depends upon the distance of the two coils. The plate condenser may be placed in between. The two rheostats are mounted to the right of the condensers. The loud speaker jack is mounted in the extreme lower right hand corner. The terminal strip should be placed on back of the baseboard, to the right. A cable may be used, if desired, the results not being impaired in any way. The —01A type tubes are used throughout this set. Therefore a 6-volt storage battery should be employed to light the filaments. If as much as 135 volts are used on the plates of the last audio tubes, then a 6-volt C battery should be used. Both RF dials will tune in step, provided the antenna is about 100 feet long, including the leadin. The ground lead should be approximately 30 feet. The control filament of the RF tube is critical. The detector tube is not critical. The plate condenser, C3, controls the regeneration or the oscillatory action of the tube. This is not critical, however. If the detector tube does not oscillate sufficiently, either the capacity of the variable condenser, C3, may be increased by shunting with small condenser, having capacity of .00025 or .00035, etc., or increasing the number of turns in this circuit. In other words, tap the coil at the 9th or 10th turn instead of the 8th, etc. A loop may be used with success with this set. All that are needed are four binding posts and of course the loop, which is made thus. The frame should be 2 feet square. Fourteen turns are wound on this frame, each turn being separated ¼", No. 14 bare copper or annunciator wire being used as the conductor. The grid post on the first socket is brought to one post. The post, which is adjacent, is then connected to the end of the secondary winding, L2. The stationary plate connection of the variable condenser, C1, is brought to the grid post of the socket. The rotary plate connection of C1 is brought to one post. The other post, which is adjacent, is brought to the beginning of the secondary winding, L2. Now when the loop is to be used, place the terminal from the loop to the posts, connecting with the grid and the F minus posts of the first socket. When the antenna is to be used, place a piece of bus bar across both posts, so the grid is connected to the end of the secondary winding and the beginning of this winding is brought to the F minus post. The loop terminals are then disconnected from the circuit. No distortion should prevail. If it does, the trouble will most certainly be present in the resistance stages. That is, there might be a possible short or open circuit in the resistors or the fixed condensers. This can be found out with the aid of a pair of phones and a dry battery, etc. When connecting the loop, be sure that the loop terminals are connected to the stationary and rotary plate connections of C1, but not to any portion of the secondary winding.

* * *

I WOULD like to have the wiring directions of a 4-tube, single major control receiver, employing a regenerative detector and three stages of audio frequency amplification. The first stage of AF coupling should be of the transformer type, while the last two stages should be of the resistance coupled type. I wish to wind the coil on a spider weave form, a diagram of which is requested. The number of turns to be placed on the coil, capacity of condensers, resistance of fixed resistors, description of panel and baseboard layout

are also requested.—Gregory Gordon, Sioux City, Ia.

The primary, L1, consists of 10 turns. The secondary, L2, consists of 50 turns. A special tickler coil, consists of 38 turns. The primary and secondary are wound with No. 22 double cotton covered wire. The tickler is wound with No. 36 single silk covered wire. The form that these windings are to be placed upon is shown in Fig. 1. This form is cut out of either a piece of hard rubber panel or cardboard. The dimensions are clearly marked on this form. Two of these forms will be needed. One of these will carry a primary and secondary winding. The other will carry the tickler winding. The primary winding is begun near the center hub. There is no space left between the two windings. The 1 1/2" hub may be cut out, or left in. If it is left in, binding posts should be inserted. The beginning and end of the windings are then brought to these posts, marked for convenience. If the hub is cut out, the leads from the windings should be made long enough for connecting. One of the projections of the form may be used as a mounting, an angle iron being bolted thereon. The tickler coil should be mounted parallel to primary-secondary coil, with the secondary winding nearest the tickler winding. If, however, the center section is not cut out, as is done when using the projection as a mounting, an angle iron may be bolted on this center portion and the two coils joined together with a long screw. In this way only one mounting will be needed for the two coils and greater coupling between the two will be obtained. In other words, to leave the center hub in saves trouble. A .0005 mfd. variable condenser, C1, shunts the secondary winding. A 2,000-ohm potentiometer, R1, shunts the tickler winding. The audio frequency transform, AFT, should have a low ratio. Fixed resistances R3, R4 and R6, have a resistance of .1 megohm, while R5 has a resistance of .5 megohms. C3 and C4, fixed stopping condensers, have a capacity of .25 mfd. R2, a detector filament rheostat, has a resistance of 6 ohms. A ballast resistor, R7, controls the filament of the three audio tubes. This has a carrying capacity of 3/4 amperes. Now as to the wiring of this set. The beginning of the primary winding, L1, is brought to the antenna post on a strip. The end of this winding is brought to the ground post on this strip. The beginning of the secondary winding, L2, is brought to the rotary plate post on C1 and to the F plus post on the detector socket. The end of this winding is brought to the stationary plate post on C1 and to the grid post on this first socket. The plate post on this socket is brought to the beginning of the plate or tickler winding. It also is brought to one terminal of R1, this being the end post. The other end post of this potentiometer, R1, is brought to the end of the tickler winding. The center post being connected with the arm of the potentiometer is brought to the P post on the AFT and to one terminal of a .001 mfd. fixed condenser, C2. The other terminal of this fixed condenser is brought to the A minus terminal on the strip and also to the terminal on R2, connecting with the arm. The resistance terminal of this rheostat is brought to the F minus terminal on the socket. The B plus post on the AFT is brought to the B plus 67 1/2 volt post on the strip. The G post on this AFT is brought to the grid post on the second tube, or the first audio tube. The F minus post on this AFT is brought to the A minus post on the strip and to one terminal of R7. The other terminal of this ballast resistor is brought to the F minus terminal on the socket. This same terminal is also connected to the F minus terminals on the other sockets. The plate post on this socket is brought to one terminal of the fixed resistance, R3, and to one terminal of C3.

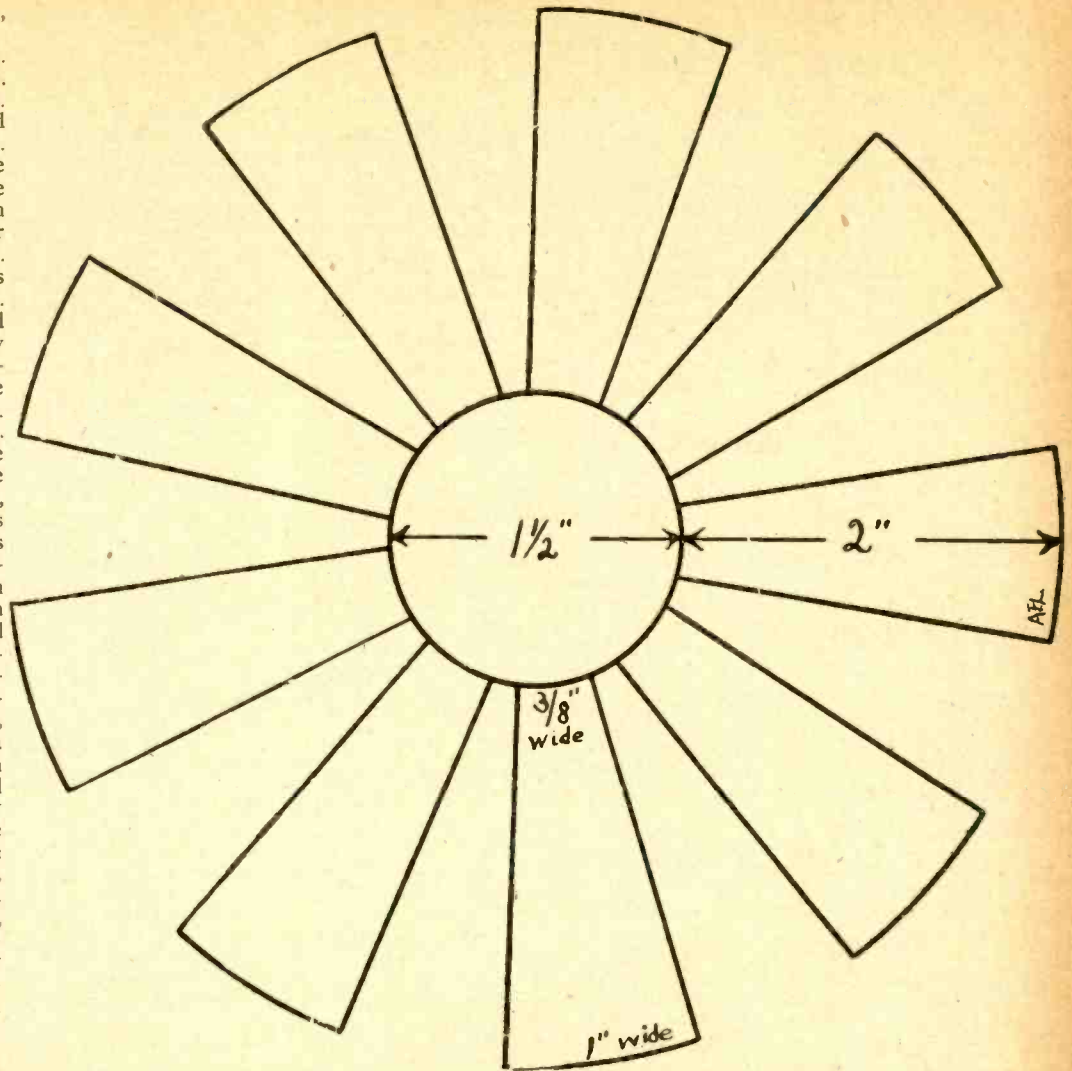


FIG. 1. The form upon which the special coil for the set described for Gregory Gordon is wound. The turns should be brought over two of the protruding arms and then under two. The winding should be very tight.

The other terminal of this condenser is brought to the grid post on the next socket, which will hold the second audio tube, and to one terminal of the fixed resistor, R4. The other terminal of R3 is brought to the B plus 135 volt post on the strip. The other terminal of R4 is brought to the F minus post. The plate post on this socket is brought to one terminal of R5 and to one terminal of C4. The other terminal of C4 is brought to the grid post on the last socket and to one terminal of R6. The left off terminal of R5 is brought to the B plus 135 volt post. The left off terminal of R6 is brought to a C

minus terminal. The plate post on this socket is brought to the top terminal of the single circuit jack. The bottom terminal is brought to the B plus 135 volts post. All the F plus posts are connected together and thence to a terminal of a filament switch. The other terminal of this switch is brought to the A plus B minus post. The F minus post on the last two audio sockets are brought to the F minus post on the first audio socket. A 7x12" panel and cabinet to fit can be used to mount the parts. Condenser should be in the center, potentiometer to the left and rheostat to the right.

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Pointers on the Patent Law

Disclosure of New Radio Device to Friends Often Avoided, in Fear of Being Tricked by Them, Only to Defeat the Patent for Want of Necessary Proof as Against Rival Claimant — Time of Reduction of Invention to Practice, Not Date of Filing of Application, Determines Priority.

[The author of the following article, the subject of an address before the Institute of Radio Engineers, is a noted patent authority, a member of the New York Bar and a lecturer on patent law at Columbia University.]

By *Everett N. Curtiss*

THE inexperienced inventor as a rule is the victim of his own imagination or his own unfounded suspicions, in that usually he is watching for some patent pirate just around the corner whom he fancies is looking for the opportunity of swooping down upon him and of taking away the coveted prize.

He is, therefore, fearful of disclosing his invention to anybody. He is suspicious even of his friends. It may be in rare instances his friends are such as to warrant such suspicions, but more often the inventor's secretiveness results in his neglecting to preserve proper evidence of his date of conception and his reduction to practice, so that in case of a contest



HIROSHI ANDO, 24, Japanese, says he invented television in 1925 and the Neutrodyne in 1922, which was before Prof. Hazeltine brought forth his Neutrodyne.

as to who is the prior inventor of a certain invention he is unable to offer good and sufficient proof of the actual facts and loses the contest, not to a pirate but to a rival inventor with the requisite evidence.

Filing Date Not Controlling

Some inventors have the idea that patenting an invention is a sort of marathon race to the Patent Office. As most people know, nothing could be farther from the truth. While it is of advantage to be the first to file an application in the Patent Office, a prior inventor if he be diligent in reducing to practice and in filing his application will, nevertheless, prevail even though his filing date is subsequent

Comprehensive Notebook Should be Kept by Inventors and Diagrams and Explanations Recorded Therein — Witnesses Should Sign Important Passages and Dated Drawings Should Be Drafted—Affidavits and Also Letters in Post-marked Envelopes Other Good Forms of Proof.

to that of his rival, but not two years or more prior to the issue date of his rival's patent. Furthermore, getting a patent is not a speedy process. Ordinarily it is several months before a patent application is reached by the examiner and several years before the patent actually goes to issue.

It sometimes happens that where two or more men have been working to bring an invention to a successful issue it is determined by them to file an application for a joint invention. The central idea may have been the creation of one of them, but the others have contributed time, effort and mechanical skill, and it seems only just, all things considered, that the application should be filed in the names of all of them. This is often a snare and a delusion.

