

**SILENT
THOUGHT
BROADCAST**

*5-Tube
Shielded
DX Set*

**CANADIANS
ANGRY OVER
WAVE GRABS**

*Chicago
Wildly Favors
Silent Night*

APRIL 9

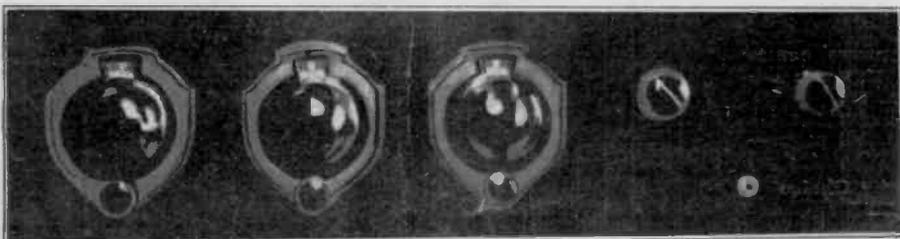
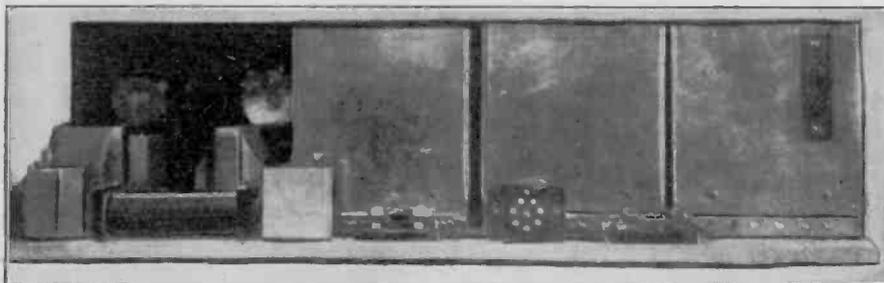
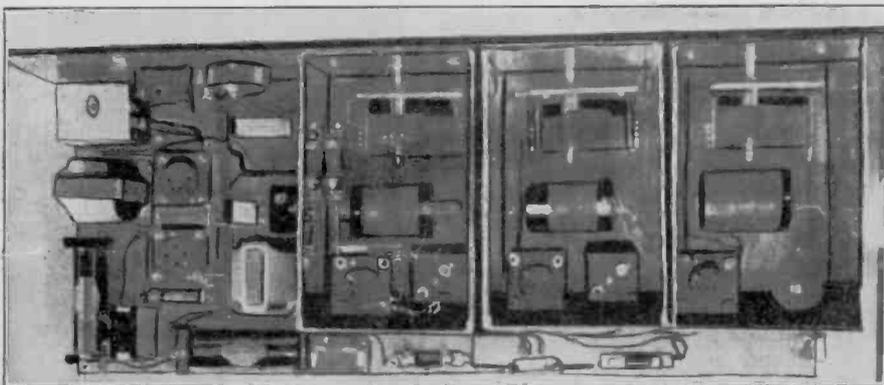
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RADIO

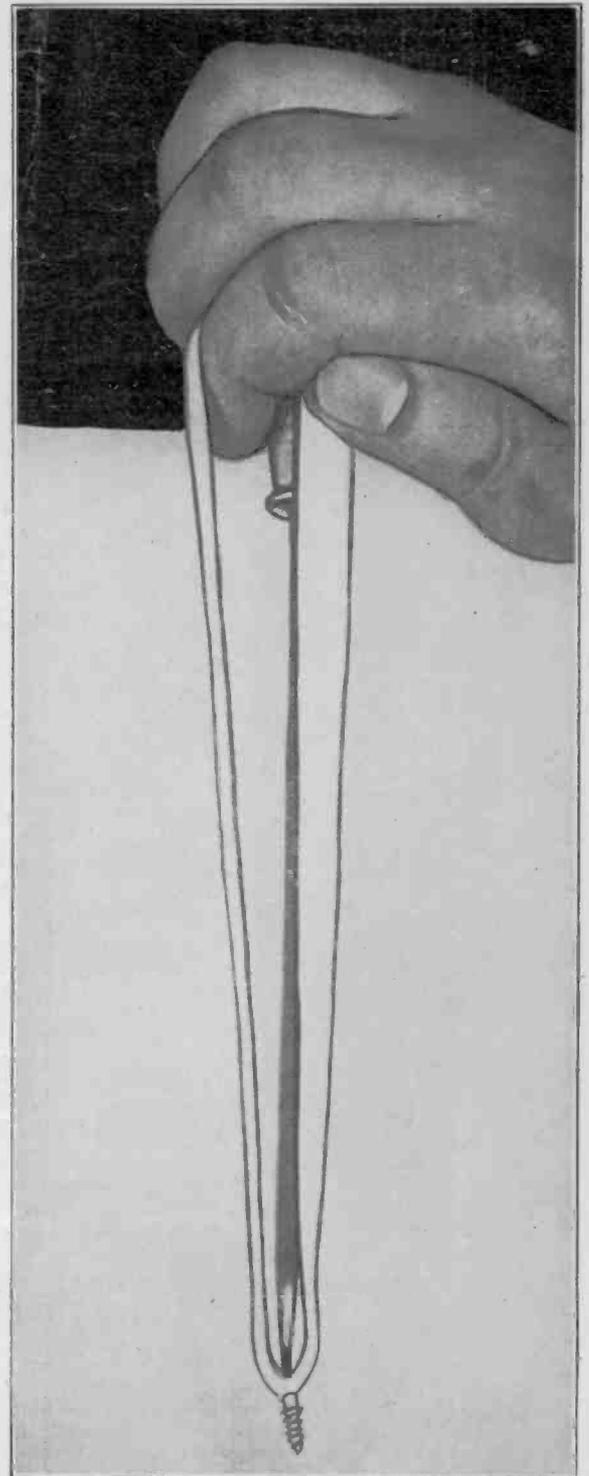
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WORLD

America's First and Only National Radio Weekly



THE FIVE-TUBE SHIELDED RECEIVER pictured above in top, rear and front views, is described on page 4.



(Hayden)

WHEN YOU have to insert a screw in an awkward place, especially where you cannot hold the screw, use a screw driver fitted up with a piece of narrow cloth about twice the length of the driver. Cut the cloth at the bottom, for the insertion of the screw.

**RADICAL AC
TUBE PROVES
MERE MYTH**

*Bias Resistor's
Effect On
Oscillation*

**TIME CONSTANT
HAS BEARING
ON DISTORTION**

*Husband Or
Wife as Radio
Boss of Home?*



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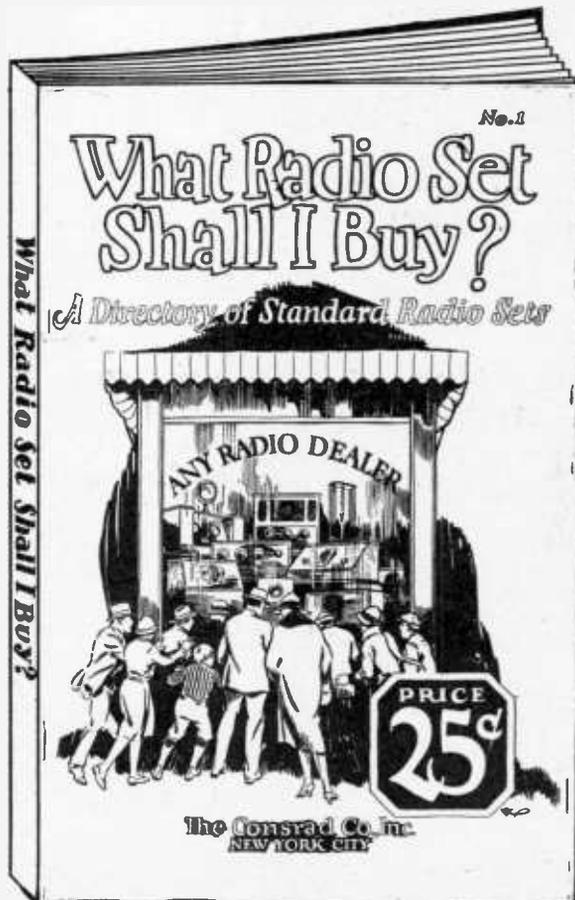
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CITY & STATE.....



A THOUGHT FOR THE WEEK

RADIO is figuring largely in the affairs of distressed China. Mexico, too, has recourse to radio in its days of trouble, and the always-scraping Central and South American near-republics have added the bellicose note to radio's song. Perhaps there'll be a new god of war, whose helmet will be in the form of a cone speaker.

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THE TUBE HALLUCINATION

AN unexpected blow was dealt to the radio industry by the publication of a news article in a New York daily newspaper, setting forth that a revolutionary tube had been developed and that it dispensed entirely with all batteries and current supply units. The tube was described as supplying alternating current for plate and for an equivalent of a filament.

The tube, the article set forth, was the CX-325, the companion model of which was the UX-225.

The facts were that a tube using a step-down transformer for directly heating a cathode from the alternating current line had been developed, but not perfected, in laboratories and had been given the distinguishing titles "CX-325" by Cunningham and "UX-225" by the Radio Corporation of America. The tube thus operates on unrectified A current, without A battery and without an A eliminator. But it does not affect in any way the necessity for plate current from some independent source, either B battery or B eliminator.

The outstanding misinformation that the news article contained was that alternating current could be used directly for plate supply in broadcast receivers. It is well known that alternating current cannot be used on the plate. Every alternate half cycle is negative, and no current flows from filament to plate when the plate is negative, hence half the time the tube would be dead. Half a moon may be better than no moon at all, but, sadly enough, the generous rule of romance does not apply to the Aladdin lamp of radio.

An additional unfortunate aspect of the news article was the characterization of the tube as revolutionary, which led many prospective purchasers of tubes—not only the general public but jobbers and dealers as well—to regard it as imperative that they find out all about this tube before they order any of the existing tubes on the market. Also prospective set and kit purchasers decided they had better wait. Hence not only were E. T. Cunningham, Inc., and the Radio Corporation of America affected, but all other tube manufacturers as well, and many set and parts manufacturers.

Telegrams began to pour into the offices of E. T. Cunningham, Inc., and R. C. A. and other manufacturers, inquiring about the new tube, and making it necessary for some of the tube manufacturers to devote most of their employees' time for an entire week to telling about the new tube, as well as going to the expense of advertising to set forth the honest-to-goodness facts.

The particular model tube in question probably never will even

reach the market. It has never been perfected. One difficulty is that the AC hum is rather strong when the audio amplifier passes low notes well. Also, the manufacturing process is complicated and the tube presents merchandising problems. For instance, it would have to sell for not less than \$6 and might even cost \$9. In addition, a step-down transformer would have to be purchased, and when all is said and done, the amplification and detection capabilities still would be no better than those of the standard CX-301A and the equivalent five-volt, quarter-ampere filament tubes.

The manner in which the harmful and erroneous publicity arose was that somebody furnished the newspaper that printed the article with a sample tube appropriated from the manufacturer's laboratory. Along with the sample no doubt some confidential misinformation was supplied. A reporter for the newspaper then interrogated somebody connected with the R. C. A. concerning the tube, so the article set forth, and while receiving no definite information, nevertheless was not told just what the characteristics and nature of the tube were. Whether anybody inquiring about a supposedly new and revolutionary tube would be justified in calling it such on the basis of absence of information from any official source the general public may well decide. That same public, however, should and must accept the statements of the two largest tube manufacturers, whose similar models were discussed in the news article, as final and authoritative, and must not accept the news article as being worth anything like its face value.

The AC heated cathode is nothing new in radio but was embodied in the McCullough tube which was put on the market two years ago, and which is now being marketed by the Kellogg Switchboard and Supply Company. Hence, the newness of the idea does not exist any more than does the pretended revolution.