Few Joint Inventions

Joint inventors are those who jointly create a single invention. If the creation of the invention is the product of a single mind no amount of co-operation of others in reducing the same to practice can change the original individual creation into a joint invention. It is rarely that two or more persons can unite together in creating a single invention.

In many cases, where so-called joint inventors are subjected to cross-examination, it develops that there was but one inventor and that the others were not inventors at all and the patent is declared void for this reason.

Great care should, therefore, be taken where an inventor deems himself a joint inventor. He should carefully sift the whole situation to determine whether or not after all there was really joint invention, and only after mature consideration should a joint application be filed.

Should Keep Records

It is of great importance to the radio inventor to keep and preserve careful records. He should have note books in which to make sketches of such inventions as may occur to him from time to time, together with notes of explanation. These should all be dated. If he thinks that any of these are of material importance he should secure the signature of witnesses and also have made up dated drawings by a competent draftsman fully illustrating his construction. Another method is that of a drawing and affidavit clearly describing the same and setting forth the fundamental features of the invention. Still another method is that of writing dated letters disclosing the invention to a relative or to a friend, particularly where the envelope bearing the postmark is preserved. It is also of im-

Summary of Thirteen Patents Newly Granted

WASHINGTON.

The following patents were granted recently:

1,586,985—Duplex Carrier-Wave Transmitting and Receiving System. Harold Trap Friis, Red Bank, N. J., assignor to Western Electric Company. Filed Dec. 28, 1921.

1,587,096—Combined Radio Loud Speaker and Lamp. Arthur E. Wheeler, Logansport, Ind. Filed June 30, 1925.

1,586,653—Wireless Transmission System. Frank Conrad, Pittsburgh, Pa., assignor to Westinghouse Electric and Manufacturing Company.

1,586,558—Electron-Discharge-Devices Manufacture. James E. Harris, Newark, N. J., assignor to Western Electric Company. Filed Nov. 20, 1922.

1,587,168—Loop Aerial. Marius Mathieson, Chicago, Ill., assignor to Mathieson-Sandberg Company, Chicago, Ill. Filed April 13, 1925.

1,587,389—Condenser. Olov Gustav Lissen. Jersey City, N. J. Filed March 13, 1924.

1,587,095—Electrical Condenser. Bester R. Webster, Chicago, Ill., assignor to Reliance Die and Stamping Company, Chicago, Ill. Filed April 28, 1924.

1,586,580—Oscillating System. John C. Schelleng, Milburn, N. J., assignor to Western Electric Company. Filed Aug. 20, 1925.

1,586,524—Constant Frequency System. Raymond A. Heising, Milburn, N. J., assignor to Western Electric Company. Filed Dec. 29, 1916.

1,586,657—Inductive Loop Antenna. Solomon Davids, Wheeling, W. Va. Filed May 17, 1923.

1,586,672—Crystal Detector. Edwin L. Hackett, Wyoming, N. J., assignor to M. H. Avram & Company, Inc. Filed Sept. 5, 1922.

1,586,755—Inductance Apparatus. John F. Lindberg, Chicago, Ill., assignor to Reliance Die and Stamping Company, Chicago. Filed Sept. 25, 1922.

1,586,828—Radio Detector. Andrew H. Miller, Detroit, Mich. Filed Nov. 26, 1923.

Safeguards for Inventors

portance to save if possible any models or full sized machines, together with working drawings, bills for parts and records of actual tests. All these matters go to show the date of invention, the date of disclosure and the date of reduction to practice.

The Armstrong Case

It is not the date of filing an application for patent which controls in a contest as to who is the first inventor. It is he who can show by a preponderance of the evidence that he first conceived the invention and with due diligence reduced it to practice that will be declared the first inventor and entitled to the patent.

Thus, for example, in the well known litigation over the Armstrong feedback patent in the Federal courts in the Second Circuit, Armstrong was able to prevail over all other alleged inventors making claims to his invention by reason of the decisive character of his proofs establishing the fact that he was the first inventor.

The inventor's mere assertion, standing alone, that he invented his device on a certain day amounts to nothing.

Neglect is Costly

No court will ever find the date on invention to be established on the uncorroborated testimony of the inventor. It is, therefore, of the utmost importance that this evidence be secured and preserved as heretofore indicated, or the inventor will have to bear the penalty of his neglect. So also must the inventor's reduction to practice be fully substantiated.

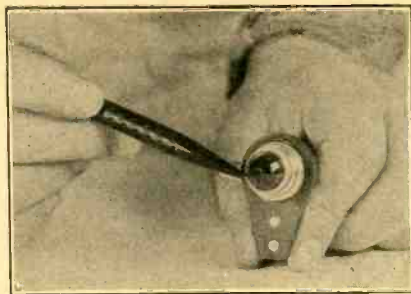
If sufficiently early in point of time the date of the filing of the application may be relied upon as a constructive reduction to practice, but it is better, all things considered, to try out and demonstrate at the earliest possible moment under the conditions of actual commercial use the operativeness of the invention. It is evidence of the tested reduction to practice which counts most heavily with the courts and the one which most effectively disposes of the contention of abandoned experiment.

Should Act Promptly

An inventor cannot afford to sleep upon his rights. If he has made an invention it is his duty to apply for a patent. The theory of reward to an inventor by the grant of patent is based upon some obligation in his behalf. A patent is a contract. In consideration of the enjoyment of the exclusive right of the invention for the period of seventeen years the inventor makes a full disclosure to the public in order that at the end of this period the public may have thrown open to it the full knowledge of and right to make, use and sell the invention. In other words, an inventor must play fair with the government. If he makes an invention and takes no steps toward reducing it to practice or demonstrating its practical use until a rival inventor enters the field he may lose his right. If he stands idly by and permits others to use his invention without protest his acts may be construed as a constructive abandonment and his rights to a patent are forfeited. Where this right is once abandoned by the inventor it cannot afterward be resumed at pleasure, as where gifts are thus made to the public they become absolute.

Care Necessary on Claims

Another important matter neglected by inventors is the necessity of making a full disclosure of the invention in the application as originally filed. While the fullest opportunity of amendment both of the specification and claims is permitted



APPLICATION for a patent for a turn-and-press light switch for panels has been made.

in elucidating, amplifying and correcting the same, it is not permitted to incorporate new matter. The inventor, therefore, should not rely too much upon his attorney for this original disclosure. He should read and re-read the specifications and claims as drafted by his attorney to make sure that his invention is fully and correctly set forth.

It is better by far to say too much than not enough. Too much may easily be cancelled, but if the inventor says too little he will be correspondingly limited.

Path to Broad Protection

The claims are also important. The claims are the life of the patent. The inventor is required by law particularly to point out and distinctly claim the part, improvement or combination which he claims as his invention. Nothing is secured to the patentee unless there be in his patent a valid claim covering it.

What is not claimed is by implication given to the public, so claims should be drafted to give the inventor the broadest possible protection. The broadest claim of the patent is the claim containing the fundamentals of the invention, or the invention reduced to its lowest terms.

The inventor should realize this and carefully examine the claims with this in mind.

The drawings should be carefully checked, and enough figures should be employed fully to illustrate the invention. Mistakes are likely to creep in. Care must be taken to correct them before the patent is issued. If a drawing is defective, as, for example, where an inoperative hook-up is shown, the effect on the patent may be disastrous and may result

in the patent being declared to be void for want of utility.

Patent Requirements

For an alleged invention to be patentable it must be new, it must have utility and it must involve the exercise of the inventive faculty. What the inventor gets by his patent is a negative right—that is, the right to exclude others from making, using or selling his invention without his permission. If his rights are infringed he may obtain relief by a suit at law for damages or by a suit in equity for an injunction, profits and damages.

The 2-Year Rule

The two-year statutory periods are important to the inventor. The patent statute provides that a printed publication or patent published in this or in any foreign country more than two years prior to the filing of the inventor's application here, or a public use or sale of the invention in this country more than two years prior to such date, shall operate as a bar to the issuance of the patent.

This language not only applies to publications and uses of other persons than the inventor but also to the inventor himself. Care should accordingly be taken by the inventor not to permit these two-year periods to run against him, either by rushing into print or by permitting a public use of his invention and then neglecting to file his application within the time.

Furthermore, the inventor, if he contemplates filing applications abroad, must be careful not to publicly publish or use the invention here in advance of the making of such applications or he may lose valuable rights or perhaps all rights relating thereto.

Penalty of Secrecy

Some inventors have thought it better to conceal their inventions, as in the case of a secret process—to delay over a considerable number of years the filing of an application for a patent until it was determined that secrecy could not longer be maintained. The danger of this is that courts have held in a number of cases that such conduct on the part of the inventor constituted abandonment and forfeiture of the right to obtain a patent.

In the absence of a special agreement, inventions made by an employe belong to him personally. But where he is employed in a certain line of work to invent, his inventions belong to his employer. That is,

(Concluded on page 30)

Five Major Reforms Asked by Patent Board

WASHINGTON.

With the radio division, the biggest of any, five and one-half months behind in its work, the Patent Office is being considered for reorganization. Recommendations were made by the special committee for the modernization of the Patent Office.

This important office was transferred to the Commerce Department about a year ago. However, before Secretary Hoover considered any radical changes in its administration, he awaited a report from a special committee, which just now has been received.

This group, composed of patent experts from all over the country, has made five principal recommendations, as follow:

The providing of modern equipment, including steel vertical filing cases, which would greatly facilitate the clerical work of the office.

The construction of a new building at the earliest possible moment, designed for the special needs of the Patent Office and of ample capacity to provide for present necessity and future growth.

A large increase in the technical force of the office, including a larger number of principal and assistant examiners.

A larger translating and classification force.

An increase in the salaries of all scientific and technical employees in order to check the large number of resignations and obviate the present large turnover.

New Buildings Will Cost Westinghouse \$5,525,000

PITTSBURGH.

The present building program for the expansion of facilities at various plants and offices of the Westinghouse Electric & Manufacturing Company will involve an expenditure of \$5,525,000, according to T. P. Gaylord, acting vice-president of the Company.

New factory structures or office buildings are now in course of construction at East Pittsburgh, Pa., headquarters of the Company and at Mansfield, O., Detroit, St. Louis, East Springfield, Mass., Sharon, Pa., and Derry, Pa.

The cost of the new general office building now nearing completion at the East Pittsburgh works of the Westinghouse Company is \$1,500,000. The structure is 11 stories high, with a floor area of 165,000 square feet. This space is designed for the accommodation of 1,800 employees.

Acoustic Ceilings

The building is built of steel with brick exterior. The ceilings throughout the structure will be acoustically treated to diminish the reflection of sounds and noises. Semi-automatic elevators will be another modern feature. The building is scheduled for completion late this summer.

Plans for the construction of a \$500,000 storehouse for finished products at the Mansfield works of the company have been approved. The building of steel-brick design will be four stories high and will have a floor area of 130,000 square feet. This is the third building to be erected by Westinghouse at Mansfield since the company moved there from Flint, Mich.

The building under construction in Detroit represents an expenditure of \$400,

000. The building is four stories, of concrete construction with brick exterior. It will have a floor area of 100,000 square feet. It has been designed for use as office, warehouse and service station.

Other Structures

The George Cutter organization of the Westinghouse interests has under construction a \$300,000 building in St. Louis, Mo. This structure will be used as a cement pole plant—a new Cutter industry. The building is one story high and will have a floor space of 38,000 square feet.

Plans have been completed for additional buildings at the East Springfield Works that will represent an outlay of approximately \$475,000. The principal part of the program calls for a three-story office building. The offices of the new building will provide executive rooms for the engineering, sales, drafting and mechanical departments. The cost of this building will be \$275,000.

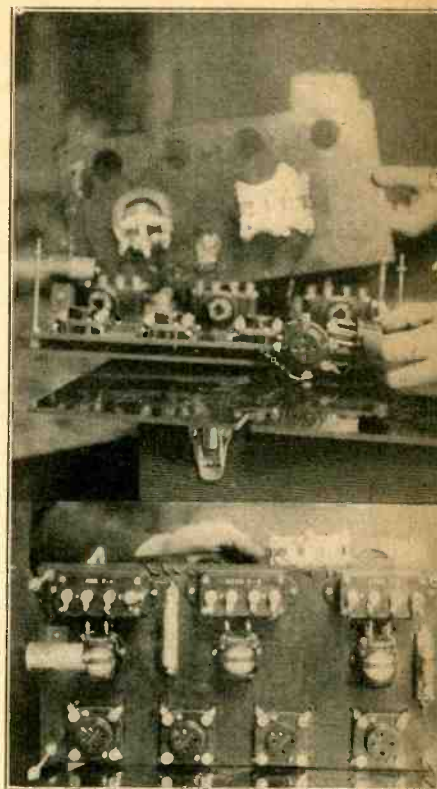
A four-story extension to be built on the main factory will be of heavy mill-type construction. This, together with other improvements, will cost in the neighborhood of \$200,000.

Sharon Activities

Plans are being prepared for construction work that will entail a cost of \$275,000 at Sharon, Pa. The program includes for a five-story building for light manufacturing purposes. The structure will be mill type of brick steel construction. A one-story building also will be erected for heat treating and galvanizing work.

A \$75,000 office building is now under construction in Derry, Pa. The building will be two stories in height. It will be of steel brick construction.

4-Tube Reflex Built a



THE photographs show a set built in a s 436 Sterling Place, Brooklyn, N. Y. It i detector and three audio stages, operated the case. How a socket base is used for There is only one tuning control.

Microphone Celebrities Are Talent in New Revues

Open air radio revues are becoming popular. Curiously enough, many of them are entirely without radio. They are based upon the idea that the listening public would be glad to see in person the local radio entertainers. Accordingly, these artists are invited to a lawn social or a community center gathering and, where it is possible to do so, the radio announcers who are also quite well known locally, present the stars.

This form of entertainment was given with considerable success recently by the Jewish Community Center at Washington, D. C., and although there was no radio hookup, there was a microphone and "broadcasting" was carried on through the evening from "Station WJCC," Washington Jewish Community Center.

Coast Guard to Show How It Communicates

How Coast Guard ships at sea communicate with one another by radio at the time of daring rescues will be shown in detail at the Coast Guard exhibit at the Sesqui-Centennial Exposition, now open at Philadelphia. There will be shown several types of radio apparatus used by the Coast Guard on its various vessels and ashore.

In the exhibit will be a model T-1 radio transmitter such as is used on the 75-foot patrol boats with a short wave receiver. Type CGR-5 medium wave 500-watt transmitter will also be on view, as well as a Type 1420-C receiver.

Tools, antennae, switches, and other radio paraphernalia will complete the layout. The radio cabins of Coast Guard cutters and patrol boats will be thrown open for inspection by listeners.

MacMillan Is 'Angekoko' To Eskimo Listeners

Eskimos in Greenland are enjoying the programs of super-power station WLWL of the Paulist Fathers in New York, according to a letter received from Mrs. Sigrid Langskov, wife of the governor of Sukkertoppen, Greenland, by Commander E. F. McDonald, Jr., who visited Sukkertoppen on the S. S. Peary with the MacMillan expedition last year.

"Sukkertoppen is known as the Venice of Greenland," Commander McDonald writes John Shepard III of station WLWL in telling of the reception reports received in the first mail of the year from Greenland. His letter continues:

"Built entirely on an island this little settlement is absolutely cut off from civilization from the middle of October

until the middle of April and you can well imagine how radio is enjoyed by them.

"Mrs. Langskov has asked me to extend her thanks to station WLWL, in a very interesting letter telling how the Greenlanders accept radio."

The Eskimo looks upon radio as something of the supernatural, Mr. McDonald explained, Commanders MacMillan and McDonald having been named "Angekoko" or Miracle Workers when they showed the Eskimos radio for the first time.

Zenith radio receivers with dry battery equipment were presented the wives of several of the governors of Greenland by Commander McDonald last year.

The women expressed deep thanks.

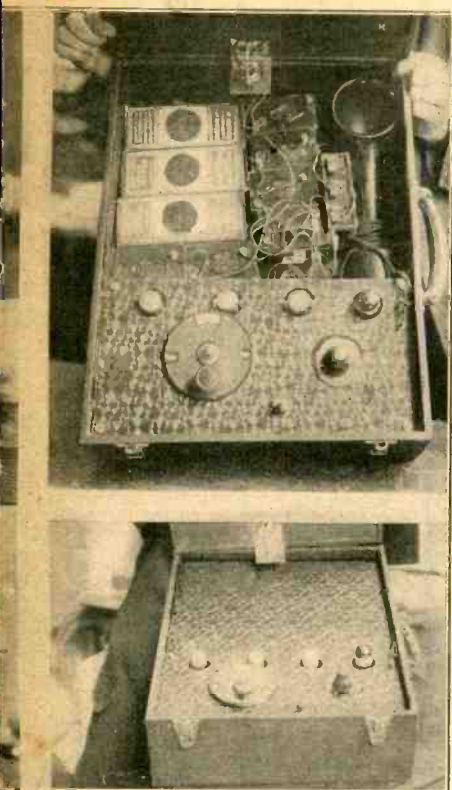
Aircraft Appropriation an Incentive to Radio

As wireless is the only means of communication with aircraft, the addition of 1,000 fighting planes, as provided in the Naval Aviation bill, will be a further incentive to development of radio for aircraft. This will not come at once, as the airplane building program, which involves an expenditure of \$85,000,000, will take five years to carry out.

Likewise interesting from a radio standpoint is that the Navy is to build two more dirigibles, each much bigger than the Shenandoah. The dirigibles, of course, will be able to carry more weight and therefore their transmitting sets may be almost of battleship size, although of considerably lighter construction.

Special sets will be constructed.

s a Portable Loop Set



Special portable case by Harvey Sampson, of a reflex, with three radio stages, crystal from a loop, which is built in the top of battery connections is shown at left, top. A potentiometer controls oscillations.

Message Arrives Safely After 45,000-Mile Trip

HONOLULU.

An outstanding example of the amazing strides that the radio amateur has made in the last few years is furnished by the record of a recent message that originated in the Hawaiian Islands for delivery in China. Although ordinarily such messages are sent either direct to the destination, or by means of one or two intermediate relays, the communication in question traveled a distance of nearly twice the circumference of the earth before it reached the party for whom it was intended.

The message was started from amateur station 6DBL, at Honolulu, and from there went to 2NZ, E. S. Strout, Jr., of New York City, no direct communication to China being possible. 2NZ gave it a fresh start toward the Orient by passing it along to 9ZT, Don Wallace, in Minneapolis; but Wallace, evidently deciding that it would be better to go back a little and get a running start, passed it to the

U. S. Navy's experimental station, NKF, at Bellevue, near Washington, D. C.

From Bellevue it was sent over to New Zealand, where 2AC, again unable to connect with China, handed it to a French station. The Frenchman evidently still had faith in the southern route, for he passed it along to a South Africa amateur. The South African happened to hear a Philippine amateur, so gave it to him, and the Philippine amateur delivered it to an amateur in China who saw that the message reached its ultimate destination.

Casual though this incident is, the average radio public will probably be startled to realize the way the amateur of to-day tosses messages back and forth between the different continents of the earth. Where five years ago it was considered a noteworthy achievement for an amateur to be able to transmit over a distance of 1,000 miles, the amateur of 1926 finds the world no larger than one of our smallest States.

Most Prosperous Season Is Forecast By Mapes

Col. S. H. Mapes in a recent interview stated that Radio Center activities convinced him that the season of 1926-7 would be one in which the radio fraternity would enjoy its most prosperous season. Not as prosperity was rated in the old days, when it was a gamble whether you made money or not, but a prosperity that could be definitely figured before the market even commenced. The elimination of the small fry and the "over-night" manufacturers from radio ranks has placed the entire radio industry on a sound and secure basis, permitting the "in good faith" manufacturer to judge and lay out just what he can offer for sale, and still assure himself of making a profit for every one without having to debase

himself to stock removal sales at the end of the season.

The large out-of-town dealer heretofore realized that he must save time if he wishes to visit all the conventions in the city. Now he eliminates this waste of busy hours by turning his steps directly toward Radio Center, the logical market as he knows for the radio industry. There he can see all the important manufacturers' lines and even hear their actual demonstrations with the minimum of time and expense.

Within the last two weeks, a total of 145 buyers, representing the cream of the trade, placed more than \$250,000 in orders with the manufacturers now at the center, said Col. Mapes.

Missing Son Sings; DX Mother Hears Him

When Mrs. S. D. Armour twirled the dials of her radio in New Orleans she accidentally picked up KTCL, Seattle. As she listened the announcer said: "The next number, a solo by Cyril Brown." The song proceeded and Mrs. Armour recognized the voice of her son, whom she hadn't seen for nine years. She did not know he had become proficient in music. A letter to KTCL told of the aerial bridge established between the long-parted mother and son.

So a complimentary program was arranged and again she heard her boy sing, this time many of the songs of the southland. She applauded by telegraph.

Ah! Miracle of Youth!

Kathleen Stewart, whose nimble fingers have many times held WEA's audience spellbound as they wove a piano melody on WEA's wave, was recently stopped by a big, bold policeman up in New York State. The guardian of the law was convinced that the charming Kathleen was too young to possess a license to drive a car, but when she gave him one of her gracious smiles and revealed her identity, he relented, and with a friendly word of appreciation for her radio programs, allowed her to shift the gears and step on the gas.

The Chain Idea

HERE lie the remains of a radio fan. Now mourned by his many relations; He filled up his gas tank while smoking his pipe. And was picked up by twenty-one stations. —Exchange.

Wavelength Assigned For Aviators' Beacons

WASHINGTON.

The first step in providing radio direction finding facilities for aviators was taken at a recent meeting of the Inter-department Radio Advisory Committee representing all government departments, when a recommendation was adopted to assign the frequency of 290 kilocycles (1,034 meters) for the exclusive use of aviation beacons.

The committee also recommended the reservation of the band between 285 and 305 kilocycles, or between the wavelengths of 1,052 and 983 meters for all forms of beacon service.

The radio beacons now operated by the lighthouse service will be continued.

The radio beacon is a signalling device operated from landing fields for the purpose of keeping aviators on course. These

signals go out in two direct lines, permitting the aviator, by calculating the intensity of the sound coming from both sides; to ascertain whether or not his course is true. With the perfection of a new compass-like device it is expected that aviators can readily keep on course by following the point of the needle.

The aviation field at Dayton is the only landing station in the United States at present equipped to send out beacon signals. Eventually it is planned to transmit the signals from permanent and emergency fields located at such points all over the country so as to provide aviators with accurate location information at all times. The beacon signals are particularly helpful at night and in bad and foggy weather.

They save many lives.

Welcome To Byrd To Be Put On The Air

WOR, in conjunction with WNYC, will broadcast the ceremony of welcome to be extended Lieutenant-Commander Richard R. Byrd, at noon next Monday, June 21. New York, New Jersey and Virginia

will participate in the welcome ceremonies, represented by Governors Smith, of New York; Moore, of New Jersey, and Harry Flood Byrd, of Virginia. Band music will be heard.

menters', these 'money-losers,' proposed that the law should be amended so that—estimating fifteen songs are played each hour—the rate for the songs be fixed at eighteen cents per song.

"If these songs are copyrights of the American Society, the collective members of this 'musical monopoly' would receive exactly \$2.70 an hour.

"The same hour which yields the 'abnormal' amount of \$2.70 for division among the musicians and writers nets the American Telegraph and Telephone Company \$2,700—for that is what the Ameri-

"If a potential enemy were to prepare in this way for anticipated hostilities, on the outbreak of war, he could readily send out the signal of destruction and to a considerable extent paralyze his opponent.

Unmanned Fighting Vessels

"We know enough today about the radio control of remote mechanisms (the field of radioteledynamics) to expect that as development proceeds, unmanned airplanes, surface vessels, submarines, and land tanks carrying dangerously destructive explosives, poisonous gases, or disease

it is reasonable to assume that with the advent of international broadcasting and the further development in this field which is sure to follow, the enemy may, in time of war, be able to have direct access to the homes of citizens and other residents in the enemy country, with consequent possible dangers which should be carefully considered. Means can, no doubt, be developed and provided for dealing with radiations from enemy countries, but this will follow only after a clear recognition of the existence of this problem."

Hoover Considers Dropping Regulation of Broadcasts

Some "Chamber" Music

he is not justified in attempting any longer to shoulder the responsibility of regula-

A THOUGHT FOR THE WEEK

THE cables tell us that the Welsh are going in strong for radio. But what good will it do the outside world if Miss Berthytha Thgwrgwg should warble the latest ditty entitled "Angeperth Gwytherb-fell Is the Sweetest Maid in Flanngerrel-laufr?" Would anybody believe it?

RADIO WORLD

REG. U.S. PAT. OFF.



Radio World's Slogan: "A radio set for every home."

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JUNE 19, 1926

Roxy Ordered to Camp to Train with Marines

Major Samuel L. Rothafel, U. S. N. C. R. has been ordered to report to the Marine Barracks, Quantico, Virginia, for active duty for two weeks training. Major Rothafel ("Roxy") will leave on July 2 and will return on July 19. Major Rothafel served in the regular Marine Corps many many years ago on the U. S. S. Bancroft, before he came to New York and became prominently identified with theatrical activities. On January 20, 1925, he was sworn in as Major in the Marine Corps Reserve personally by the Major General Commandant John A. Lejeune. Major Rothafel will attend the regular Marine Corps Reserve Training School at Quantico, Virginia.