While manufacturers suffered for a short time because of the injurious news article, they quickly recovered from the unintentional blow, business being restored to normal by a quick presentation of the facts.

A pointed exposition was made by Herbert H. Frost, general sales manager of E. T. Cunningham, Inc., when he said that the tube probably never will be commercialized and had not even yet been perfected.

Elmer E. Bucher, general sales manager of the R. C. A., stressed the confinement to A battery dispensation, and cited the hum. He added that the tube would not render obsolete existing broadcast receivers.

It is an unfortunate fact that because radio has proven such a wonderful thing and is mysterious to such a great number of laymen, that credence is still put in the idea that a revolutionary development will render existing installations obsolete.

While it is hard to wrest encouragement out of an unfortunate situation, nevertheless if the statements of the tube manufacturers do nothing else than to drive home once again the fundamental idea that nothing revolutionary is in sight or need be expected, they will serve a good purpose.

In the law of evidence is a sharp distinction between an hallucination and a delusion. An hallucination is a figment of the imagination based on some fact, however slight. For instance, if a man said of a piece of paper on the floor that it was talking to him, that would be an hallucination. A delusion hasn't even a fact behind it. For instance, if a man were to shout that he was Napoleon Bonaparte, that would be a delusion.

So the news article concerning the much-heralded tube was only an hallucination.

MAN'S VOICE FOR WOMEN

THE woman's voice as a subject of analysis for broadcasting qualities is under discussion again, this time because WBZ has supplanted a feminine adviser on household affairs with an attractively-voiced man. The overtones or harmonics of the feminine voice, the station reports, do not make for the best reception, and the unfortunate result is that the very point of the woman's remarks may be lost, due to distortion. That, in fact is the crux of the matter—the blow to intelligibility dealt by distortion.

A station must contend with conditions as they are. If it is true that many receivers distort, and they certainly do, then the public should be educated more violently to the need of purchasing tone-quality sets. That, of course, would be hard lines for a few set manufacturers whose chief asset is that the set works and whose chief weakness is that it produces distortion. At least the home constructor, being versed in the ways of building tone-quality sets, can have one for the making, either by revamping what he has, or by building a new receiver. And set manufacturers who use audio transformers had better put the better kind in their sets, and worry less thereafter about distortion and price. The extra few dollars will have been well spent.

As for the man who is to tell the women folk in masculine style how to keep house, let him strengthen himself against gibes of friends, for although the comments may be humorous they will not be in point. The voice that is understood is the voice that wins. And it is perfectly logical, therefore, to have a man talk even about women's affairs, though the logical often strikes us at first as being ridiculous.

A 5-Tube Shielded Set Interstage Coupling Avoided by "Cans"

By Herbert E. Hayden

Photographs by the Author

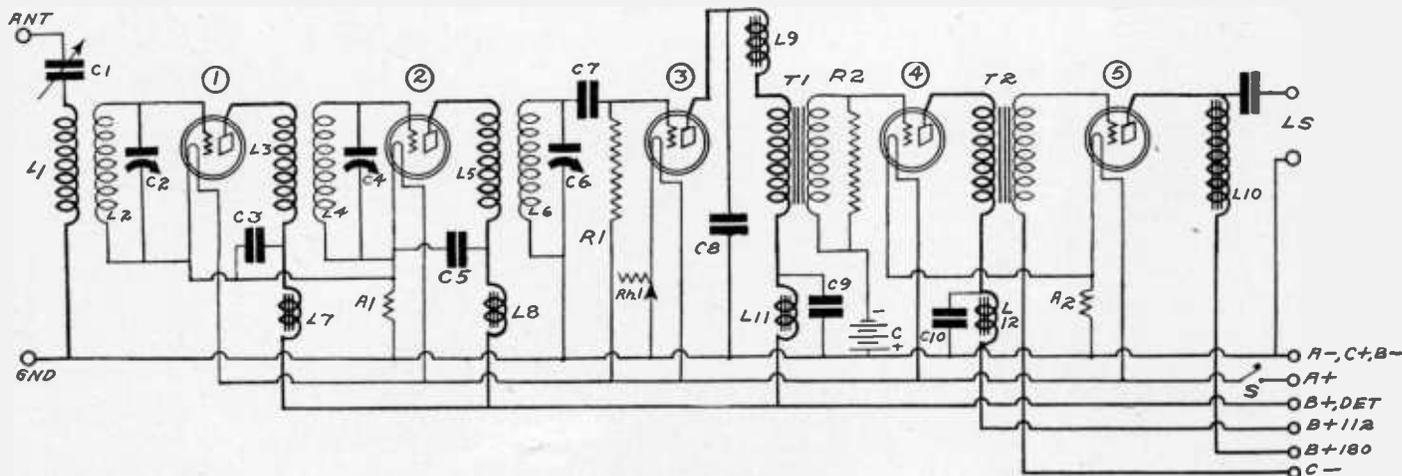


FIG. 1

Circuit diagram of 5-tube shielded receiver showing the proper connections. C11 is in series with one LS post.

OF the many methods used for eliminating undesired interstage coupling at radio frequency, no one perhaps has received greater recent attention from the fans than that of shielding the different radio frequency stages. Shielding not only eliminates the greater part of capacity coupling between stages but also the electromagnetic coupling.

When shielding is used it is not necessary to place the tuning coils at certain angles, for the magnetic field of one coil which strays into the territory of another coil is almost completely stopped.

A grounded shield is a fence through which static lines of force cannot pass and through which electromagnetic lines of force have great difficulty in passing. If the shields are made of a metal of good conducting properties the magnetism is reflected from the surface of the metal.

Needs No Neutralizers

Also when shields are used it is not necessary to employ any neutralizing condensers to neutralize the electric coupling between the grid and plate of a tube, although such condensers do no harm if they are used.

The radio frequency portion of the present receiver (Fig. 1) is made of three almost identical sections, each enclosed in a shielded compartment made of aluminum sheeting 1/16". The dimensions of the compartment shielding are 6 3/4" high, 8" long and 5 1/4" wide. The side and end pieces are made in such a manner that the box may be assembled without the aid of any screws, solder or bolts, yet the box is relatively strong. The lid of the box consists of one piece or two equal pieces of aluminum so shaped as to fit nicely over the side and end pieces and lock the entire assembly together.

In the first box is contained the antenna series condenser C1, which is a small variable, say, .00025 mfd., for adjusting the wavelength of the antenna circuit. The primary, L1, the secondary, L2, and the tuning condenser, C2, are also inside the first "can." The secondary winding is wound on a tubular form 2 1/4" in diameter, with 68 turns of No. 24

- #### LIST OF PARTS
- C2, C4, C6—Three tuning condensers, .0005 mfd. each.
 - C1—One antenna variable condenser, .00025 mfd.
 - L1, L2, L3, L4, L5, L6—Three radio frequency transformers.
 - C3, C5—Two 1/4 mfd. condenser.
 - C7—One grid condenser, .00025 mfd.
 - C8—One by-pass condenser, .0005 mfd.
 - C9, C10—Two 1 mfd. condensers.
 - C11—One stopping condenser, 4 mfd.
 - L7, L8, L9—Three radio frequency choke coils.
 - L10, L11, L12—Three audio frequency choke coils.
 - T1, T2—Two audio frequency transformers.
 - A1, A2—Two ballast resistors, with mountings.
 - Rh1—One 20-ohm rheostat.
 - LS—One single circuit jack.
 - S, R2—One 500,000-ohm variable resistance, with built-in filament switch S.
 - R1—One grid leak.
 - One cable connector.
 - Two binding posts for antenna and ground.
 - Four shielding boxes.
 - One 28-inch front panel.
 - One 27x10-inch wooden baseboard.
 - Three 8 1/4x5-inch baseboards, to go inside the boxes.
 - Ten feet of flexible wire for leads.
 - Three vernier dials.

double silk covered wire. The primary is wound on a small tubing that just fits inside of the secondary and it contains 20 turns of the same size of wire as the secondary. The capacity of the condenser is such as to cover the wavelength band, e. g., .0005 mfd. The first tube socket is also mounted inside the first box. The .25 mfd. by-pass condenser, C3, is placed under a small baseboard. Each box has its own small baseboard independent of the main baseboard.

Box Contents

The second shielding box contains the

second stage, including the radio frequency choke coil, L7, the purpose of which is, in conjunction with C3, to keep the radio frequency currents out of the B battery. Condenser C5 is of .25 mfd. and its position in the second box is the same as the position of C3 in the first.

In the third box is the detector stage, including the socket, the coils L5, L6 and L8, the condensers C6 and C7 and the grid leak R1. L5 and L3 are similar to L1 except that only fifteen turns are used for the primary. Coils L4 and L6 exactly like coil L2. Condensers C4 and C6 have the same value as C2. L8 is of the same design as L7. The grid condenser C7 has a capacity of .00025 mfd. and the grid leak is a variable resistance, preferably the Bretwood De Luxe model.

A filament ballast, A1, is used in common for the two radio frequency amplifiers, while a rheostat, Rh1, of 20 ohms resistance is used to control the filament current in the detector. Those desiring a more complete control of the volume may put the rheostat in place of A2 and then use a single tube ballast for the detector. Both A1 and Rh1 are placed outside the shielding. The rheostat is placed on the panel and the ballast is placed on the baseboard back of the shielding.

Choke Coils and Audio

L9 is a radio frequency choke coil similar to L7. It is used in conjunction with by-pass condenser C8, for keeping the radio frequency output of the detector tube out of the B battery. C8 has a value of .0005 mfd.

The audio frequency amplifier is a standard two-stage circuit employing high-grade transformers, T1 and T2. Attention is called to the two audio frequency choke coils, L11 and L12, in series with the two primaries of the two audio transformers. These are for stopping motorboating, which is likely to occur when high-grade amplifiers are used with B battery eliminators. The two by-pass condensers, C9 and C10, are connected between the grounded side of the circuit

(Concluded on page 5)

How to Compute Power

The Watt is the Product of Volts and Amperes

By Brunsten Brunn

THE term watt is used very often in electrical work. What does it mean? The watt is the practical unit of power, and power in turn is the rate at which work is done or energy expended. When power is multiplied by time or work, energy is obtained. When we buy electricity we buy electrical energy not power.

Power is the time rate at which we buy it or use it. For example, if we connect a 50-watt light to a circuit and let it burn for one second the power is the same as if the light were kept burning for a year.

The wattage tells that when we connect that lamp we are using electrical energy at the rate of 50 watts. To find out how much energy we have used after a certain time of burning we must multiply the wattage by the time. If we let the lamp burn for four hours we have used up 50×4 watt-hours of work or energy, which is equal to 0.2 kilowatt-hours. If the cost of electrical energy is 7 cents per KWH the cost of burning a 50-watt light for four hours is 1.4 cents. The wattage is always obtained by multiplying the volts by the amperes. Thus if the voltage is 110 volts and the current is 2 amperes, the wattage is 220 watts or 0.22 kilowatt.

Stored Energy

In the April 2 issue of RADIO WORLD, in the article, "Facts Every Experimenter Should Know," the principle of conservation of energy was discussed briefly. Since power is the rate of receiving or expending energy, the principle should also hold for power. However, it is possible to store up energy for future use, or to draw upon a store for immediate use. It is therefore not true that power expended is the same as the power received. Storage tanks for electrical energy are inductance coils, condensers and

storage batteries. They may be charged at one rate and discharged at a different rate.

In many cases, however, the energy is used up as fast as it is received, and in those cases it is correct to speak of conservation of power. For example, the power in the primary of a transformer is the same as the power in the secondary, except that some is lost in the form of heat in the process of transformation. If the power is drawn from a certain supply line by a transformer the power available in the secondary is very nearly the same as that drawn from the line. If the power is not used in the secondary it is not drawn from the primary, except for the small portion which is lost in heat in the primary wiring and in the core of the transformer. This is small when the transformer is idling.