Congress and Chaos

FACED with the customary likelihood that Congress would exact no legislation vesting power to regulate radio, Secretary Hoover is reported ready to drop all supervision and control of broadcasting, and let the stations and public shift for themselves. This is a drastic step, but if Secretary Hoover has made up his mind to take it, one must assume that the action has the approval of President Coolidge, and that both the Secretary and the President have given it most careful consideration. Both of them are conservative by nature. While at first blush it might seem a rash move, the public confidence that both men have earned entitles the policy to an adequate assay.

Looking at the facts that are behind such a proposal, one sees on the one hand the court decisions that hold there is no power vested in the Secretary of Commerce to withhold licenses from stations, or to refuse them a wavelength, or even to apportion wavelengths among them. Hence only by courtesy, and not by law, is the present exercise of authority possible. However unfortunate this state of affairs may be, whereby the radio chief of the United States functions socially, rather than legally, strictures against the courts would be out of order, for they have acted impartially. It is the law that is weak. It is a sign of strength in the judicial system that it brings to public attention and action this very weakness.

Secretary Hoover has been taking an unsound view of the judicial action in suggesting that the court decisions invited chaos. These decisions were merely declaratory. They utilized well-established rules of statutory construction and defined what powers the statute created and what powers it did not create. It must be remembered that the law was passed long before broadcasting existed, when ship-to-ship communication and other channels of exchange of commercial messages constituted the field of radio. Hence it is not surprising to find that a law enacted to meet one condition should be inadequate to meet the newer and much bigger problems which broadcasting entails.

On the other hand is Congress that, year after year, does nothing about it. Clearly it is the duty of Congress to supply the remedy, and the Secretary of Commerce no doubt has given up the idea that the courts may be relied upon to torture the meaning of the statute to confer upon him the power that he needs by law for the proper exercise of the duties of radio chief.

But Congress has been narrow and unequal to the task. Last year, despite the aid of recommendations of the Third National Radio Conference, it permitted relief measures to be lost in the shuffle of adjournment. This year, with the same fate threatening, it was only to be expected that the Secretary of Commerce should be roiled at having to shoulder not only the responsibilities of radio control, but the doubly dangerous responsibility of exercising control without duly constituted authority, in other words, trying to make good the shortcomings of a Congress unkind to him at best.

When the subject of remedial legislation first came up this year it looked as if Secretary Hoover's views would be carried into effect, for the House passed the White bill, which was based largely on recommendations of the Fourth National Radio Conference. Murmurs of discontent, based on political enmity, and fraught with jealousy of Secretary Hoover's power, while aired in the House, did not affect the result there. When the subject came before the Senate, however, the cry that Hoover was a Czar and that

control of radio was too much power for one man was loud and frequent.

Realizing the need of legislation, and fearing that too strict an adherence to the terms of the White bill might mean defeat of the project, President Coolidge looked with compromising favor upon an executive board to control radio. But this did not pacify the Senate obstructionists, and the Dill bill, creating an independent board of five, to be appointed by the President with the advice and consent of the Senate, was reported favorably by the Senate committee. Therefore if the Senate committee report were adopted, the course would be a reference to a joint committee of both branches, in an attempt to obtain a result that would meet the favor of both.

If jealousies, hatreds and ignorance had not prompted the alleged fear of creating Hoover a radio Czar, the terms of the White bill might have met with favor in the Senate, and some relief would be in sight. The independent board plan might be a good one, as presented by the Senate committee, but it is expensive and of doubtful necessity. The Secretary of Commerce has vindicated himself by his sincere administration of his radio duties. None can truthfully deny his fairmindedness and great ability. That a senseless political outcry should be raised to embarrass the radio listeners and industry is just cause for deep lament in the breast of every one whose purpose is the honest solution of this hard problem.

What the old radio law has left unsaid it is the duty of Congress to say. With little likelihood that any remedy will be enacted, it is not too bold a step for the Secretary of Commerce to let things slide in the dangerous fashion that Congress invites. The political tricksters, fighting straw Czars contrived only in the name of mud, do radio an injury, and it is well that some step be taken to show up these enemies of the public welfare. It is they who, instead of really wanting some particular bill, manage to prevent the enactment of any. The Secretary of Commerce, were he to continue his difficult duties by the grace of consent of those affected, would be at the mercy of any one who would withhold such consent, e.g., by usurping a wavelength.

Let Congress fail to pass any remedial bill, if it so insists, and let the Secretary of Commerce wash his hands of the whole unhappy mess. Then let Congress answer for itself.

The Trend in Sets

THE mechanical and the aesthetic in radio receivers are occupying the foreground of attention at this time. There has been a change from primary consideration of circuit to fundamental appraisal of appearance and manual operation. This is because the circuits have settled down to an orthodox group. Generally speaking, sets of a like number of tubes are on a fairly equal basis of performance.

Last year the trend toward console models set in. Also sloping panels started to gain favor. The encased type of dial ran into a worthy sea of popularity, supplanting the plain round mould of prior ascendancy. The speedometer types of dials took unto themselves quite a following. These afford a reading behind the panel, while the dial is turned from the front. In manufactured sets the drum dial pleased the eye and the hand of many. With the drum type the condenser shaft points to the right or left, instead of toward you, and a disc that protrudes through the panel is attached to the shaft.

These refinements make for points of neatness and give sets a distinguishing appearance.

Gernsback Says—

YES We Should Have
Radio Censorship
and Congress Should Clothe
Hoover with Adequate Power
By Hugo Gernsback

NO Monopoly of the
Air Exists; Stations
Are Not Public Utilities; Li-
cense Should Not Be Limited

compelled to use these; hence they are a real public utility. A radio set performs no such function at all.

Not a Public Utility

But a radio broadcast station does become a public utility during war time. The Act of 1912 empowers the President to seize radio stations if he sees fit and operate them for any desired purpose. That is the law, but we require no new law about it. In 1917 all radio stations were promptly seized and operated by the Government under the Radio Act of 1912. If another war should start, the broadcast stations would indeed become a most powerful public utility, because important news could be disseminated by the radio broadcast stations more quickly than would be possible by any other means. In peace times, however, I for one contend that radio is not a public utility.

Most assuredly there should be radio censorship. A radio station must be compared to a newspaper when it comes to the dissemination of news and the like. When a newspaper sends out a reporter to cover news, the reporter always applies a certain amount of censorship, because he is not going to include in his copy any vile or unspeakable language that he might hear in a certain debate; nor would the editor of the paper publish such matter. If the radio station permitted a speaker, who might be drunk or unbalanced, to broadcast, that station certainly would be in line for a severe amount of criticism from the listening public. Operators at the control board of station WRNY are instructed to cut off the air as quickly as noticed any questionable jokes, profanity, etc.

If ever censorship were needed, it is certainly in radio. A father may bring home a magazine containing matter for grown ups only, and caution the mother to keep it from the young children; but such precautions can not be applied to a radio set. The youngsters use radio sets, and if there were no censorship, the children might listen to all sorts of matter not fit for their ears. Either you have censorship or you have not. Radical speeches in America, I believe, and this is my own opinion, have been barred by a number of broadcast stations so far, not for the reason that their station owners were afraid to broadcast them, but no doubt because they thought the general public did not care for them. Furthermore, talks or discussions should never exceed ten minutes' time, as nothing is more tiresome to listen to on the radio than a lengthy speech. Most of the talks declined heretofore would have taken hours to broadcast. WRNY has never rejected a good speech just because it contained matter that was not to the station's own interest. The trouble with most radical speeches is that they offend a great number of persons, and for that reason they are not broadcast, any more than they are printed in the majority of the newspapers.

I believe that the station owners and directors, as a whole, can be trusted to know what can be broadcast with good taste, and what cannot.

What Stations Should Be Licensed?

There are today some 550 broadcast stations in this country. When broadcasting was started in 1922 there was a scramble to obtain wavelength assign-

ments, and these wavelengths were assigned just as quickly as possible by the Department of Commerce. Like all physical things, radio is no exception. You can only have so many roads, so many channels, over a given area. This is a physical law. There exist today in the ether exactly 95 radio channels. If we try to put more channels on the ether, immediately there is chaos. It is like trying to run two railroad trains on a single track. If you separate the trains far enough apart, no harm ensues. If you try to operate them closely together, you will have collisions. The situation is exactly the same in radio. Some 550 radio stations operating on 95 channels means that some of the stations must be so far separated geographically, just like the railroad train in my simile, that they cannot harm each other. Or one wave channel is shared by different stations just as if you took the one-track railroad train and operated one train today and another one tomorrow. Exactly this happens in radio where several stations share one wavelength; otherwise we could not have 550 stations and only 95 channels.

Length of License

Some persons argue that radio station licenses should be granted only for a certain length of time. How they arrive at such logic is a mystery to me. You might just as well say to the New York Central or any other railroad that you will give them their right-of-way for two years, and then permit someone else to come along and replace the old railroad. Or you might tell the owners of the New York Times Building that they have no right to own the land on which the building stands for more than a few years. A radio station is nowise different. It builds up a tremendous amount of good will, expends a huge amount in providing interesting programs, and by all economic laws is entitled to derive the benefit of its work, the same as any other enterprise, real estate, right-of-way or franchise.

Power to Control Radio

The radio broadcast industry is new. It faces many delicate situations from a technical standpoint, not realized by most law-makers, who as a rule are totally ignorant as to such requirements. The Department of Commerce since 1912 has shown itself remarkably capable of coping with the most difficult questions that arise in radio, as well as radio broadcasting. It has the experience. As the saying goes, it knows the ropes. All Mr. Hoover's Department needs is a small amount of power. The Department of Commerce today is doing police work without the authority of a policeman. If I started to erect a building in Central Park, I would be promptly stopped by a policeman, who has the necessary authority to stop me. If I wish to run a trolley car line across the tracks of the Pennsylvania Railroad, the law will promptly stop me. The Department of Commerce today has no such power. If someone wants to broadcast on someone else's wave, he simply proceeds to do so, and nobody bids him nay. If the Department of Commerce is given proper legislation, it is my opinion that nothing else is required and that the radio industry can take care of itself as in the past. No further legislation is needed or wanted.

The trouble with all would-be radio lawmakers is that they do not realize how young and imperfect the art is. In the next two or three years we will have television. It will then be possible to see the person who is broadcasting. In what directions these wonderful improvements will lead us, no one can foretell. Until now radio has made the tremendous strides that it has, for the simple reason that it was unhampered. It will develop to even greater and as yet undreamed of magnitude, if left alone.

(Broadcast from WRNY)

THERE has been much loose talk for many months regarding the radio monopoly, and the public has been thoroughly confused by the various controversies.

First, as to radio broadcasting as a whole, I may say with authority that there exists no monopoly today in any sense of the word. No one controls radio broadcasting. There are some 550 radio broadcast stations in this country, less than 5% being owned by any one interest. The American Telephone & Telegraph Corporation, while it broadcasts over some thirteen stations, does not own these stations nor does it control them. Nor is there any combination as to the wire lines, because any one station or group of stations can link up with various other stations and form a competing net work if it chooses. Recently in New York a new such network was formed, whereby a number of stations located in different cities are linked up by wire lines.

As to the actual apparatus and instruments used for broadcasting, these can be purchased from various sources, and many stations exist in this country today that have not obtained their equipment from the so-called "trust." These, in radio parlance, are called "bootleg" equipment stations, because some of the equipment used infringes on existing patents.

The Patent Situation

As to the patent situation on broadcasting equipment, a patent gives its owner a monopoly; that is what it is for. An inventor has rights which should be protected, just as an author is protected by his copyright. But the owners of the broadcast equipment patents sell such equipment to anyone who can pay for it. If there were a monopoly in restraint of stations, the public might rightfully be alarmed; but this is not the case, because even today, when no more wavelengths are to be had, any one who desires can still buy broadcast equipment.

As to any monopoly on the other end of the radio industry—the listening end—here too we find no monopoly. Anyone can build radio sets or instruments today. Hundreds of firms are producing radio sets of the tuned radio frequency type as well as other types that do not infringe patents. The most widely sold radio set in the United States is not manufactured by the so-called "trust." So there is no monopoly here either, and I for one am certain that there is no chance of having a monopoly in radio in any of its branches today.

I for one do not see wherein radio broadcasting is a public utility any more than a newspaper, magazine, theatre or lecture hall is. A radio broadcast station disseminates news, literature, music, drama and what-not. Why, therefore, should it be considered a public utility any more than a newspaper? To be sure, it performs a public service and is of some utility. However, it performs no such function as a railroad or a street car line, which must in the nature of things be regulated by a commission. You do not necessarily have to have a radio set; as a matter of fact, millions of people today do not own one; thousands have never even listened to a radio set. But you cannot go to work or travel without using a railroad or a street car. You are

Boost Radio as All-Year Attraction, Frost Advises

By Herbert H. Frost

Conditions are far from stable in the radio industry and many things exist in it which tend to destroy the confidence of the consumer. It is only natural that these things have been brought about, as the past years of radio are records of improvised means, haphazard plans, and unsound methods. We have seen much of the spectacular and little that is convincing.

We have taken advantage of natural selling periods each year, and during the intervening time seem to have done little that is educational, thereby helping to perpetuate a seasonal demand instead of bending our efforts towards a proper appreciation of the value of radio entertainment, regardless of the season of the year. Bankers will tell you that any industry, regardless of its character, is in the molten stage until it has passed through several well defined cycles or periods.

The Days of Huge Profits

The first stage in radio came with the introduction of broadcasting, which created a wildfire demand for apparatus far in excess of supply, resulting in exorbitant list prices and enormous profits. Following this we entered the second stage, to find that conditions in the first stage had attracted thousands of concerns into the radio business, which resulted in competition becoming very keen, supply more than equaling demand, profits rapidly falling, and chaos came riding in, waving the flag of distress.

Following this the industry entered the third period, which is the one we are now in and which, I believe, we will soon leave behind us. This is the stage of liquidation, failures and uncertainty. The in-

dustry has reached the lowest point on the curve, and it follows that any industry at this point must take one of two roads—disintegration or stabilization. There is no fear as to which road our industry will take and this association must be the great stabilizing factor in placing the industry before the public in a sound and acceptable manner, with the resultant return to us in the form of normal manufacturing profits.

No Plan of Operation Used

As an industry we have been working without any basic plan, and, we must have a basic plan which will include manufacturer, jobber, and dealer, having for its purpose the education of the public to the point of creating an irresistible desire to hear broadcast programs, and this is the fundamental.

The character of programs carried into the millions of our homes is the essence of the future of radio. Too much thought and care cannot be given to this vital fact, for only by continuance advancement towards perfection in broadcasting can we create and foster the desire to hear broadcasting, and build a firm foundation for the growth of our industry. It is only fair that all interested parties should become a part of the basic plan and in fact, it is only through such concerted action that such a plan can be put into effect. Results must come through the co-operation of those in the industry banded together for the advancement of all, and realizing the strength of union. This idea is nothing new, as you see it in other fields every day, and its effectiveness is best evidenced by the stability of the industries using this means of creating consumer good-will followed by consumer acceptance and consumer demand.

Dongan Business Grows; New Plant Being Built

Dongan Electric Mfg. Co., of Detroit, are evidencing their confidence in the future growth of the business by the initiation of an extensive building program. Pressed to the limit of their production facilities throughout last season, the company acquired the property adjoining them, a fine corner site. During the last few months of the season part of the old buildings were utilized, but it was found that much greater facilities were needed to make ready for the coming season's business.

The new building to be erected immediately will be two stories in height constructed so that additional floors can be added as needed. The old building is being remodeled to join with the new building in one large complete plant. This serves to route work through the plant from the raw material to the shipping department with the greatest degree of efficiency.

Production will not be interrupted for a single day and by the start of the big production season the entire plant will be in operation.

New and modern equipment is being installed throughout. A special department is being equipped with the latest devices for the manufacture of B eliminator transformers and chokes, a new development of radio in which Dongan has played a leading part.

According to J. E. Hicks, president, Dongan now bears the distinction of being the largest manufacturer of radio parts in Michigan. In addition to the big Detroit plant, Dongan maintains a complete manufacturing plant in Walkerville, Ontario, to serve the Canadian market.

Crosley's Added Space to be Occupied Sept. 1

Although construction of the 6-story addition to the main plant of The Crosley Radio Corporation in Cincinnati was not started until May 20, the building will be ready for occupancy on September 1, immediately after which the assembling of receiving sets and musicones will be started on a tremendous scale.

The new structure, which is in the form of an extension of the present plant, will occupy a 75 foot frontage on Arlington Street, extending south 200 feet.

RESULTS LETTERS

RESULTS EDITOR:

I have built many receivers described in RADIO WORLD and have been more than pleased with them. Recently I purchased all the parts necessary for the new model Powertone, described in the April 17 issue of RADIO WORLD by Capt. P. V. O'Rourke and had it built for me. I can receive distant stations as loud and as clear as locals. WEAF, although only two miles from my home, can be tuned out with as much ease as a bucket of water can put out a burning match. I am indeed satisfied and wish to thank RADIO WORLD for the wonderful articles that are always published.

OLGA WEISS,
608 East 9th St.,
N. Y. City.

* * *

RESULTS EDITOR:

Having made several sets from diagrams which appeared in RADIO WORLD, I am pleased to state that the results obtained with each. The Diamond of the Air is a wonder. The tuning is simple and the DX obtainable is marvelous. The tuned antenna idea, as employed by Herman Bernard in his Loud Boy, described in the Feb. 6 and 20 issues of RADIO WORLD sure worked wonders on many sets.

H. W. CROUCH,
Delhi, N. Y.

Literature Wanted

THE names of readers of RADIO WORLD who desire literature from radio jobbers and dealers are published in RADIO WORLD on request of the reader. The blank below may be used, or a post card or letter will do instead.

Trade Service Editor,
RADIO WORLD,
145 West 45th St., N. Y. City.

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Name

City or town

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If not, who is your dealer?

His Name

His Address

- Tompkins Radio Shop, 82 La Salle St., N. Y. City. (Dealer).
- H. W. Hendricks, Winterset, Ia.
- John Bilors, 19818 54th St., Brooklyn, N. Y. (Dealer).
- Wiley Skinner, 117 West Lincoln, Royal Oak, Mich.
- J. N. Kelley, 1511 Habersham St., Savannah, Ga. (Dealer).
- M. G. Grosby, Care R. C. A., Riverhead, L. I., N. Y.
- Chas. Guess, 3854 St. Louis Ave., St. Louis, Mo.
- B. Bary, 1485 Vyse Ave., Bronx, N. Y. C.
- Sevick Radio Sales Agency, Granite, Col. (Dealer).
- J. N. Flanders, care Radio Service & Exchange Co., 718 19th St., Denver, Col. (Dealer).
- O. R. Kring, 5020 Osceola St., Denver, Col. (Dealer).
- Leo Dempsey, care Blanton-Walker Music Co., El Dorado, Ark.
- Grover Shary, 409 East 64th St., N. Y. City. (Manufacturer).
- I. C. Kniffin, Marlboro, Ulster Co., N. Y.
- D. Siask, Wellington, Kans. (Dealer).

- Edward I. Andrews, 790 Court Ave., Memphis, Tenn.
- F. Redmond, 138 West 167th St., Bx, N. Y. C.
- Albert Miller, 18122 W. Susquehanna Ave., Philadelphia, Pa.
- R. Wm. Woolfolk, Atlee, Va. (Dealer).
- M. E. Whitney, Capinteria, Cal. (Dealer).

CAPITAL INCREASES

- General Electric Co., Schenectady, N. Y., 7,350,000 to 12,900,000 shares, of which 5,500,000 are special stock, \$10 each; 7,400,000 common, no par.
- Marathon Radio Co., N. Y. City, 200 common, no par; H. M. Stein, G. Modell, M. Krantz. (Atty., I. Sack, 110 West 40th St., N. Y. City).
- Mogul Radio Co., N. Y. City, 200 common, no par; H. Kavner, H. M. Stein. (Atty., I. Sack, 110 West 40th St., N. Y. City).

NEW CORPORATIONS

- K. W. Radio Co., N. Y. City, \$20,000; G. and C. Kraus, L. C. Welling. (Atty., H. R. Berlincke, 160 B'way., N. Y. C.).
- Radiophone Sales Co., N. Y. City, \$3,000; N. H. Berry, B. von Brandt, L. H. Muller. (Atty., B. E. Gordon, Jersey City, N. J.).
- Delphia Engineering Corp., Brooklyn, N. Y., \$10,000; C. Salomone, J. P. and H. C. Bruell. (Atty., W. Klingenstein, 305 B'way., N. Y. City).

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COMING EVENTS

SEPT. 5 to 11—Los Angeles Radio Show, Ambassador Auditorium. Radio Trades Association, Los Angeles.

SEPT. 10 to 17—National Radio Exposition, Grand Central Palace, New York City. American Radio Exposition Co., 1500 Broadway, New York City.

SEPT. 13 to 18—Third Radio World's Fair, Madison Square Garden, New York City. G. Clayton Irwin, manager, Times Bldg., N. Y. City.

SEPT. 25 to OCT. 2—Pittsburgh Radio Show. H. K. Eleyet, cars "Pittsburgh Press."

OCT. 11 to 17—Fifth Annual Chicago Radio Show, Coliseum, Chicago, Ill. G. Clayton Irwin, manager, Times Bldg., N. Y. City.

OCT. 25 to 30—Second Annual Indianapolis Radio Exposition of the Central States, State Fair Grounds, Indianapolis, Indiana. Management of Indianapolis Radio Exposition Corp., 1,407 Merchants Bank Bldg.

OCT. 30 to NOV. 6—Cleveland Radio Industries Exposition, Public Auditorium, Cleveland, O. G. B. Bodenhoff, manager, 511 Guarantee Title Bldg., Cleveland, O.

OCT. 30 to NOV. 6—Third Annual Brooklyn Radio Exposition, Twenty-third Regiment Armory.

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If you are going away for the summer, take RADIO WORLD along with you! It will help you with your summer radio problems.

We will send you RADIO WORLD from now until the end of August at the special rate of \$1.

If you are already a subscriber and are moving to the country, send change of address two weeks in advance of date of publication.

Subscription Department, RADIO WORLD, 145 W. 45th St., N. Y. C.

THE GREAT AID OF BY-PASS CONDENSERS, by John F. Rider, appeared in RADIO WORLD dated May 8. Sent on receipt of 15c, or start sub. with that number, RADIO WORLD, 145 W. 45th St., N. Y. C.

Germans Prefer Distance via Local Rebroadcasts

How would you like to pay the letter-carrier fifty cents a month for your privilege of listening in on the radio?

Cheap at that! But there is no need for it in America. It is the regulation in Germany, and the money thus raised goes to the government for the encouragement of broadcasting, and, if anything remains, to reduce taxation.

An explanation of the difference between broadcasting in America and Germany was given by David L. Loewe, of Berlin, who spoke over WPG, Atlantic City. Mr. Loewe said:

"There is a tremendous interest in radio in every section of Germany. The general radio situation, however, is quite different from that which exists in the United States.

"The radio audience is licensed to receive by the Post Office Department and a fee of 50c a month is charged for all receiving licenses. This is collected by the postal carriers. It is unlawful to maintain a receiving set without such a license. The customary procedure is for the new owner of a receiving set to notify the officials that he has acquired such a set and his name is put on the list. This list now includes more than 1,250,000 persons.

Some Users Cheat

"As may be well understood, in view of the failings of human nature, also because of the tremendous amount of detail work involved, not all who register pay the fee, and a great many who own radios wilfully or thoughtlessly forget to apply for a license and meet their just obligation.

"Broadcasting stations are managed by private interests under licenses from the Post Office Department. In addition to this, the Post Office owns the majority of shares in the broadcasting company. Furthermore, the wavelengths are determined by the Post Office.

"To prevent interference, these stations have co-operated in a general movement throughout Europe for the adjustment of wavelengths so that their reception difficulties may be reduced to a minimum. In the past there was a great deal of inter-

ference but by co-operation of all broadcasting stations in Germany and elsewhere the situation has been materially improved.

"The stations in Germany are operating on wavelengths that are used by American stations. In addition, some of them go up to materially higher wavelengths, which fact necessitates the use of receivers different than those employed by a vast majority of Americans.

Have Direct Advertising

"There is a number of large stations in Berlin but all the stations are operated from a central studio in Vox Haus, where finely-equipped studios can accommodate three programs going on simultaneously. One of the studios is large enough to house an orchestra of 150 members. Every modern device for the reproduction of music and speech is provided in these studios.

"The remote control system is not approved in Germany. Theatrical and operatic performances are put on at the studios.

"All those who appear before the microphone to entertain the public are paid, a considerable part of the fund derived from the licenses being devoted to this purpose. Even lecturers from the Universities are compensated for their time.

"In addition, stations have adopted a

policy of selling time for direct advertising in contrast to the indirect advertising with which the American audience is familiar. Such advertising is in the form of Hints to Buyers and is generally given in the morning or early afternoon, and really occupies only a small part of the day's program. Many persons are very much interested in the announcements made at these advertising periods. Those who do not care about the advertising, of course, do not have to tune-in.

Rebroadcasts Popular

"Owing to the excellent character of the programs and the volume and quality with which they are received from the high-power broadcasting stations, comparatively few broadcast listeners try to tune in on foreign stations. In other words, to speak in the American vernacular, DX reception is the exception rather than the rule. This does not mean that the people of Germany do not enjoy foreign programs; to the contrary, they get
(Concluded on page 25)

NEW 1926 FREE RADIO GUIDE
 Newest Edition Ready
 Shows the latest circuits, the newest developments in radio at startlingly low prices. Get the parts you want here and save money. The best in parts, kits, sets and supplies. Orders filled same day received. Write for free copy NOW; also please send names of one or more radio fans.
BAHAWIK COMPANY, 102-140 So. Canal St., Chicago.