Tubes Generate No Energy

In connection with conservation of energy it should be stated that while vacuum tubes amplify voltages and currents, they do not generate any energy. They merely control a local source of energy, and that source may be a battery or an eliminator. When a vacuum tube is connected up with circuits so as to form an oscillation generator no energy is generated but is merely changed from steady to oscillating. A similar transformation occurs when a flutist blows a steady stream of air across a small hole and produces a tone which is oscillating.

Previously Ohm's law was given for the case of steady current and DC resistance. The law holds in general for AC and impedances. Suppose that the impedance of a circuit is Z, the effective AC voltage in the circuit is E and the effective AC current flowing is I, then $E = ZI$ is the general statement of Ohm's law.

The impedance to AC current of an inductance coil is equal to the product of

the inductance in henrys and 2π times the frequency of the current. That is, if L is the inductance and w is the 2π frequency, then $Z = Lw$. The result is in ohms. If the inductance is 10 henrys and if the 2π frequency is 1,000, the impedance is 10,000 ohms. If an AC voltage of 110 volts is applied across the coil the AC current flowing will be 11 milliamperes.

Condenser Impedance

The impedance of a condenser to AC current is equal to the reciprocal of the product Cw, or $Z = \frac{1}{Cw}$, where C is the

capacity of the condenser in farads and w is the 2π frequency. The result is again in ohms. If the capacity of the condenser is one microfarad and the 2π frequency is 1,000, the impedance Z is equal to 1,000 ohms. If the voltage of the line is 110 the current through the condenser when connected across the line would be 110 milliamperes. This would be AC of course. A 2π frequency of 1,000 is equal to 159 cycles.

When an inductance coil and a condenser are connected in series the impedance of the combination is obtained by taking the difference between the two. Thus if the 10 henry inductance coil and the one microfarad condenser discussed above be connected in series the impedance of the two is 10,000 minus 1,000 ohms, or 9,000 ohms.

If there is resistance as well as inductance or capacity this must also be taken into account in obtaining the total impedance. The general expression for impedance in series circuit having resistance inductance and capacity is $Z = \sqrt{R^2 + (Lw - \frac{1}{Cw})^2}$. The resistance is the

AC resistance, which is always higher than the steady current resistance.

5-Tube Set Using Three Shield Cans

(Concluded from page 4)

and the junction of the primaries and the audio chokes. The condensers, of course, are used to by-pass the higher audio frequencies around the chokes. Their values are 1.0 mfd. each.

Ground the Shields

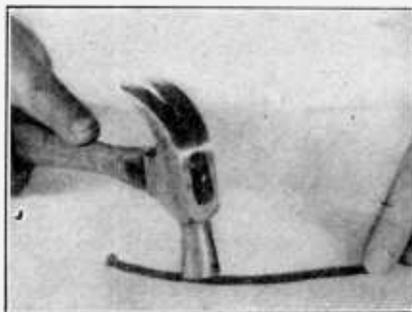
A ballast, A2, is used in common for the two audio frequency tubes. It should carry one-half ampere if CX 301-A tubes are used and three-quarter ampere when one of these and a power tube are used.

The choke coil, L10, is a high inductance audio choke for separating the DC from the AC in the speaker. It should have an inductance in excess of 100 henrys. The stopping condenser, C11, should have a value of 4 mfd. or more.

R2 is a variable high resistance of 500,000 ohms placed across the secondary of the first audio transformer as a volume control. It is mounted on the panel for easy access.

A filament switch, S, is placed in the positive lead of the filament battery. A

HIT AND HIT HARD



(Hayden)

THE AVERAGE fan finds it quite difficult to cut the insulation off rubber covered wire with a pair of cutting pliers without also cutting the wire. However, by hitting the insulation with a hammer, as shown above, you can easily remove the insulation by scraping.

cable connector should be used in place of binding posts for the various supply lines.

The shields should be grounded. As A minus is grounded, simply connect A minus to each shield, and the shields may thus be used as part of the wiring to filament. The leak connection from grid post of the detector socket direct to A plus makes the grounding of the third shield perfectly safe.

[Photos on front cover]

Microphone Put at Viols Better Tone

Los Angeles.

Believing that the broadcasting of the Los Angeles Philharmonic Orchestra could be bettered, Robert Hurd, program director at KFI recently set about finding a way to get more nearly perfect tonal balance. While the original concert was highly pleasing to the thousands who heard it, Mr. Hurd's trained ear detected a predominance of some of the woodwinds and string instruments, and was puzzled at the lack of depth of the ensemble.

He had the KFI technicians shunt in on one of the morning rehearsals of the orchestra, carrying the music from the Philharmonic Auditorium over the private telephone lines to the studio, where it was put through the input panel and connected with the studio loudspeaker, without being broadcast.

When he had each of the sections in the orchestra play alone, the operator checked their intensity and volume on the galvanometer, and each was found to be all that could be desired, until the bass viol section was heard and found to be wanting in volume. So the program director had an extra microphone placed near the viols, with splendid results.

The Time Constant As a Source of Distortion at RF and AF

By J. E. Anderson, A.B., M.A.

Contributing Editor; Consulting Engineer; Associate. Institute of Radio Engineers

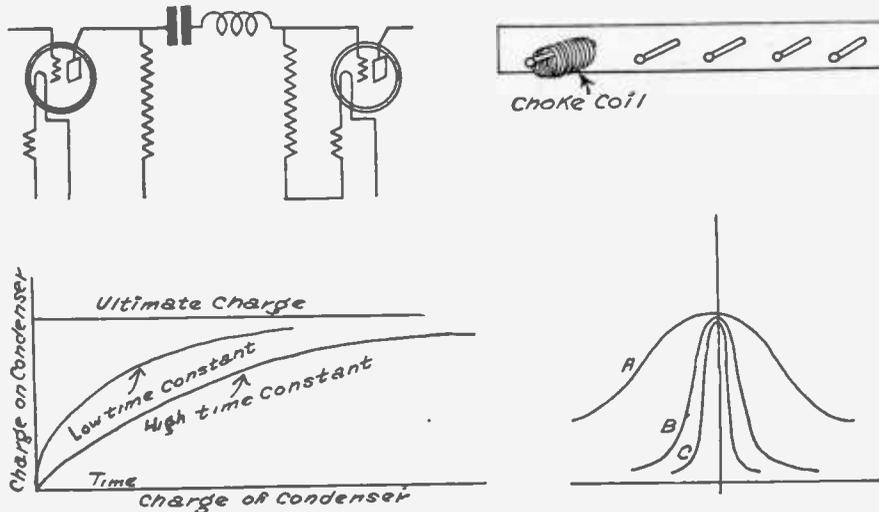


FIG. 1 (upper left) illustrates a choke coil in series with a high resistance for stopping high frequencies. It makes little difference whether the coil is placed on the grid side or on the condenser side of the grid leak. Both connections are equally ineffective.

FIG. 2 (upper right)—A choke coil hung on a peg has about the same choking effect on radio frequency currents as a coil placed as shown in Fig. 1.

FIG. 3 (lower left)—The charging of a condenser takes place as shown by these curves. The ultimate charge is the quantity of electricity which will be in the condenser when it is finally fully charged. As time increases the actual charge approaches this value as shown by the curves.

FIG. 4 (lower right)—This shows three resonance curves of different time constants. A has a low time const., C a high value of time constant. This neglects the resistance in the condenser and supposes that the resistance is in the tuning coil.

IT has been stated by certain writers that the condenser between the plate of one tube and the grid of the next in direct coupled amplifiers couples the two tubes. Although this condenser is often called a coupling condenser it does not couple the two tubes. It merely stops the direct high potential of the B battery from getting on the grid of the succeeding tube. It is properly called a stopping or isolating condenser. It is the plate coupling resistor or choke coil that does the coupling. Of course the degree of coupling is modified somewhat by both the condenser and the grid leak but not very much, if the circuit has been designed properly.

Sinister comments have also been made by these writers about the time constant of the stopping condenser and the resistances in series with it. The intended interference from these comments is that the time constant affects the quality adversely, and therefore that it would be well in order to avoid direct coupling. It has also been stated that a condenser has a natural frequency and that this is the cause of the put-put effect, or motorboating, often met with in direct coupled circuits. It has also been inferred that the greater the time constant of a stopping condenser and series resistances, the worse the circuit as an amplifier.

CXR Equals Time Constant

The time constant of a condenser and a resistance in series with it is the product of the capacity of the condenser and the resistance. That is, if the capacity of the condenser is C farads and the resistance in series with it is R ohms, then the time constant of the circuit is CR seconds. Thus if the capacity is 0.1 mfd.

and the resistance is 2 megohms, the time constant is 0.2 second. Now if we were to believe the statements published, if the stopping condenser and the resistance in series with it had this value in an amplifier, that circuit could not amplify any frequencies which were equal to or greater than about 5 per second.

The higher the time constant of the circuit, the better it is as an amplifier. The time constant does not measure the time that the condenser charges or discharges, but it measures the rate of discharge and charge. The time of charge and discharge, no matter what the size of the condenser, is infinitely large. It takes many light years and then some, for a condenser fully to discharge.

This means that it can never be completely charged or discharged. Although that is a fact, for all practical purposes it can be said that the condenser can be charged or discharged in a very short time. The time constant gives the time that it takes to discharge the condenser from full charge to a value $1/2.718$ of the original. The discharge takes place logarithmically, so that in equal times the same percentage of the charge remaining is discharged. The law of charge of a condenser is similar to the law of discharge.

Effect on Amplification

The only time that the time constant enters into the amplification is when the receiver is first turned on. The stopping condenser is practically discharged after the set has been off for a long time. As the set is turned on the stopping condenser must be charged to a voltage equal to that of the sum of the B and C batteries before the operation is normal. In

well-designed amplifiers this time is appreciable. If the set happens to be tuned in on a signal as it is turned on the charging process is observed as a growl or a gurgling. After about a second the operation is normal. The longer this transient effect is, the higher is the time constant of the various stopping condensers and resistances and the better is the set as an amplifier. That is, the better it will amplify the low notes. The high notes are not affected.

The stopping condenser is not charged and discharged for each cycle of the note amplified. There is no AC difference of potential across it. If there is, some of the notes will not be amplified. If the condenser is too small, or if the grid leak resistance in series with it is too low, the time constant is too small. There will be an AC potential across it and the low notes will be suppressed. The facts are exactly opposite to what has been claimed by certain writers on the subject.

When the stopping condenser is used for detection this situation is different. The time constant should not be too large. If it is, only the lowest notes will be detected. Even the ordinary values of .00025 mfd. and 1,000,000 ohms will cause a considerable suppression of the higher audio frequencies in the detector.

Motorboating Is Independent

With regard to the put-put effect, this cannot be due to a periodic charge and discharge of the stopping condenser because the condenser has no natural period. The period is infinite, as was stated above. If there is a natural period of the condenser and of the small inductance of the leads, this would be of the order of one millionth part of a second, or even very much shorter. The put-putting is evidently of a longer period. Periodic blocking in a circuit may be related to the time constant, but it is not because of the natural period of the circuit. It has not any.

A circuit consisting of an inductance coil and a resistance in series with it also has a time constant. It is the ratio of the inductance to the resistance, or if L is the inductance and R the resistance, the time constant is L/R . The quantity determines the rate at which current increases in the circuit as a voltage is applied, or the rate at which the current in the circuit decreases as the voltage is removed. If the inductance is large and the resistance small the time constant is large, and then it takes a comparatively long time for the current to build up because the rate of change is small. Likewise when the time constant is large it takes a long time for the current to die down as the voltage is removed. A coil in which the resistance is small is a good choke coil because the current will neither increase nor decrease as the voltage changes. But if the resistance of the coil is large, or if there is a large resistance in series with the coil, the choking effect is very small, because the time constant of the circuit is small.