SEE JAY POWER UNIT



Here at Last!

A combination alkaline element battery and trickle charger all in one. Can be charged while set is operating. Price complete shipped dry with solution, \$16.00. 100-volt with Chemical Charger, \$12.00. 140-volt, \$17.00.

Write for our illustrated 24-page booklet and Send No Money Pay Expressman.

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Radio World has made arrangements

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- RADIO NEWS or -BOYS' LIFE or
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- SCIENCE AND INVENTION or -RADIO AGE or
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- Add \$1.00 a year extra for
- Send \$6.00 today for RADIO WORLD -Canadian or Foreign Postage.
- for one year (regular price) -Present RADIO WORLD subscribers
- for \$2 numbers) -can take advantage of this offer by
- and select any one of the other -extending subscriptions one year
- nine publications for twelve months. -if they send renewals NOW.

RADIO WORLD'S SPECIAL TWO-FOR-PRICE-OF-ONE SUBSCRIPTION BLANK
 RADIO WORLD, 145 West 45th Street, New York City.

Enclosed find \$6.00 for which send me RADIO WORLD for twelve months (52 numbers), beginning..... and also without additional cost, Radio Broadcast, or Popular Radio, or Radio News, or Science and Invention, or Radio Dealer, or Radio (San Francisco), or Radio Age, or Boys' Life, or Collier's (or \$10.00 for two yearly subscriptions).

Indicate if renewal. Name

Offer Good Until Street Address.....

June 30, 1926 City and State.....

them exceedingly well by a happy process of re-broadcasting.

"There, programs from Rome, London, Paris, Stockholm, Geneva, etc., are received on special apparatus located outside of Berlin, for instance, and rebroadcast through the big German stations on the local wavelengths. Re-broadcasting is done by what might be termed a filtering process for the elimination of extraneous noises, whenever it is possible to effect such a good result.

"Thus, several millions of German listeners may hear with loudspeaker strength programs from practically every section of Europe. Tuning-in directly into these stations would not give such fine volume and quality, except where persons possess sets of special perfection, and then, only if the atmospheric conditions are favorable over the whole distance which the radio waves must travel.

"Thus broadcasting reception in Germany is quite different from that which prevails in the United States, for in the United States encouragement is given to the presentation of the finest talent which is obtainable and radio has become a particularly useful adjunct to education."

—Eric H. Palmer, Freed-Eisemann Corp.

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7x12	7 x 18	7 x 26	\$2.25
\$1.25	7 x 21	7 x 27	
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RIX RADIO SUPPLY HOUSE, INC.
5505-4th Ave. Brooklyn, New York



FREE!

12-Cell—24-Volt Storage 'B' Battery

Positively given free with each purchase of a WORLD "A" Storage Battery. You must send this ad with your order. WORLD Batteries are famous for their guaranteed quality and service. Backed by years of successful manufacture and thousands of satisfied users. Equipped with Solid Rubber Case, an insurance against acid and leakage. You save 50 per cent and get a **2-Year Guarantee**

Bond in Writing WORLD Battery owners "tell their friends." That's our best proof of performance. Send your order in today.

Solid Rubber Case Radio Batteries

6-Volt, 100-Ampere \$11.25
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6-Volt, 140-Ampere 14.00

Solid Rubber Case Auto Batteries

6-Volt, 11-Plate \$11.25
6-Volt, 13-Plate	..... 13.25
12-Volt, 7-Plate	..... 16.00

Send No Money Just state battery wanted and we will ship day order is received, by Express C. O. D. subject to your examination on arrival. **FREE "B" Battery** included. **Extra Offer:** 5 per cent discount for cash in full with order. Buy now and get a guaranteed battery at 50 per cent saving to you.

WORLD BATTERY COMPANY
1219 So. Wabash Ave., Dept. 17 CHICAGO, ILL.

World STORAGE BATTERIES

Set your Radio Dial at 216 meters for the new 1000 watt World Storage Battery Division, W.B.C. Chicago. Watch for announcements.

Nation's Musical Officials Flock to the Microphone

WASHINGTON.

At the National Capital many persons in official life, or their wives, appear from time to time at the local broadcasting stations.

A popular singer on the air is Mrs. Fred S. Purnell, wife of the Congressman from Indiana. Mrs. Purnell is a soprano and has great personal charm and beauty.

Heard first in her home in Chicago and later at the Congressional Club in Washington, and then from the broadcasting stations, is Mrs. Carl R. Chindblom, wife of the Congressman from Illinois, a talented pianist.

A Whistler on the List

Broadcast recently was the whistling of Mrs. Kincheloe, wife of the Congressman from Kentucky.

Two of the sopranos heard here are Mme. Henriette Coquelet, wife of a former attache of the French Embassy, and Mme. Michel Tsamados, wife of the former charge of the Greek Legation.

Nor is the microphone faced to the exclusion of members of Congress themselves, for Representative Clinton A. Woodrum, of Virginia, is a baritone. Another sweet singer in the halls of Congress is Representative M. E. Crumpacker, of Oregon.

Formerly an actor and later a theatrical manager, Congressman William P. Connery, of Massachusetts, is a host unto himself as a monologue artist and story

teller. Having served nineteen months in the thick of the battle in France, his war stories are particularly sought.

Aitchison Sings, Too

A singer of no mean attainment himself, Clyde B. Aitchison, chairman of the Interstate Commerce Commission, has introduced to listeners the Interstate Commerce Commission chorus, which is heard on occasion at the Capital and last winter gave an entire evening's program for the entertainment of its friends. Chairman Aitchison, who also hails from Oregon, organized this chorus and has personally directed it from its beginning.

Although Vice-president Dawes was a recognized composer before he became famous as a statesman, and is a violinist, the nearest he came to being heard over the air in Washington as a musician was the night he went up to a broadcasting station to listen to a contest of country fiddlers. There was a conspiracy on foot to chuck a violin into his hands and get him to lead the brethren but evidently it didn't work or, if it did, the listening public never knew it.

Another musician, whose speeches have been heard on the air but who has evidently refrained from playing for the radio public, is Speaker Nicholas Longworth. Mr. Longworth is a lifelong student of music and was recently elected president of the Chamber Music Society of Washington.

KITS! Dealers! Write for special discounts on any Kit you are interested in.

Distributors
MAURICE SCHWARZ & SON
710-712 Broadway Schenectady, N. Y.

VEBY HIGH-MU TUBES

Made especially for Resistance Coupled Amplifiers. Now you can get more volume with greater clarity.

A. F. 20 for the 1st and 2nd Stage	..... \$3.00
A. F. 6 Power Tube for 3rd Stage	..... 4.50

VEBY RADIO CO.
47-51 Morris Avenue Newark, N. J.

FENWAY
—for DX

Winter or Summer the Fenway is a consistent DX-getter. Naturally, you want to own one of these super-sensitive receivers. Fenway Blueprints show you how to build a laboratory set.

PRICE OF COMPLETE SET OF BLUEPRINTS—\$3.00 Postpaid

Others Give Their Radio Prints Away **FREE!**—Fenway Prints Cost **You \$3.00—WHY?**

Radio Division, The Columbia Print
147 West 45th Street New York City

1,000 WATTS FOR WEW

WASHINGTON.

WEW, owned and operated by the St. Louis University, has completed the installation of new 1,000 watt equipment. WEW first operated with 150 watts on 248 meters and has since been granted a request for increased power to 1,000 watts.

FREE RADIO CATALOG

Just off the press! Our second catalog for 1926. 100 pages of parts, accessories, kits and sets—all the best and the latest. A copy is yours for the asking. Just drop us a line—do it today!



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CHICAGO SALVAGE STOCK STORE
509 S. State Street, Chicago, U. S. A.

GET RADIO WORLD ON YOUR VACATION

Be sure to take RADIO WORLD along with you on your vacation, or read it while you are at your summer home. So that you will not miss a copy, send \$1.50 for three months subscription and RADIO WORLD will be sent to you all summer. RADIO WORLD, 145 W. 45th St., N. Y. C.

What Price Selectivity? Any Price, Is Answer

(Concluded from page 4)

property of tuned circuits relative to the practical selectivity at the upper and lower ends of the condenser. Suppose that the selectivity, or the Q of the circuit, as previously defined, remains constant throughout the tuning range. This condition may readily be brought about by the insertion or removal of resistances. Under this condition any two frequencies having the same ratios, no matter what their absolute values, will be selected to the same degree. For instance, if a given receiver tuned to 610 kc suppresses an interfering wave on 660 kc 95%, then the same receiver when tuned to 1,220, will suppress 1,320 kc 95%, because 1,220 bears the same ratio to 1,320 that 610 does to 660. These happen to be harmonics of the first pair taken, but the rule applies to all other frequencies as well.

Since the power of separation remains the same for equal frequency ratios for all absolute values of frequency, as long as the Q of the circuit remains the same, and also since broadcasting channels are spaced at equal frequency differences, it is obvious that the need for selectivity increases directly with the frequency of the carrier.

For example, 1,220 and 1,270 have the same frequency separation as 610 and 660, but as far as the tuner sees it, the former pair is just twice as close together. It would require twice as great selectivity to separate 1,220 from 1,270 as it would to separate 610 from 660 by the same amount. The main reason why super-heterodynes are much more selective than other tuned receivers is that the intermediate frequency carrier has a relative low value.

The Q of a tuned circuit decreases with increase of frequency, because the inductance decreases with frequency and the resistance increases more rapidly than the frequency. This fact also militates against the separation of the high frequency channels. Not only is the need for selectivity greater for the higher frequencies, but it is more difficult to obtain. For getting a high degree of selectivity for the high frequencies the Super-heterodyne is eminently suited. Once the frequency change has been effected, all carriers are separated with equal facility.

Let us take a few numerical examples of the suppression of side-bands and consequent distortion of the signal. Take the carrier 610 kilocycles. For an effective selectivity of 500 the suppression at 10,000 cycles is 99.6%, at 5,000 cycles it is 98.5%, at 1,000 it is 50%, at 500 it is 20%. For a selectivity of 100 the suppression at 10,000 cycles is 93.4%, at 5,000 it is 72%, at 1,000 it is 20%. For an effective selectivity of 20 the suppression at 10,000 cycles is 30%; at 1,000 it is 4%. In some of these cases the suppression is almost complete. It is evident, therefore, that no very great selectivity may be used without destroying the quality of the signal.

Arnold Morgan Joins Announcers at WEAF

A new voice, carrying with it the pleasant accent of the Southwest and the Pacific Coast, has recently been heard from WEAF. This is the voice of Arnold Morgan, the latest addition to the well-known announcing staff of WEAF.

Morgan has an intimate acquaintance with every section of this country. Born in the Indian Territory, now the State of

Oklahoma, he moved at an early age to the Pacific Northwest, and of late years has spent his time in the East. His early youth was spent in Portland, Oregon, where he attended the public schools and fixed his eye on teaching as his life profession.

After being graduated from the State Normal School, Morgan changed his mind and began to study concert and oratorio singing. He served for one year as the director of the voice department of a small Western University and also did considerable private voice teaching. Three years ago he came to New York to continue his musical studies and soon became a member of the Stellar Male Quartet. To a certain degree he is no stranger to WEAF's radio audience, as he was a member of the original Eveready Group, one of the pioneers of broadcasting. He is now the tenor soloist of the Grace Episcopal Church of Brooklyn, in addition to his duties at WEAF.

During the World War Morgan served with the coast artillery of the United States Army.

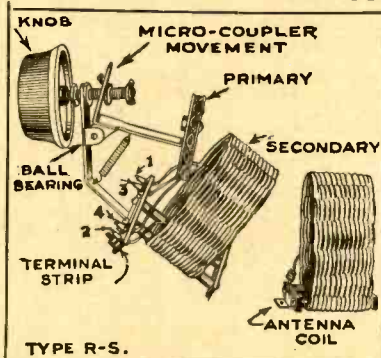
Three More Apply For a Station License

Bringing the total to 623 stations, the following applied for licenses to broadcast:

United Masonic Temple Corporation, Chicago; City of Fort Morgan, Fort Morgan, Colo.; and Harry Weinberg, Brooklyn, N. Y.

THE MICRO-COUPLER

"MAKES THE
ROTOR OBSOLETE"



SUPERSENSITIVE VERNIER effect
over ENTIRE COUPLING RANGE.

The Only Tuner Approved and Authorized

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For Use on Their Circuit.

Type RS, especially adapted for the ROGERS-SCHUDT CIRCUIT, together with Antenna Coil and all accessories, ready to mount

PRICE \$10

If Your Dealer Is Not Supplied We Will Ship From Factory.
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SIMPLEX RADIO DEVICES
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30 CHURCH STREET NEW YORK CITY

AEROVOX FIXED CONDENSERS
and GRID LEAKS

Used by over 200 of America's leading set manufacturers. AEROVOX Fixed Mica Condensers have been approved by M.I.T., Yale, Radio News, Popular Radio and Popular Science.

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489-491-493 Broome St., New York

TRY THIS ON YOUR LOUD SPEAKER BRADLEY ANTENNALESS

World's first successful Aerialless, Loopless Hookup. The set that puts Havana, Mexico City and Hastings, Neb., next door. 1200 miles, and then some, any night on the speaker.

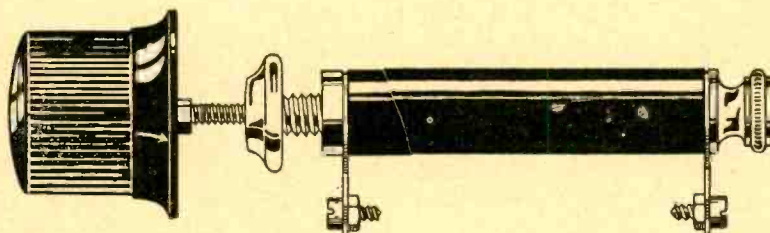
GREATER VOLUME, GREATER SELECTIVITY, GREATER
CLARITY THAN 3 TUBES EVER GAVE BEFORE

Tune out locals at will. Not an attachment, but a balanced hookup. Used in Florida, where static is really static, since 1923. Will bring in strong, clear reception when the big set can't get through. The best portable hookup on earth. Be convinced. Try it. Fellow BCL, you're losing a real treat if you fail to get this one. Blue Prints and all details mailed for \$1.00.

C. C. BRADLEY

209 Hamilton Avenue, Tampa, Florida

MORE POWER! NO EXTRA TUBES!



The Bretwood Variable Grid Leak

(Bretwood, Ltd., Sole Patentees and Owners)

Guaranteed Precision Range 1/4 to 10 Megohms

**Brings in More Distant Stations — Affords
Greater Volume — Improves Tone Quality!
Fits Any Set, Panel or Baseboard. Price, \$1.50**

“IT DOES THE TRICK”

“Nothing Better”

The North American Bretwood Co.

For some time I have seen in the Radio World your advertisement of the Bretwood Variable Grid Leak, as well as some of your testimonials, and I decided to try one of the leaks at the first opportunity, which presented itself last night.

I own a 5-tube factory built set. During the last three days I could not get a sound out of it due to what I thought was a terrific spell of static, but which was caused by a defective grid leak. The noise was indeed so terrible that rather than hear such a racket I turned off the set and went to bed.

To-day, as luck would want it, I happened into a store and saw a Bretwood Variable Grid Leak on display. I decided to try it immediately. The results were absolutely gratifying. Other sets in the neighborhood are not getting anything at all, while I have brought in a great number of stations with speaker volume, with a socket aerial. I must say for the benefit of those who have not tried your grid leak that there is nothing better in this line.

ALFONSO FABRIS ARCE,
4116 Ave. R, Galveston, Tex.

The North American Bretwood Co.

Telephone, BRYant 0559

145 West 45th Street, N. Y. City

Sole Distributors for United States

North American Bretwood Co., 145 West 45th St., N. Y. City.

Gentlemen: Enclosed find \$1.50. Send me at once one Bretwood Variable Grid Leak on 5-day money-back guarantee.

NAME

ADDRESS

CITY STATE

Inquiries Solicited from the Trade

Tuning and Operating Freshman Masterpiece

[In the preceding issue of RADIO WORLD, dated June 12, the construction of the Freshman Masterpiece Receiver was described. The following are hints on tuning, operation and checking up.]

By Jack Zatulove

Start by setting dial 2 and 3 at 10 degrees, then rotate dial 1 slowly between 5 and 15 degrees. If station is not heard, set dials 2 and 3 each two degrees higher and again slowly rotate dial 1. Continue this operation until a station is heard, then readjust each dial separately to greatest volume. All three dials should read about the same. When the station is tuned in, increase or decrease both detector and amplifier filament current until you have attained the desired volume. In tuning the distant stations, the dials should be rotated very slowly. Make a record of each station tuned. You will then always be able to turn your dials to the exact station you desire to hear.

UV201-A or C301-A tubes operate best in a set of this type, in which case, 45 volts should be used on the detector and 90 volts on the amplifier. If a soft, or UV200 is used for detector tube, be careful not to apply more than 22½ volts on the detector binding post.

Be sure to follow the wiring diagram exactly, as one wrong connection will throw the entire set out of balance, there-

by losing its main factor of non-neutralization.

Be sure that the filament return of No. 3 radio unit is connected to the positive or + side of the A battery.

Be sure to connect both rheostats in the negative lead, thus assuring the correct voltage drop across the filaments of all tubes.

Be sure to connect the minus B battery wire to the plus A battery binding post.

Be sure to connect the phone jack across the primary of the second audio transformer. This allows the phones to be plugged in without disconnecting the loud speaker.

Be sure to connect a Freshman .002 fixed condenser from plate on detector tube to A— and a Freshman .006 by-pass condenser across the plus A and plus B leads, to assure clear and undistorted reception, so well brought out in the Freshman Masterpiece Receiver.

Be sure that all A and B batteries are fully charged and in perfect condition. Poor and noisy reception is usually caused by run down or faulty batteries.

Be sure all aerial and ground connections are properly tightened and soldered. Have you ever tried an Antenna plugged

in a lighting socket, for use as an aerial or ground, or both?

Be sure that all sockets and other accessories are of excellent standard make, to uphold and work in conjunction with the efficiency of the set.

Be sure when soldering, to use as little flux as possible, thus eliminating the possibility of excessive flux running around, and causing leakage between two or more connections.

Marine Musician Retires

Radio listeners will no longer hear the stirring notes of Principal Musician Samuel Firth of the U. S. Marine Band, who recently was retired after thirty years of service. Not only was Musician Firth well-known to radio listeners but he has played before seven Presidents of the United States.

RADIO GIVES TARGET RESULTS

The Third Infantry Regiment at Fort Snelling, Minn., has found radio just the thing for inter-company, battalion, and regimental rifle matches. The results of the scores made are radioed to competing units.

WDEL TAKES VACATION

WASHINGTON.

WDEL, at Wilmington, Del., signed off for the summer months. The station will resume broadcasting on September 1.

THE VICTOREEN

How to build this 8-tube Super-Heterodyne described in February 20, 27, March 6 and 13 issues of RADIO WORLD. Send 60c for all four copies. Send \$6 for year's subscription and get these four copies FREE!

RADIO WORLD

145 W. 45th St. New York City

WORLD'S FINEST LOUD-SPEAKER

A three-foot cone speaker—unit developed by the inventor of the Tropadyne. Can be assembled in fifteen minutes, saving 80% of the cost. Complete Kone Kit with blue prints sold on rigid money-back guarantee—shipped prepaid—\$10.

Engineers' Service Company

Suite 203 25 Church St., New York



UX POWER TUBES installed in any set without rewiring by Na-Ald Adapters and Connectorals. For full information write Alden Manufacturing Co., Dept. S-10, Springfield, Mass.

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS.

10 CENTS A WORD. 10 WORDS MINIMUM. CASH WITH ORDER

PATENTS—Write for free Guide Books and "Record of Invention Blank" before disclosing inventions. Send model or sketch of your invention for our inspection and instructions free. Terms reasonable. Radio, Chemical, Mechanical, Electrical and Trademark experts. Victor J. Evans Co., 924 Ninth, Washington, D. C.

THE 5-TUBE SUPER HETERODYNE SET. by Jasper Jellicoe, appeared in RADIO WORLD dated April 17. Sent on receipt of 15c. RADIO WORLD, 145 W. 45th St., N. Y. C.

CONSTRUCTION OF RADIO PHONE AND TELEGRAPH RECEIVERS by M. B. Sleeper, sent on receipt of 75c. The Columbia Print. 145 W. 45th St., N. Y. C.

DESIGN DATA FOR RADIO TRANSMITTERS AND RECEIVERS by M. B. Sleeper, sent on receipt of 75c. The Columbia Print. 145 W. 45th St., N. Y. C.

THE GREAT AID OF BY-PASS CONDENSERS, by John F. Rider, appeared in RADIO WORLD dated May 8. Sent on receipt of 15c, or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

DETAILS OF WIRING THE DC B ELIMINATOR, Part II, by Lewis Winner, appeared in RADIO WORLD dated April 24. Sent on receipt of 15c, or start sub. with that issue. RADIO WORLD, 145 W. 45th St., N. Y. C.

CASH PAID FOR Dental Gold, False Teeth, Discarded Jewelry, Diamonds, Platinum, Mail, Florida Gold Refining Co., 21 Adams, Jacksonville, Fla.

SELL AND INSTALL RADIO SETS. With a \$25 capital we can put you in the radio business and show you how to earn a hundred or two a week. For full details write Columbia Print. Radio Division, 143 West 45th St., New York City

THE BERNARD PORTABLE SUPER-HETERODYNE appeared in RADIO WORLD dated April 3, 10, 17 and 24. Sent on receipt of 60c, or start your subscription with April 3 issue RADIO WORLD, 145 West 45th St., N. Y. City.

WIRELESS IN THE HOME by Lee deForest sent on receipt of 15c. The Columbia Print 145 W. 45th St., N. Y. C.

HERMAN BERNARD, managing editor of RADIO WORLD, broadcasts every Friday at 7 p. m., from WGBS, Gimbel Bros., N. Y. City. 315 6 meters. He discusses "What's Your Radio Problem?" Listen in!

A BUILT-IN SPEAKER SET, by Herbert E. Hayden, **POWERTONE IN OPERATION,** by Capt. P. V. O'Rourke, **THE NOVICE'S NOOK,** by James B. Scully, appeared in RADIO WORLD dated May 22. Sent on receipt of 15c, or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

SALESMEN OR AGENTS WANTED

MANUFACTURER WITH A SUCCESSFUL LOCAL RECORD wants salesman, full or part time, city or country. Manufacturer desires national distribution of article of proven merit, unconditional guarantee, big money, interesting work. Write Highland Machine Co., Sales Dept. 3, 462 Penn. Ave., N. W. Washington, D. C.

TABLE FOR CONVERSION OF FREQUENCIES AND METERS appeared in RADIO WORLD dated May 1, 1925. Sent on receipt of 15c, or start your sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

THE NEW 1-DIAL POWERTONE SET, by Capt. P. V. O'Rourke, appeared in RADIO WORLD dated April 17. Sent on receipt of 15c, or start sub. with that number. RADIO WORLD 145 W. 45th St., N. Y. C.

CONFESSIONS OF A SUPER BUG, by James H. Carroll, appeared in RADIO WORLD dated May 22. 15c per copy, or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

COMPLETE LIST OF BROADCASTING STATIONS appeared in RADIO WORLD dated June 6. Sent on receipt of 15c, or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

TEAR OFF AND MAIL TODAY

8 Week's Trial Subscription, \$1.00

KEEP ABREAST OF THE LATEST
RADIO DEVELOPMENTS

RADIO WORLD
145 WEST 45th ST. NEW YORK CITY

U.S. Will Broadcast Often To Million Farm Audience

By M. S. Eisenhower

U. S. Department of Agriculture

More than a million farmers will be Uncle Sam's students in a huge classroom that will literally cover a nation when the National Radio Farm School of the United States Department of Agriculture opens on October 1. The fall program of the farm school has just been approved by Secretary of Agriculture William M. Jardine.

For years farmers have wanted some means of disseminating valuable farm information to each other rapidly. In the days of the pioneers, when the workers of America's basic industry were fighting

against droughts, attacks of bugs and rodents, bad soil conditions, etc., a farmer did not know the methods which farmers in a neighboring state used to meet these emergencies.

Growth of Communication

Gradually there grew up various agencies for sending information to farmers—telephones, newspapers, farm magazines, farmers' bulletins, etc. Today there is no group in America more eager for up-to-date scientific information than the farmers themselves. Overflowing agricultural colleges in every section of the United States are ample proof of that.

Every modern industry has some means of almost instantaneous communication with every branch of its organization, for cooperative effort is essential to a successful industry. In no industry, however, is the need for cooperation so need-

ful as it is in agriculture at the present time.

Every agency which deals with farming itself or with the scientific experiments for the betterment of farming practices is working towards this end.

Science is Welcome

A great deal of the old feeling of individual effort on the farm has been destroyed; certainly there is no longer any antagonism toward the farmer-scientist, for every farmer in the country knows at heart that he himself is a scientist of first importance and if a new development is made on his land he is anxious for every farmer in the country to get the complete details of the improvement. The radio is the agency which adequately completes the group of methods which are now used for getting this information to all American farmers.

The Fall program will be broadcast by more than 100 stations and thus the information will be within a dial's turn of more than a million farmers, their wives, and children—for there are now a million radios on farms. The program has been planned to interest every member of the farm and small-town family.