The Grid Choke Fallacy

In connection with the use of choke coils a fallacy should be pointed out. Recently many circuits have been published in which a choke coil has been connected

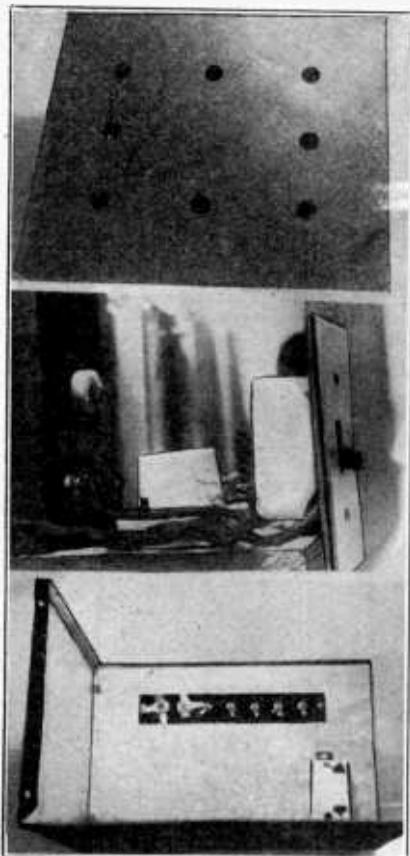
Concluded on page 29)

The Power Compact

Socket Operation for all B, One A, One C

By Lewis Winner

Technical Editor; Associate, Institute of Radio Engineers



FIGS. 5, 6 AND 7

The top photo shows the vent holes, drilled in the metal cabinet, which allow air to enter and keep the tubes as well as the surrounding parts cool. The center photo shows how the severed AC input lead is connected to one post of the socket and to one post of the switch. How the Bakelite stripping with the binding posts and single-circuit jacks appear, is shown in the bottom photo. Note the rear of the switch.

[The first part of this article appeared in the April 2 issue of Radio World. The concluding installment follows.]

INSTEAD of connecting the AC leads of the R210 directly to line, as provided, it is necessary to cut one lead, so that the fuse and switch may be inserted. It will be noted that the fuse socket and the switch are placed near enough to this lead so that no other wire need be attached to this original piece. The leads may then be tacked down with the aid of staples along side of the R210 unit and run out through the side.

There is no wiring to be done from the transformers to the chokes, etc. This is only indicated in the diagram. All the units shown in the dotted line portion together with all the leads, are already made in the complete unit. The only connections that are made from this unit are the filament connection to the rectifier tube, the filament connection to the amplifier tube and the center tap connection which is made to a 1,000-ohm Kroblak wire-wound fixed resistor providing C bias, and the three connections to the 2 mfd. fixed condensers, C1, C2 and C3.

The binding posts, jacks and variable resistances are mounted on Bakelite strips,

which are already mounted on the cabinet when purchased. The AC output lead is brought through the extra hole, drilled on the strip carrying the variable resistors, through a hard rubber bushing.

Making Condenser Housing

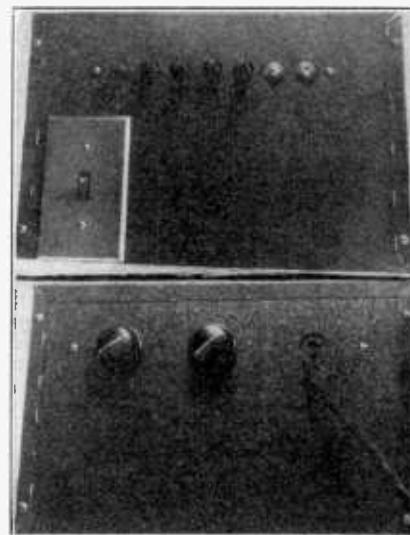
The R210 unit is first mounted on the baseboard, which is 11 11/16 inches long and 9 9/16 inches wide. The fuse socket is mounted in front of the three posts marked F C F, close to the short edge. Do not center it. It should fall between the F and C posts. The Kroblaks are next mounted, these being in line with the socket. The output transformer and double impedance are next mounted, respectively. You will note that these articles just about fill up the entire lengthwise space. There should be about 1/8 inch space left between each of these articles. Be sure that none touch each other. The fixed condensers are next mounted. This is quite difficult and should be done slowly and with care. Three 2 mfd. condensers are first lined up, right next to the power unit. A corner brace and a mending plate is then procured. These are bolted together. Another corner brace is attached to the other end of the mending plate. You should now have a frame which resembles an S. Place this over the condensers. One corner brace should hit the baseboard. The other should hit the top of one condenser, while one mending plate should fall along the side.

Attach a mending plate to the corner brace on top. To the other end of the plate, place another corner brace. To this corner brace, attach another mending plate and to this plate attach a corner brace. You should now have a housing for these three condensers. Do not screw down, yet, though. Now place the 4 mfd. fixed condenser, next to the 2 mfd. condenser, furthest away from the left hand lengthwise edge. The other 2 mfd. fixed condenser should be now placed next to this. Now from the mending plate on top of the three condensers, place another mending plate. Bolt these together. Procure another mending plate and bend it, so that one hole of the plate falls on the side of the single 2 mfd. fixed condenser, while the three other holes fall on top of the mending plate covering the top of this single 2 mfd. condenser and 4 mfd. condenser. The bend is one-half inch from the short end. To the hole on this short end, bolt another mending plate. To the end of this plate, the final corner brace is attached. Now place one 1 mfd. fixed condenser flat up against the 4 mfd. condenser (looking from the left hand lengthwise edge.) The other one 1 mfd. fixed condenser is placed at right angles to this one, parallel to the last 2 mfd. fixed condenser mounted. These are bolted down with wood screws. Replace all the large condensers and put the frame over them. Screw down with wood screws. If you have carefully followed these directions and the photos, shown last week, you should have no difficulty in making this housing.

Inserting the Switch

The sockets are next mounted. One socket is mounted in the small space, around the fixed condensers. Two more sockets are placed in line with the double impedance, they being 1 1/4 inches apart. One of these sockets is also in line with the socket in the condenser entrenchment. These are 1 1/2 inches from the left hand edge.

The mounting of the binding posts, jacks and variable resistors, require no special at-



FIGS. 8 AND 9

One side of the cabinet, with the switch, binding posts and input and output jacks, is shown in the top photo. The variable voltage adjusters and the cord to the line as placed on the opposite side of the cabinet, is seen in the bottom photo.

tion. However the switch mounting is tricky. It is necessary to first place the baseboard in the cabinet and then mount the switch unit. The cabinet does not provide for the insertion of this type of switch. It is therefore necessary to do a little cutting. First insert the switch, so that the on and off lever can be seen through the large hole which is present. Now cut a vertical slot about 1 inch from the top of this hole. Place the plate over it. Mark for the mounting holes and drill. Although a brass plate and switch combination were brought as a unit, each can be purchased separately. Therefore, if you wish, you can use a bakelite plate, which is frosted with the same color paint as the cabinet. It can be purchased for about 10c.

Proper Wire To Use

The wiring is very simple. Rubber covered wire should be used for the power unit. Stiff bare wire may however be used in the audio portion. You will find that the flexible leads from the 2 mfd. condensers, just about reach the posts on the power unit, if the condensers have been placed properly. All the other leads should also be short if the parts have been placed according to directions. The socket in the condenser entrenchment is used to hold the rectifier tube. The one in line with this socket is used for the voltage regulator tube. The other socket is used for the power amplifier tube. Only three posts are used on the rectifier socket, the two F's and one P. The G is not used. On the voltage regulator socket, the F plus post or the post diagonally opposite to the G post and the G post itself is used. F goes to P post of rectifier socket, G post to + 90.

If you have a receiver which is not critical on the RF or detector plate voltages, the variable resistances, may be supplanted by a fixed resistor having a resistance of 10,000 ohms. This will drop the 90 volts to 45. So as to obtain maximum efficiency from the eliminator, it is essential that you ground the B minus post.

The Nine-in-Line

A Sensitive, Selective Super-Heterodyne

By Lewis Rand

[Part 1 giving a general discussion on this receiver, was published last week, April 2 issue.]

PART II

THE first operation in the assembling of the receiver is the mounting of the parts on the panel. The Mar-Co controls and condensers are first mounted. The two Yaxley rheostats and Centralab volume control are then attached. The filament switch follows. To mount the Mar-Co Illuminated Controls and the variable condensers use the templates supplied. You will find that the back of the control just fits into the space, between the subpanel and the panel. The condenser, when the subpanel is attached, will just fall flush on the surface.

The panel is now attached to the subpanel with the aid of brackets. The High Frequency Laboratories' transformers should then be mounted in the following fashion, with the back of the panel facing you, reading from left to right. One audio transformer, F320, is first placed. The radio frequency choke, L425, follows. This is followed by the second audio transformer, also an F320. The air core transformer, H215, follows. Then an iron core transformer, H210, is screwed down. The second air core transformer H215 is next. The remaining two iron core transformers, H210, are then screwed down. When mounting these, the B and F posts should face you. This means that the P and G posts will face the panel. Clip off all the soldering lugs on the B and F posts. A lug is placed underneath each screw run through the P and G posts above the subpanel. Lugs are placed on the B and F posts underneath the subpanel. After this operation has been completed, the sockets are next mounted.

Detach the upper portion of the socket from the bottom portion, by means of the black colored bolt which run through the center. Fit the underneath portion of the socket into that portion of the socket above the panel, so that the P and G posts are facing you, the F posts facing the panel. A small notch underneath the upper portion will fit into the lower portion. Then place the screw back again, tightening it up. The mounting screws are then put through the holes in the lugs. Be sure that you have not switched the position of the socket. This same system is followed out for mounting the other eight sockets.

The three loop Yaxley pup jacks and two phone tip jacks are next inserted. The Yaxley cable connector plug is next attached. It is in the left hand rear corner. The General Radio 50 mmfd. microdenser next takes its place. This is followed by the Amperites, the one for the detector being placed next to the socket for this tube, while the three for the second detector and two

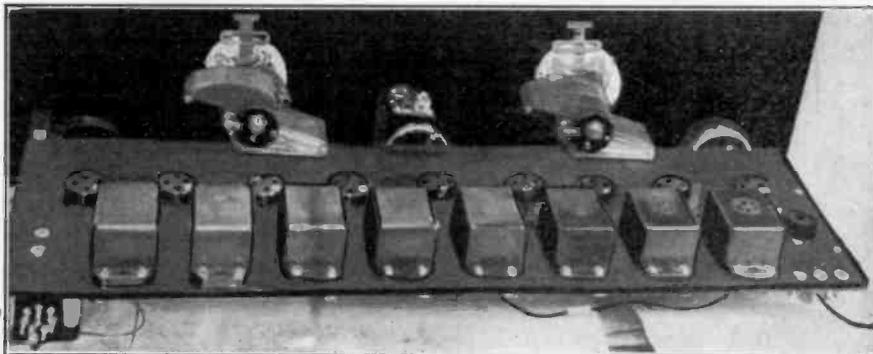


FIG. 4

The rear view of the completed receiver. Note the flexible C battery leads. The Yaxley cable connector plug is seen in the lower left hand corner.