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CRAM'S INTERNATIONAL RADIO ATLAS

This latest and greatest Radio Atlas has four big maps, a list of all the Radio Stations in the United States, Canada and the entire world, alphabetically arranged by states and cities, latest wave lengths, kilocycles and names of operators. Liberal space for your private log. Postpaid on receipt of 50c, or one sent free with new yearly subscription for Radio World (\$6.00 for 52 nos.), but with no other premium.

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COMPLETE LIST OF BROADCASTING STATIONS appeared in RADIO WORLD dated June 6. 15c per copy or start sub. with that issue. RADIO WORLD, 145 W. 45th St., N. Y. C.

THE CONTROL OF FEEDBACK, by Barney Feete, appeared in RADIO WORLD dated April 24. Sent on receipt of 15c, or start sub. with that issue. RADIO WORLD, 145 W. 45th St., N. Y. C.

GETTING MAXIMUM RESULTS with Super-Heterodynes by Herman Bernard appeared in RADIO WORLD dated May 15th. 15c per copy, or start your subscription with that issue. RADIO WORLD, 145 West 45th St. N. Y. City.

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THE DIAMOND A BADGE OF MERIT

Join the Happy Thousands Who Triumphantly Built This 5-Tube Set!

Real Know Quality!



Easy to Tune, Easy to Build!

Herman Bernard, designer of this wonder circuit, has written an illustrated booklet on "How to Build Radio World's 1926 Model Diamond of the Air." Send 50c and get this booklet, including a full-sized wiring blueprint and free nameplate.

Outstanding Features of Set: (1) Fans, charmed by tone quality, sensitivity and selectivity, report speaker reception of far-distant stations with great volume. (2) A 2-tube earphone set, a 5-tube speaker set, and a separate 3-stage audio-amplifier for immediate use with any tuner, are combined in one. (3) No rheostats are used. (4) The set is inexpensive to construct and maintain. (5) The set works from outdoor aerial or loop, hence no aerial problems present themselves, in city or country.

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Managing Director

THE AERO ALL-WAVE SET, by Capt. P. V. O'Rourke, appeared in RADIO WORLD dated April 24 and May 1. Sent on receipt of 30c. RADIO WORLD, 145 W. 45th St., N. Y. C.

GETTING DX by Capt. P. V. O'Rourke, appeared in RADIO WORLD dated April 3. 15c per copy or start sub. with that issue. RADIO WORLD, 145 West 45th St., N. Y. C.

Restrictions on Parts Are Moot Patent Query

(Concluded from page 15)

while the mere fact he is employed by another person does not preclude him from making improvements in machines with which he is connected and making application for patents therefor as his own personal property, yet if he be employed to make such improvements the right to such patent belongs to his employer, since he is merely doing what he was employed to do.

Questions of Ownership

Even if he be not employed to invent, if he uses the property of his employer and the services of other employes to de-

velop and put into practical form his invention and permits his employer to use the invention without protest, a shop right or license may result to the employer.

Contracts with employers are usually drawn by the employer and are construed most favorably to the employe. A contract requiring an inventor to turn over all the inventions he may make without limitation to his employer is void as in restraint of trade and against public policy. Such agreements must be limited to the line of endeavor in which the employe is engaged or by the scope of the employer's business, and if it be desired that the employe should turn over such

Sets Made Experimentally Held Not to be Patent Infringements — This Raises Questions as to Liability of a Dealer Who Sells the Parts and Courts Have Yet to Settle This Point De- cisively.

inventions or applications therefor to the employer words of assignment or the equivalent should be unequivocally set forth.

What Constitutes Infringement

At the present time there are coming before the courts many questions of contributory infringement with respect to the selling parts which may be used in a patented receiving or sending set. If any individual sells an entire set which is an infringement of the set, there is no trouble in fixing the responsibility, but where one person assembles parts for such set furnished by others, it is a matter of considerable difficulty to show the necessary concert of action the law requires in this connection.

If the part supplied is incapable of any use except an infringing one, intention to infringe is presumed, but where such part may be otherwise used positive proof must be adduced to show such intention. In other words, in contributory infringement intention to infringe is an important element and must ordinarily be shown by affirmative evidence, such as declarations by the person supplying the part that the same is to be incorporated in the infringing set.

Merely selling the set unassembled, however, is not sufficient to avoid the charge of infringement, as is shown in a recent case decided by the United States District Court of the Southern District of New York, where the court said that "it is an infringement to divide the patented machine into parts ready for assemblage, even though the party who is to use them must put them together."

Questions Before Courts

In an old Federal case it was early decided that if an infringing machine is made as an experiment merely, it does not infringe former patents. To constitute infringement the making must be with an intention to use for profit, not for the mere purpose of a philosophical experiment. Can it be said in the individual case where a person purchases parts from various dealers to form part of an experimental set used at home that such dealers are contributory infringers, even if they knew of such experimental use? If an experimental use is not an infringement, how can a contributor to such use be an infringer? If every builder of a home set is an experimenter and dealers who contribute parts are not to be held guilty of infringement, will not the door be opened considerably and the field of the patentee correspondingly restricted? These and other questions are coming before the courts, and upon their proper solutions depends the future of the radio industry so far as concerns dealers and users.

"The radio set has been of untold good to those who through age or physical infirmity are unable to participate in stated religious services. Their testimony to the benefits they have received is of such volume and quality as to convince me that if the radio industry existed for this purpose alone it is amply justified."
—The Rev. Dr. S. Parkes Cadman.

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Volume, Clarity, Selectivity, Sensitivity, Portability

IMMEDIATE DELIVERY

"READY to operate under all conditions.

ABLE to perform where others fail.

MAKES your vacation a joy.

BEATS anything of its kind at any price.

LOUDSPEAKER volume on six 199 tubes.

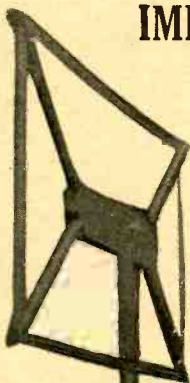
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REALLY a Rambler—weight only 25 lbs. with all equipment.

SELLING at half the price of inferior outfits.

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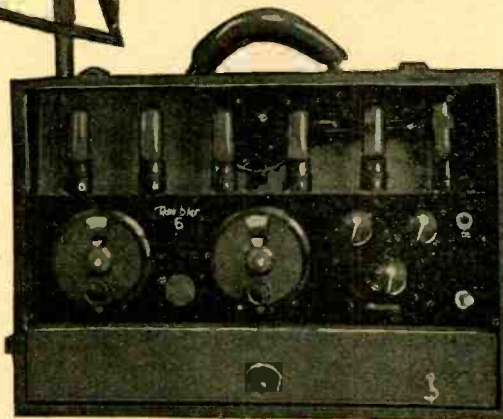
X"TRAORDINARILY selective.



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Without Tubes or Batteries

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Set ready for action. Cover (not shown) makes it an easy to carry small handbag.

Without doubt the most sensitive portable yet made, combining ease of operation, dependability, and volume without distortion.

A true portable, weighing only 25 pounds, fully equipped with loop antenna. It is ideal for automobile traveling, camp use and an all-year-round set for home use.

May be set up and operated in thirty seconds.

Fully guaranteed against electrical or mechanical defects.

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The Newest Up-to-the-Minute Radio Set—It has Never Been on a Dealer's Shelf—Most Selective. A Wonderful DX Getter. Sold on a Guarantee of Satisfaction or Money Back.

Volume Control—Perfect Calibration—Rang 180-550

BST-6

**B-for Beauty
S-for Selectivity
T-for Tone purity
6-its 6 tubes for distance**



The BST-6. 2 Feet 4 Inches Long. 9 Inches Inside Depth. 8¾ Inches High.

THIS marvelous six-tube tuned radio frequency receiver is Self-Equalized and built of low-loss materials throughout. Its clear, rich tone of astonishing volume is a revelation. The circuit consists of two stages of tuned radio frequency, tube detector and three stages of balanced audio amplification. Air cooled rheostats and universal sockets are used.

Modified straight line frequency variable condensers are employed, insuring separation of the low wave length stations. **PERFECT CALIBRATION—STATIONS ONCE TUNED IN CAN ALWAYS BE LOGGED AT THE SAME DIAL POINT.**

The BST-6 works best with a 75 to 100 foot aerial, 6 volt "A" storage battery, two 45 volt "B" batteries, 4½ volt "C" battery, six 201-A tubes and any good loudspeaker.

Specifications

- Bakelite Panel, Walnut Finish—
- With Etch-O-Gravure and Gold Decorations—
- Bakelite Sub-Base—
- Kurz-Kasch Bakelite-Walnut Pointers; Gold-filled, to Match—
- Kurz-Kasch Bakelite Gold-filled Rheostat Knobs—
- Lubree Straight Line Frequency Condensers—
- Special Coils; Double Silk Solenoids—
- Shore Audio Transformers—
- Caswell-Runyan Two-tone Walnut-Finished Cabinet.

LOG OF BST-6

Taken on a Fifteen-Foot Aerial in One-half Hour by Al. Kraus, 996 Aldus Street, New York City.

WSBC .....	.10	WGY .....	.50
WBBR .....	.16	WMAK .....	.51
WEBH .....	.49	WMSG .....	.11
WHT .....	.55	WOC .....	.85
WCCO .....	.61	WFAA .....	.78
WSB .....	.66		

SELECTIVITY

I live within four blocks of WLWL, and since the opening of this station have had great difficulty in choking them off my old set. Even after employing a wave trap I could still hear WLWL around the entire dial and was told by several friends that living so near this powerful station it would be impossible to entirely cut them out with anything less than a super-het. It was a very agreeable surprise, therefore, when I installed my new BST-6, to find that while WLWL came in on 25 I could tune in WRNY on 21 and entirely cut out WLWL. **This is certainly real selectivity.**—F. S. Clark, 350 West 55th Street, New York City.

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**Direct from factory to you
No dealers' or middlemen's profits**

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Full Range, Normal Pitch, Maximum Volume

FROM the highest harmonics of the violin to the lowest bass notes of the drum, the Pontico Cone reproduces the broadcasting with absolute fidelity, at normal pitch and with volume equal to standard horns.

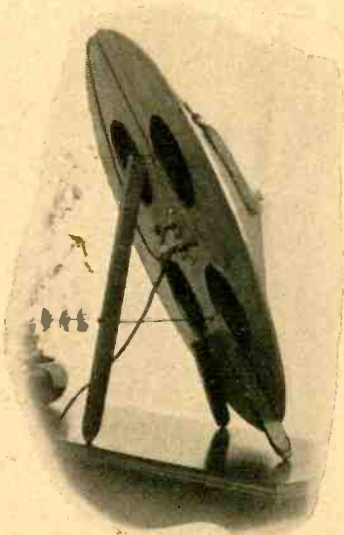
Such remarkable performance is unprecedented at almost any price. The Pontico is destined to sweep the market this fall. Nine out of ten of the radio dealers who have heard the Pontico in competition with the leading makes of \$25 cones have placed orders for Ponticos.

These dealers say, and we appreciate it, that the only real difficulty ahead of us is convincing the public that a cone so perfect can be made at so low a price.

The Pontico is 18 inches in diameter. The edge is heavy gold embossing. The diaphragm is heavy golden fibre. There is a steady easel to stand it up, and a gold cord and tassel to hang it flat against the wall. In any position the performance is remarkable. The loud speaker element is so perfectly balanced and strongly built that even holding the vibrator does not interfere with the reproduction.

Three things have made this extraordinary cone possible at the price—(1) Enormous production of one and only one style. (2) The elimination of elaborate gilded bases and extravagant ornaments. (3) The perfection, during nearly 20 years, of an exactly balanced, positive acting speaker unit.

Unless your local dealer already has them in stock, a Pontico Cone will be shipped to you direct, carefully packed in a strong container, post paid, for \$10. Pin a \$10 bill or money order to the coupon below and mail today. Shipment will be promptly made. Satisfaction or money back without question is our absolute guarantee. Buy yours before the radio dealers in other cities sign up the entire production.



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Please send a Pontico Cone complete and ready for use, postpaid, to:

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It is understood that you will refund the \$10 enclosed herewith upon return to you of the cone, if, for any reason I am not satisfied.

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A specially designed Myers tube made with microscopic accuracy and extremely delicate balance—yet it is guaranteed 100% non-microphonic, non-critical. Recommended for extra DX work or where present volume is decidedly insufficient. SD1 uses 5 volts, .25 amperes. The price, \$3 each.

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This is an improved type—built especially and solely for use in the final power out-put stage. Current, 5 volts, .5 amperes.

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These and all Myers tubes embody the famous patent construction which gives a result impossible otherwise. Standard Myers tubes are sensitive, yet stable, positively non-microphonic, non-howling, anti-static, long-lived and perfect in tone quality. Available on O1-A or O1-X type Detectors, Radio Frequency or Audio Frequency. Current, 5 volts, .25 amperes. Standard bases. Each is made and marked for its purpose. Buy a complete set.

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