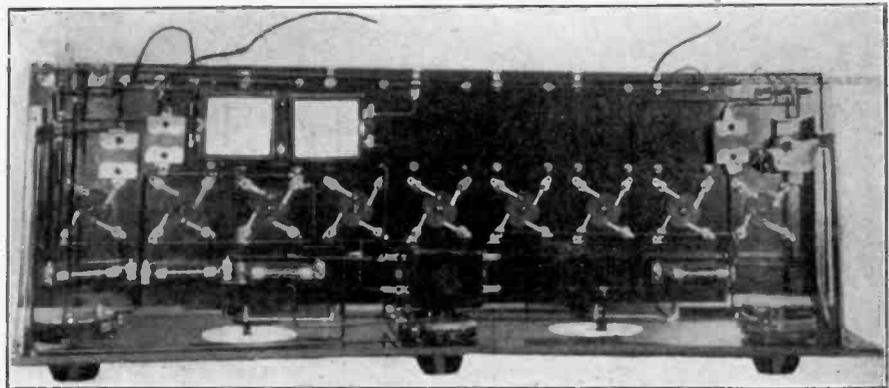


FIG. 5

The bottom view of the set. Note the simplicity of the wiring.

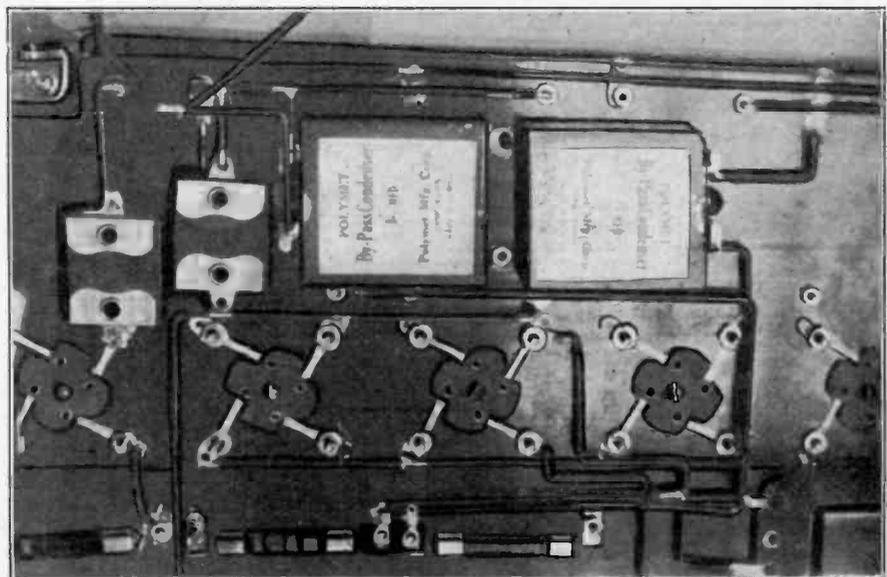


FIG. 6

A closeup view showing how the large bypass condensers C6 and C7 are held together with a single screw and bolt. The three Amperites for the second detector and two audio tubes in the lower left are also clearly seen.

audio tubes are placed one next to the other in a straight line. The exact positions of these can be best seen in Fig. 5, where the extreme right hand cartridge is the first detector Amperite, while the other three are in the right hand corner. The oscillator coil, L430, is placed underneath the subpanel, directly in the center, near the panel. The P and B posts of this coupler face the right, while the P and G. posts with the center tap faces the left. The two large Polymet bypass condensers, C6 and C7 are

held beneath the subpanel by a single screw. These are toward the rear of the subpanel, and about seven inches from the right.

(Part III next week.)

SPAIN APPROVES CONTRACT

Madrid, Spain.

At a recent meeting of the Cabinet, approval of the establishment of a direct short wave wireless communication system between Madrid and Buenos Aires, by a private concern was given. The Government stressed that this system was not to be a monopoly, not to be limited to communication between Spain and Argentina and not to receive aid from the Government.

MORE RADIO FOR GUATEMALA

New radio service between Guatemala and other parts of the world was inaugurated. The service is to be through the radio station belonging to the Guatemalan Government and the radio system of the Tropical Radio Telegraph Co.

WMS NOW 5,000 WATTS

Nashville, Tenn.

WMS, the National Life and Accident Insurance Company station of this city, recently increased its power from 1,000 to 5,000 watts.

The Cut-off Frequency

A Factor In Applying Motorboating Cures

By Dexter Manning

WHILE there is no receiver which is free from the troubles that give rise to motorboating, the put-putting is most frequently met with in resistance coupled amplifiers because these amplify the low notes better than other receivers and by-pass condensers are not effective at the low frequencies. Other circuits may motorboat but you can't hear it.

Any change in a circuit which reduces the amplification at the low frequencies will reduce or stop motorboating, and conversely, any change that will increase the amplification will increase the effect. However, these changes must be made with due regard to their effect on the cause of motorboating, which is a common impedance between the various circuits in the amplifier.

One thing that reduces the tendency to motorboat is to increase the coupling resistor (plate circuit). Although this increases the amplification slightly it reduces the cause of motorboating by making the common impedance a smaller proportion of the total impedance in the plate circuit.

Small Condenser

Another method that reduces the trouble is the use of a small stopping condenser in the grid circuit (ordinarily called coupling condenser). This reduces the amplification at the lower frequencies where a by-pass condenser is ineffective in reducing the common impedance. Hence this method of stopping motorboating is often used.

The use of a low value of grid leak with the condenser is also effective in stopping motorboating. Its action is similar to that of the small condenser in so far as it reduces the amplification at the low frequencies. The low value of grid leak reduces the amplification over the entire scale, however, but the decrease at the low frequencies is greater than at the high.

The grid leak and the condenser really work together in cutting down the amplification at a given frequency. The resistance of the leak, the capacity of the condenser and the frequency enter into the amplification in almost exactly the same way, so that at a given frequency the amplification is the same if the resistance is 2 megohms and the condenser 0.5 microfarad as it is when the condenser is 2 microfarads and the resistance is 0.5 megohms. The larger the product of C and R the greater is the tendency of the circuit to motorboat at a given low frequency.

Grid Leak

The use of a small value of grid leak to stop motorboating is quite common because of the ease with which the

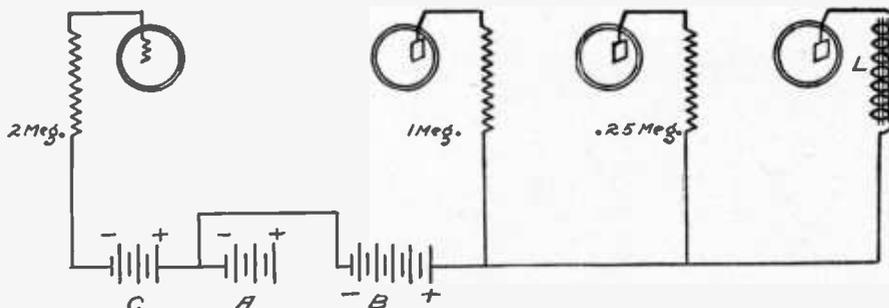


FIG. 1

The common connection of the plate, grid and filament circuits through the batteries or other power sources.

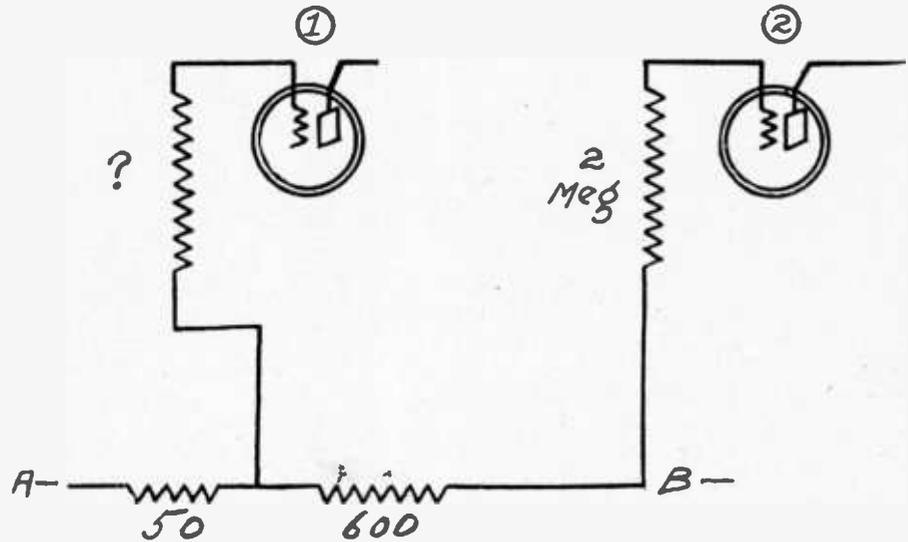


FIG. 2

The grid bias for the final audio tube and the other negatively biased tubes in a receiver may be obtained by utilizing the voltage drop in resistors connected in the common power leads, e. g., B minus and A minus. The values 50 and 600 ohms are for a B eliminator delivering 60 milliamperes at 180 volts, where the total B current of the receiver is 60 milliamperes, and the final audio tube is a CX-371.

remedy may be applied. When this remedy, or that of a small stopping condenser, is used, let no one entertain the illusion that the low notes are retained in full in the amplifier. The smaller the condenser is with a given value of grid leak the higher is the cut-off frequency. Also the lower the value of the grid leak for a given value of the stopping condenser, the higher is the cut-off frequency. When both a small condenser and a low value of grid leak are used the cut-off frequency is so high as completely to frustrate the main purpose of resistance coupling.

Referring to Fig. 1 we have one method that may be used to reduce motorboating. The first coupling resistor (detector plate) is 1.0 meg. instead of the usual 0.1 megohm value. Since 1.0 meg. is large in comparison with the resistance of the B battery the cause of motorboating has been reduced greatly, that is, relatively, and the amplification of weak signals has been increased. In the next plate circuit the coupling impedance has been made 0.25 megohms instead of the usual 0.1. A larger value is used here because the second tube requires a higher effective plate voltage to handle the stronger signal voltages met here. But even 0.25 megohms will help to reduce motorboating and at the same time increase the amplification somewhat. In the last plate circuit a choke coil is used through

which the plate current flows. If the impedance of this choke coil is large at the low frequencies it also helps in reducing motorboating. However, it is difficult to get an inductance large enough with a low value of DC resistance to be of much use. Its use does not increase the motorboating, however, no matter what the value of its inductance.

Bias Through Resistor

In Fig. 2 is shown the manner in which grid bias is sometimes obtained and which is a cause of motorboating. In one case a 2 meg. grid leak is used, which is large enough not to stop the low frequencies for the stopping condensers now employed. The first grid leak has been left for experimental determination. The largest value which will just stop motorboating should be used here. The value depends on the size of the condenser, the frequency at which the circuit motorboats and on the amplification of the circuit.

It should be pointed out that when one of these practical makeshifts are employed for stopping motorboating it is not necessary to apply them to all the circuits but only to one.

The only thing that will stop motorboating without any deleterious effects on the quality is the liberal use of by-pass condensers. Unfortunately it has been the practice to scatter these capacities throughout the circuit. This is bad. Remember the saying that in upon there is strength. That is just as true of by-pass condensers as of military and political forces.

Rule of Reason

If all the condensers are lumped into one large condenser and if the plate or grid circuits are joined together so that there is only one common impedance, the single large condenser will be very much more effective in cutting down the common impedance than if the condensers are scattered. Not only will the various plate and grid currents partly neutralize each other, thus reducing the effect of any common impedance, but the large

(Concluded on page 10)

World Test of Reliability to Be Held by Amateurs

One Station in Each Country to Be Awarded Certificate
—Quick, Accurate Handling of Messages to
Be Criterion

Hartford, Conn.

An international test to be held in May to ascertain the most dependable amateur radio stations in each country, and to be participated in by amateurs all over the world, has been announced by the Communication Department of the American Radio Relay League, the amateurs' organization with headquarters in this city. The test will start on May 9, to last for two weeks, and will be open to any amateur in any country who possesses an amateur transmitting and receiving station.

Messages will be filed for delivery in all countries, and the amateur station in each locality showing the quickest, most accurate and most consistent performance in connection with the forwarding of these messages to their destinations will receive a suitable certificate designating it as an official foreign contact station.

World Tests Long Expected

In connection with the announcement of the test, F. E. Hardy, Communications Manager of the League, points out that the transmitting amateur has been working toward such a world test for the last six years. "Ever since 1921, when

amateur signals were first sent and received across the Atlantic Ocean," points out Mr. Handy, "the amateur has realized that it was only a matter of time before transmitting and receiving contests would develop from a regional or even national character and would take on an international aspect.

"Last year the first attempt at an international reliability contest was made between stations of this country and Australia. The test was eminently satisfactory and as a result of it many reliable radio channels were opened up between amateurs of this country and the British dominion.

Time For World Test

"The success of the Australian tests led early this year to a similar series of tests between amateurs of the United States and South Africa. As with the Australian event, the purpose of the contest was to open up reliable amateur communication lanes between this country and South Africa, to determine the best wavelengths to use at various times of the year and also different times of the day and night, and to determine which stations in each country could best be depended upon for consistent communication. The tests con-

ducted in South Africa were just as successful as the Australian ones, and immediately requests were received here at League headquarters from amateurs of many countries of the world requesting similar tests with their respective countries. Rather than conduct a series of tests with individual countries it was decided that the time had arrived for a single international contest embracing amateur stations in all the nations of the world."

Short Waves Believed to Travel 20,000 Miles

It used to be a common belief among amateurs that the best DX any radio station could get was 12,000 miles, or half-way around the earth. Many amateur stations on short waves have good reason to believe that they have received farther than this, however. Some short waves travel best in daylight and some best at night. By picking out a station 4,000 miles away, waiting until there is daylight between the two stations, and then selecting a wavelength that travels best in darkness and poorly in daylight, the amateur concludes that the signal takes the "dark" way around to the receiver, which would mean traveling some 20,000 miles. Similar results can be obtained by waiting until there is darkness between the two points and then selecting a "daylight" wave.

A LILY IN HIS HAND

There was a young feller named Fair,
Who mangled and used up the Air.
But there was a snooper
Who caught this bad blooper
And choked him—the world didn't care.

The Cut-Off Frequency

(Concluded from page 9)

combined condenser will be more effective in reducing the residual effective coupling.

Scatter the enemy but combine the defenses. The increase of the coupling resistors scatters the enemy and the bunching of condensers combines the defenses. By employing small stopping condensers and low values of grid leak, the enemy is killed off but only by defeating, in part at least, the purpose of the amplifier.

The relationship between the μ of the tubes in the audio amplifier and of the value of the common impedance required for motorboating is very close. The higher the μ the lower is the necessary common impedance. In some typical circuits employing high μ tubes the amplifier will start to motorboat if the common resistance is as high as 5 ohms. It is almost impossible to find any source of plate voltage which does not have more than this. This value of the critical common resistance applies especially to the cases where there is an odd number of plate circuits on the common impedance. If the number of plate circuits is even in fact the circuit is stable and the higher the common impedance the farther the circuit is from motorboating. In considering the common impedance it should be remembered that if the load on the set is inductive, as it is in nearly all cases, the common impedance must also be inductive if the set is to motorboat at a low frequency.

Filter Inductance

It has been said by some that motorboating is caused by an insufficiency of inductance in the smoothing filter. It is obvious that the higher the inductance

of the filter the more difficult it will be to make the common impedance capacitive at low frequencies. Hence to stop motorboating the inductance should be made small rather than large. Of course, it is necessary to have enough inductance in the filter to eliminate the hum. The only thing that can be done in that case is to increase the capacity of the condenser across the output so that the common impedance will be capacitive or purely resistive at the low and troublesome frequencies.

While a common impedance of a certain type in combination with a load of a certain type will cause the circuit to squeal at a high frequency, say from 1,000 to 5,000 cycles, it is very easy to stop this by a moderate size condenser across the output or across the plate voltage binding posts of the set.

Like a Reflex

When a resistance is used for obtaining a negative bias on the several tubes in a radio set many complications are introduced in the receiver. In the first place this resistance may be used for both audio and radio frequency amplifiers. The two levels of frequency are then mixed after they have been separated by the detector. They no longer co-exist as modulating and modulator frequencies but as two separate signals in exactly the same manner as in reflex circuits. It can be expected that the same troubles may be encountered as are usually met with in reflexes.

The grid bias resistor is a common impedance in the grid circuits and as such it is likely to cause squealing either at radio or audio frequencies or at both. It may also be that the common resistance will act as a damper on the signal so that the amplification is less when the common resistance is large than when it

has zero value. If that is the case a by-pass condenser across the resistance should reduce the common impedance, and at radio frequency the value of the condenser need not be large to be effective. By suitably selecting the resistor and the by-pass a nice balance between regeneration and damping can be found which causes the set to operate as near the oscillating point as desired. However, experience may prove that no by-pass is needed in a particular case, hence it will be omitted.

Common to Plate, Too

A grid bias resistor which draws its current from the plate circuit of the tubes is also a common resistance in the plate circuit, and as such it may cause oscillation and squealing, or it may cause damping if the phases are right. Suppose the circuit is so adjusted that no squealing occurs when the resistance stands alone. By putting a condenser across it the impedance in common can be reduced to practically zero for radio frequencies. This often causes oscillation because the damping effect is removed. In one radio frequency amplifier of this type the circuit was perfectly stable at radio frequency when no condenser was across the resistance. When a condenser of 0.1 mfd. was connected across it the circuit oscillated violently. The largest condenser that could be used without starting oscillation was 0.001 mfd., and at this value the circuit was stable yet the amplification was enhanced by some regeneration.

At audio frequency the common grid biasing resistance also causes either regeneration or damping. A by-pass condenser across the resistance is not very effective when the frequency is low, unless, of course, the condenser is extremely large.

Textual Directions on Building 3-Foot Cone

Marking Off and Cutting Paper, Location of Unit and Mounting the Diaphragm Fully Discussed by Speaker Expert

By Clyde J. Fitch

[The first half of a two-part article on how to build a cone speaker was published last week, April 2. The concluding part follows.]

PART II

For wall mounting the simple frame comprising two cross sticks and a wooden block, shown in Fig. 4, is preferable. This frame is easily constructed and gives an almost totally open back to the speaker, which is highly desirable. An enclosed back tends to muffle the sound. For this reason the speaker should hang so as to be spaced a few inches from the wall, or suspended in a corner of the room. By placing two three-inch feet on the two lower ends of the frame the cone will be spaced about the proper distance from the wall. These can be added to the frame if necessary. Ordinary door stops with rubber tips may be used for this purpose.

In making the wooden frame, the length of the cross-sticks should correspond to the diameter of the cone used. The sticks are mortised at the center and screwed to the block with four flat head steel wood screws about 1½ inches long.

Start Face Down

In marking off the cone, place the sheet of Alhambra cone material face down on the floor or large board and fasten it with tacks at the four corners. The center of the sheet is then located and a pin driven through it into the floor or table. For the radius a stick of wood with a hole at each end is preferable. The holes should be spaced the distance indicated in Fig. 3.

The stick is now used as a radius with which to describe the circle, a pencil point being placed through the hole in the stick

for marking. The second circle is made in the same manner, using a blunt metal point instead of a pencil. The cone is bent back along this line, forming a flange which stiffens the cone and also provides a means for attaching the cone to the frame. Ordinary glue is used for gluing the cone.

After the segment is cut out as shown in Fig. 3, the cone is drawn together and glued with the flap on the inside. The small cone, shown at right in Fig. 3 is then glued to the inner apex. This gives the cone the necessary rigidity.

In assembling the speaker, the unit is first mounted on the frame, with the drive rod of the unit located directly over the center of the cross sticks. The extension pin, furnished with the unit, is then screwed on the drive rod.

Trouble Hints

The cone is now set in place and clamped to the drive rod with the two metal washers or apexes furnished with the unit. It is then attached to the frame in four places with small wood screws. Washers are placed under the heads of these screws. The speaker is now ready for use and may be connected to the set. Unless a power tube is used in the last stage, a readjustment of the unit will not

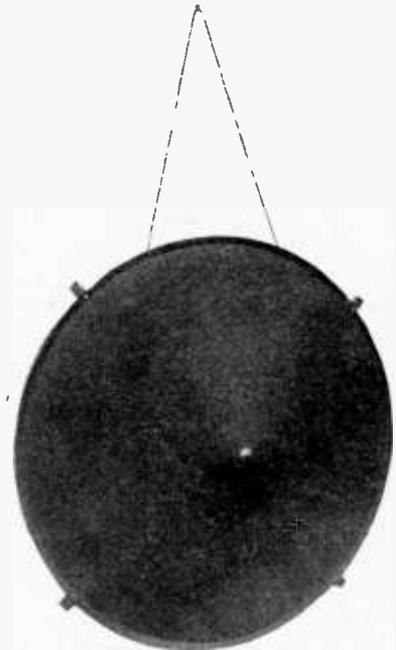


FIG. 5

The front view of the three-foot Ensco cone.

be necessary. If there's trouble operating the Ensco speaker, it is best to remove the cone and test the unit separately instead of trying to readjust the unit while in the speaker. To test, simply connect the unit to the set and hold it against the apex of the finished cone. The unit should work excellently this way. If it does, and if the assembled speaker does not work, it indicates that the cone is pushing in or out on the drive pin and changing the unit adjustment. This can be rectified by taking extreme care in assembling. Remember that all speaker units are very delicate, although they may not appear so.

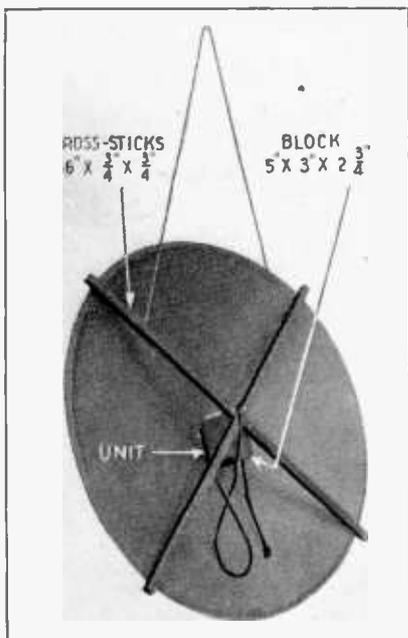


FIG. 4

Rear view of the three-foot cone, with cross-sticks identified and described, and location and size of the block given. The cords show how the speaker is hung from a moulding.

Chicago Fans Rally Behind Silent Night

Shutdown on Mondays to Enable DX-Hunting Favored in Referendum As Replies Swamp Board

REST FOR STUDIOS

Clash Arises Because Local Station Wants to Tie In With Big Chain

Chicago.

Chicago radio fans, according to Alderman Arvey, chairman of the local radio commission, are overwhelmingly in favor of the continuation of "silent night" for Mondays, and against broadcasting on that night by the chain stations operated on a sponsored program basis.

The flood of responses to a referendum snowed under the commission's small clerical force. At the rate the votes are pouring in it will take several weeks to compile the result, the commission receiving more mail than any concern in

the city. H. F. McDonald, member of the commission and president of the Broadcast Listeners' Association of America, states that the Chicago members of this body unanimously favor "silent night" and will not tolerate outside interference with it. Among the thousands of votes sent in not more than twenty against "silent night" have turned up, according to Alderman Arvey and Mr. McDonald.

"Large broadcasting chains connected with local stations believe that they have the right to sell time to their advertising customers and deliver the advertising over the air in Chicago on Monday nights between 7 and 12 o'clock," said Alderman Arvey. "Local fans are unanimous in their opinion that 'silent night' should be continued.

"There is much to be said on both sides of the question. The commission believes that this matter should be settled by the listeners, and for that reason we ask every Chicago listener send in his vote, stating either 'I am for silent night' or 'I am against silent night.' This vote will be tabulated and we will take the matter up officially with the Federal Commission.

"I might add that one of the chief reasons for 'silent night' and one not generally understood, is the fact that the operators, announcers and others employed in the Chicago stations think they are entitled to rest one night a week."

COULD IT BE OTHERWISE?

One smiling Jack Horner,
Sat there in the corner,
He was mending his home-made set.
But his features turned glum
When he hammered his thumb,
Did his mending stop then? You bet!

"Revolutionary" AC Tube Proves to Be Mere Myth

Elimination of B Batteries and B Current Supply Units
Not Accomplished—Only the A Battery Is
Dispensed With

IT MAY NEVER EVEN REACH THE MARKET

CX-325 and UX-225, Under Experiment Two Years, Used as
Basis for False Report of Its Utility—Not Perfected
Even Yet, and Will Hum if Audio System
Passes Low Notes Well

Newspaper reports of the impending appearance of a "revolutionary" tube that works on AC for both filament and plate supply, requiring no batteries and no eliminators, proved to be grossly inaccurate, as well as costly to tube manufacturers by checking sales, though temporarily.

The entire situation was well put by Herbert H. Frost, general sales manager of E. T. Cunningham, Inc., in his statement promptly refuting the sweeping claims made for the tube. Elmer H. Bucher, general sales manager of the Radio Corporation of America, in a concurrent statement, elucidated additional facts concerning the tube. The statements tell the whole story.

Frost's Statement

Mr. Frost's statement, entitled "What Is This AC Tube?" follows in full:

Considerable publicity has been given this week to a so-called new AC radio tube. This alleged development has been designated as "revolutionary." The following statements and claims for this tube appeared in a news article in one of New York's leading morning newspapers on Wednesday, March 24th:

"Batteries and current supply devices will be dispensed with in broadcast receivers by a new alternating current tube. . ."

"... a revolutionary development. . ."

"The tube seen here yesterday was marked UX-225."

"... an alternating current detector and amplifier tube which could be used in direct connection with the 110-volt house lighting sockets in much the same fashion as an incandescent lamp, thereby dispensing with all the batteries, trickle chargers, storage batteries, dry cells and current supply devices, such as A and B eliminators."

"... 1927's greatest contribution to the revolutionary developments in radio."

"... a set which will not require batteries or current supply devices."

"The necessity for batteries and battery eliminators is obviated. . ."

Worked on for Two Years

Type CX-325 has been in an experimental stage for nearly two years. Its output and capabilities are similar to those of our well-known type CX-301A.

In CX-325 we are attempting to replace the filament with a cathode heated directly by house AC, supplied through a stepdown transformer. When and if successful, this tube would eliminate the A battery, substituting raw AC. It will not eliminate the B and C batteries or B eliminators.

There is no method known to the radio art for satisfactorily utilizing alternating current for plate supply, without recti-

fication and filtration, in other words, without conversion of alternating current to direct current.

Probably Won't Be Marketed

The CX-325 has not yet reached a commercial stage. It is difficult to manufacture and would have to sell to the public at from \$6 to \$9 each.

It is our opinion that the practical difficulties connected with the manufacture of CX-325 will prevent it ever being commercialized. If perfected, it could not by any stretch of the imagination be called a revolutionary development. CX-325 could not be used in present equipment without substantial wiring changes, and then would not improve reception but merely eliminate the A battery.

Statement By Bucher

Mr. Bucher's statement follows in full:

The research laboratories of the General Electric Company and the Westinghouse Electric & Manufacturing Company, working in co-operation with the Radio Corporation of America, have been engaged for some time on the development of various types of vacuum tubes in which the current ordinarily supplied by A batteries is obtained from the electric light mains through a small step-down transformer. Research work on this problem is still proceeding and although the laboratories have developed several types of so-called AC tubes, there are a number of practical problems to be solved in the application of such tubes to radio broadcast receivers before the production stage can be reached. Among such problems is the elimination of the so-called "AC hum" in high-quality broadcast receivers where the loudspeaker response goes deep into the bass and below 200 cycles.

The statement in this morning's press, although, I am certain, unintentionally so, is, nevertheless, misleading in some respects. For example, the AC tube, when available will only eliminate the necessity for an A battery. So far as the B plate supply or the B battery is concerned, it will be necessary, as in the past, to continue to use either a B battery or a B battery eliminator; nor will the AC tube function properly in existing types of broadcast receivers unless the internals of the receiver itself are redesigned.

No Aural Difference

So far as concerns the final result to the human ear, there is no reason to expect a different result from a tube which is energized by alternating current, than is provided by present-day broadcast receivers using standard types of vacuum tubes.

The Radio Corporation of America is continuing to produce and market its present types of standard tubes and receiving sets, and knows of no reason why

anyone should hesitate to purchase any of the standard tubes or receiving sets now on the market.

Let me be emphatic in the statement that these tubes will not render obsolete radio broadcast receivers employing the present types of vacuum tubes and present methods of securing AC operation, of which there are many; neither do they dispense with all batteries. They merely do away with the necessity for an A battery.

Multiplex System Used for Messages

The inauguration by the Independent Wireless Telegraph Company of a multiplex system of operation recently took place. The enormous increase in the number of wireless messages between shore stations and ships made necessary this arrangement whereby a shore station can communicate simultaneously with six vessels at sea.

The habit of conferring by radio with members of their firms on land by American business men who travel on ocean liners, is the cause of the increased business, according to officials of the wireless company.

The new system makes it possible for the Independent Company's Easthampton, L. I., station to receive messages from three ships at one time and to transmit messages to three other ships at the same time by using different wave lengths.

The shore stations transmit on wavelengths of 600, 630, 2,250 and 2,478 meters, while transmitters on vessels at sea operate on wavelengths of 706, 1,800, 1,900, 2,100 and 2,400 meters. When the operator on board ship calls a shore station he is immediately advised by the operator at Easthampton which wavelength to use, and then transmits his messages without interfering with communications established by other ships in the vicinity.

Grounding of Ship Halts Broadcasting Thirty-Five Minutes

On the night of March 28 broadcasting was shut down from 11:35 till 12:10 A. M., when an S. O. S. was picked up from the steamer Steel Inventor, which reported that she was aground off Providence Island. Later it was reported the ship was not in danger. The Steel Inventor sailed from Galveston on March 20 bound for Manila by way of the Panama Canal.

The first wireless message did not give the ship's position, but a later report gave it as Old Providence Island near the coast of Nicaragua. The Steel Inventor was built in 1920 for the United States Shipping Board and is now owned by the United States Steel Products Company of New York.

EDISON COMPANY'S FIELD

On page 26 in the March 5 issue Mr. Caehamer asked for the name and address of the manufacturers of Edison nickel type storage cells, and the answer to this should have been: The Edison Storage Battery Co., Orange, New Jersey, are the sole manufacturers of the Edison Nickel Iron Storage Battery.

NO FREER VERSE THAN SOME WE'VE READ

To be or not to be—
That is the question.
Whether 'twere better to spend another dollar on the darn thing,
Or take an axe and gently but firmly hit it
And make good kindling wood of a rotten set.

Extra A F Power Stage Favored for Its Quality

Feeds Into the CX-371 Exceptionally Well and Gives the Low Notes a Full Opportunity to Come Through

With all the improvements that have been made in radio in recent years, engineers are still striving to give radio listeners tone quality that equals the naturalness of the old days, when all radio listening was done by means of head phones. This statement does not reflect in any way on present day speaker manufacturers, nor does it indicate a lack of radio progress, but it is nevertheless true.

The headphone listener gets the best possible reproduction because the phones shut out all room noises, and he hears best with the volume of his set cut down to what would seem a mere whisper on the loudspeaker. At this volume the tubes and transformers of the set and the phones are working well below their current saturation or overloading point. A wonderfully true, clear-toned quality results. But who wants to listen to radio with head phones nowadays.

The best radio reproduction with loudspeakers, on the other hand, is made possible by going to the opposite extreme, and increasing the volume of the set by adding power amplification.

It is this extra amplification that explains the success of the power speaker, generally acknowledged the best and the most expensive on the market. Such power amplification must be added to the average set, however, for best results. Simply putting a power tube in the last stage of the ordinary two stage amplifier will not provide the much greater volume desired, because while such tubes handle a large amount of energy, they do not actually amplify as much as the standard type 301A tube.

Reservoir of Power Necessary

A large reservoir of power must be instantly available to insure equal amplification of all tones at loud speaker volume. It is estimated that 24 times more power is needed to reproduce a low note than a high note of equal intensity. This extra power is not available in the average radio set, because neither the last tube or transformer will pass this current without overloading.

When power is added as an extra stage, however, the volume output of the set itself can be kept below the saturation point of these parts just as it is when headphones are used, while the power stage supplies the extra kick needed to operate the loudspeaker with plenty of volume.

New Power Tubes Economical

The new power tube, CX371 or UX171, have made possible power amplification to every radio set owner at moderate cost because they operate from the ordinary 6-volt A battery and at plate voltages within the range of B eliminators. These tubes give their maximum output at 180 volts B pressure, but prove satisfactory at 135 volts of B battery when used with proper C bias. At that voltage they have a greater power output than the 112 semi-power tube, making possible much better tone when properly used.

The power tube itself, however, amplifies only three times as compared to eight times for the standard CX301-A tube, another reason why the—71 should be used as an extra stage of amplification to insure satisfactory tone and volume.

The technically inclined radio fan can build up this extra stage of amplification utilizing a power tube in any form that goes best with his present equipment. The tube should be coupled to the set by resistances or a high-grade plate impedance, using a Modulator as the grid resistance to provide volume control. The output filter is made up with a 4 mfd. condenser and 30 henry choke coil. A .1 mfd. coupling condenser is suitable, while a 4 mfd. by-pass condenser is desirable to prevent possible audio oscillation with the third audio stage. A phone cord for attaching to the set, a battery cable, a filament resistance and a case will complete the assembly.

Some set owners, however, will prefer a factory built amplifier, such as the one that the Central Radio Laboratories have placed on the market.

Diamond Fan Makes Some Tests

Much ado has been made over the wonderful results of tests made in laboratories on complete receivers, and we are told about the marvelous forecasts that can be made on what a receiver can do before it is actually put into operation, foretold according to these same laboratory tests. Well, I always have had my own theory about this and have believed that much can be saved by testing out parts before building—the tests of the completed job afterwards is another story. Having my own laboratory, in which I have full confidence, I was afforded the chance to put my ideas into effect when a friend who wanted to build a good receiver asked my opinion and on my recommendation bought a kit of parts for the New Improved Diamond of the Air. He then asked me to test out the parts for him before he built the set. After my series of tests he built the receiver and has gotten some wonderful results. However, that's another story.

The Kit Under Test

He bought his kit from the manufacturer and just taking one haphazard from a pile,

so to be sure to get an average kit, it was opened in my lab giving a delightful surprise in the careful way in which it was packed, showing that these kits will stand shipment anywhere. Testing out the Bruno 99 R. F. coil and the Bruno 99 tuning coil first in order, they showed the highest averages in inductance and capacity as required by the best laboratory standards. They, as were the rest of the parts, were what the radio lover terms beautiful jobs, all perfect mechanically. Next came the Bruno light switch, new this year, which is perfectly made and according to tests pulls less than a 10th of an ampere on the filament circuit. The three Bruno bakelite vernier dials were models of their kind, worked freely and smoothly with no backlash. The Amperites needed no testing as they always stand up under the hardest wear, but we put them through some freak tests of our own, and the manufacturers would be tickled to death to know what they showed. The resistors stood up nobly and the Aerovox condensers, while old friends having been used by us for years, met with no favors on our part but received a severer grueling on that account,

to which they responded nobly. The jacks were all that one could wish for and the Bruno brackets a nice handy job. The battery cable was well made for hard and long usage and the panel a work of art, of the right material for high dielectric resistance.

Special Tests on the Audio

The 3 1-2 to 1 Bruno Truetone Model D transformer was tested last with an eye to a severe test on the audio output. Aside from cutting it in half and melting it under blast voltage, that poor transformer got a hard deal. On voltage it proved highly satisfactory, both on high and long-continued voltages. It should therefore stand any combination of voltages and tubes up to the highest now in use. The amplification curve showed smooth and even with its highest point slightly above 290 meters showing no distortion on the lower wave lengths where this fault is common in many high-class receivers. All in all, the results showed that tone quality should be sweet and mellow and volume of the best with good chances of universally matching the impedances of most all tubes and a good majority of speakers, cone and horn. With power amplification, or working off the 110-volt line there should be nothing to worry about.

Wave Range Covered

The tuning curve of the Bruno condensers and coils was beautiful, showing a range of 174 1-2 to 560.3 meters. There was a slight drop in the lower part of the curve, due to the slightly distributed capacity of the coil, and it must be remembered that no coil can be made with absolutely zero distributed capacity. The curve showed that 100 per cent straight line frequency is closely approximated. Considering all factors, therefore, and putting the results of all our combined tests into one great sum of laboratory addition, we find that the kit promises very well indeed, and our next step is to build it strictly according to blue-print, although as we scan it there arises a great temptation to make a few changes. But who are we, to better the work of Mr. Bernard. This great circuit is the child of his brain, and in the new improved edition he has made it perfect.—JAMES H. CARROLL.

The Book Woim

(This department conducted by Mortimer Z. Ghut)

"Tubes, and How to Blow Them Out," by R. A. C. Cunningham, published by Blah, Spencer and Snee, Schenectady, N. Y., \$0.3. This book is fully worth the price asked, if not much less. Nothing hitherto written on the subject has given so complete an insight into the intricacies of the great American game of tube-blowing. Particularly illuminating is the chapter describing how the author, with the aid of only twelve friends, was able to blow out 42 tubes in four minutes, twelve seconds, Eastern time. The National Association of Tube Makers has offered a prize to the man, woman, or child who will surpass this record before 1962.

"Cuss Words and When to Use 'Em," by J. Mollie Dlupe, published by Goo, Blazes and Assid, Potsdam, N. Y., \$14.40. This young woman shows an intimate knowledge of what constitutes good, round language as and if required. The book is a fine exposition of the expletive pertinent. That portion of the book devoted to "The State of Mind When You Can't Get Nothing," intended as a glossary for the disappointed male, is a magnificent attempt to prove the cuss word is especially pungent and startling just after the last tube goes out at 3 A. M.

"Bloop," by O'Harry, published by Nix and Co., and Gitt, O. A. Nickle. Good stuff. The author stalks the game to its lair and strangles it. Band plays "It Served Them Right," then eases into "The Airway," a fox trot and it all ends as sweetly as a Saturday afternoon in Cicero, Ill.

Caldwell Gives Pledge of Unspoilt Reception

In Talk From WGBS the Commissioner Bars Only
Static From the Ills That Are to Be Remedied
By the New Control Board

In a radio address broadcast by WGBS, New York City, O. H. Caldwell, New York member of the new Federal Radio Commission, declared that the Commission hopes to make possible perfect radio service in all the ether channels, barring local static, natural and man-made.

"You want to get rid of the annoying heterodyning whistles from far-away transmitters on the same wavelength," he said. "You are entitled to receive at any point on the dial a program which if audible will be as clear and unspoilt as it was when it left the studio microphone.

"And the Radio Commission is here to see that you get it. Then, of course, you want this listeners' paradise right away. So do I, as a radio listener myself and also as an officer of the United States Government pledged to see that your interests are protected.

"Why doesn't the commission tackle the worst situation first?" I suspect some one is asking. But do you see that to tackle the New York problem is really unwise and undesirable until we can solve the national problem? We must have accurate facts about all stations before we can proceed to solve the national situation; also, as a commission, must settle certain basic policies and adopt definite methods of radio procedure in attacking the big problems. Therefore, in order that every person may have the opportunity to put his ideas before the commission, we have issued a broad invitation to the thoughtful public to submit by mail their suggestions tending to improve broadcasting and the general radio situation.

"The man with a two-cent stamp, in other words, is to have the same stand-

ing and will be given the same courteous consideration by the commission as the man who is able to appear in person and present his views. In order to facilitate matters at this time, let me urge that those who mail their proposals confine themselves to the main topics to be discussed at the public hearings.

"The topics are: widening the broadcasting band; limitation of power; reducing frequency-separation; simultaneous broadcasting with same frequency; time division; consolidation of broadcasting service, and the limiting of the number of stations.

"Having determined upon our policies, we must also have before us the full facts of the broadcasting station situation as it is today. We must know authoritatively each station's wave length and power, its past and its intended time of operation, the character of its service and other facts necessary if we are to fit into a harmonious whole, the present picture-puzzle of frequencies and powers. We must get all the facts.

"Realizing this, no sooner were the President's appointments made, than an informal preliminary meeting of the commissioners that could be reached was held at Washington and the necessary questionnaires and license application blanks drawn up and at once sent to the Government printer. Thus, you will see, no time was lost, and when the first official session of the Commission was held, the forms were ready for approval and mailing. These license applications are now in the hands of the broadcasting station operators. When filled out and attested they will be returned to the commission through the local radio supervisors and

Wave Reassignment Called Chaos Remedy

Plan Is Devised Jointly by Radio Manufacturers
Association and National Association of
Broadcasters Allocates Channels

The National Association of Broadcasters and the Radio Manufacturers Association together have devised a plan which they claim solves the problem of wave allocation.

The plan drafted by the two associations makes possible the reassignment of wavelengths in such a manner as will bring order out of the chaos now existing in the broadcasting situation within sixty days and without disrupting any of the 733 stations in the United States, the sponsors state.

The proposed program would assign tentatively six exclusive wavelengths to Canada which would take care of at least six major stations there. They would also assign four new channels to the twelve on which the Canadians share time.

Station Accommodation

It is possible, according to the two associations, to accommodate the 36 stations of 500-watt power located in the Southern part of the United States and also 150 of the

50-watt stations on the American share of the sixteen part-time channels of Canada without working hardship anywhere. This would leave 73 exclusive channels for the remaining 547 American stations.

Of these channels, 22 would be used for the 139 existing 500-watt stations, an average of six stations for every wavelength. This would leave 51 channels to accommodate the 113 American stations now operating on 1,000 watts or more, an average of a little better than two stations per channel.

Concentration Points

"It is true that the concentration points of all high-powered stations are around New York City and Chicago," declared the associations. "and the commission may encounter some difficulty in adjusting such a scheme at these points. However, the situation presents such good possibilities that it is felt that it can be solved in this latter respect without undue difficulty."

then the commission will have on hand complete and verified information on which to base its vast task of station allocation to eliminate the present interference situation. With the cooperation of the broadcasters we hope to have this information in hand in the next few weeks.

"Thanks to the courtesy and consideration of other departments of the Federal Government, the commission expects to be able to function with reasonable efficiency, and to perform the most important of its tasks without serious handicap. For example, the Department of Agriculture has assigned Sam Pickard of its radio service, to act as Secretary of the commission for the time being. The Department of Commerce has provided temporary quarters.

"The Department of Justice has offered the necessary legal assistance. The State Department has aided in the clarifying of the Canadian situation. And offers of office assistance have been generously made by the War and Navy Departments and various other branches of the Government. To these Government departments the Federal Radio Commissioners express their appreciation.

"Occasionally we see newspaper headlines that refer to the members of the Radio Commission as the czars of the air. At such implications of absolute authority on our part we chuckle, for czars you know, are not limited in power and we are distinctly limited by laws. We are limited by the radio laws of 1927, which created us, we are limited by the whole body of the laws, and we are amenable to the Constitution of the United States. Here, as I see it, is the program of policy and action which the commission can adopt. Interpretation of the radio law of 1927 accurately, faithfully and fearlessly—in the best interests of the radio listener."

KFI's Birthday Marked by 20-Hour Program

Los Angeles.

Celebrating its fifth anniversary, KFI will be on the air Easter Sunday, April 17, with twenty hours of continuous broadcasting. Going on the air at 4 A. M., with a special program by Virginia Flohri and Robert Hurd at the Aeolian Studio, which will be broadcast at the municipal sunrise services in the Los Angeles Coliseum, the varied programs will continue until midnight, and will be of sacred, classical, and semi-classical selections, all jazz programs having been cancelled for this date only.

Since KFI first went on the air on Easter Sunday in 1922, it has never missed a night, and on this Easter will have attained a total of 1828 consecutive nights of broadcasting. During these five years, facilities have been perfected and developed from the little 50-watt plant to the super-station of 5,000 watt capacity, with resultant better transmission, and program quality gone forward proportionately.

NOBLE POEMS

At great expense we have engaged the inventor of cold storage to conduct this hefty column.

An Epic Tragedy

Tube
Rube
Bust
Cussed

218 APPEARANCES

Los Angeles.

Joseph Diskay, Hungarian tenor, is proud of the fact that since April, 1926, he has filled some 218 singing engagements, the bulk of these having been over KNX station here, he being an exclusive artist.

Canadians Disappointed As Conference Fails

Delegation's Visit to Washington in Quest of Twelve Exclusive Channels Brings Offer of Only Six, So Members Depart

Passing through New York, en route to Ottawa recently, Alexander Johnston, Canadian Deputy Minister of Marine and Fisheries, and C. P. Edwards, Director of Radio in the Dominion, expressed their disappointment at the outcome of the conference which they held with the Federal Radio Commission in Washington.

"We are profoundly disappointed, but not complaining that the new Commission does not see fit to agree that Canada shall have either twelve or fifteen wavelengths, instead of six," said Mr. Johnston.

"For more than two years we have been anxiously waiting for the day when radio in North America would be cleared up. This we expected would come as soon as radio legislation was enacted in the United States, but our conference in Washington this week has been disappointing.

"We have eighty-two broadcasting stations and need at least twelve waves to build up a radio system that will give reasonable service to our 10,000,000 people across the 4,000 miles from Halifax to Vancouver.

"The Radio Commission presented the draft of a treaty to us. This allowed six waves, the highest of which was 410 meters. We need at least twelve channels. We are not desirous of signing any temporary treaty or agreements, because when once accepted,

even on a temporary basis, one must generally cling to the agreement, which in radio might have vested rights.

"We have made our situation clear to the Federal Commission and we feel that the Commissioners will be fair. Perhaps Admiral Bullard, upon return to the States to take his position on the control board, will have a solution to offer. We recognize that the Commission is in the early stages of organization and perhaps it is a little too early to work out a program. One thing is certain, the solution cannot be on a population basis."

Greatest Television Is Latest Claim

The invention of new system of television, superior to any other method now being developed, is the claim of Charles Baxter, a young Bradford, England, engineer. In his process he dispenses with the special illumination of the other systems, and relies upon a rapidly moving beam of light playing on the subject to be transmitted.

Hank Blobble has bought a new 8-tube set. Mrs. Hank says she doesn't care how late he sits up. She's going home to mother, anyway.

Board Tries To Help Out Dominionites

Issues Order Forbidding American Stations From Using Canadian Channels, After Conference in Washington Collapses

After the failure of the Federal Radio Commission and the Canadian delegates to reach any agreement recently on increasing the number of exclusive wavelengths allotted to Canada, the Commission issued notice to all American broadcasters that they could not enter the wave channels already assigned to the Dominion. The order was intended as a friendly gesture and as an expression of the earnest wish of this Government to adjust the difficulties with Canada.

Officials here declared that the statement of Mr. Johnston, a Canadian delegate to the conference, that Canada was restricted to the use of six wavelengths was not altogether accurate. For in addition to six exclusive wavelengths, Canada shared twelve of the 89 air channels allotted to this country under the gentlemen's agreement negotiated several months ago. At times, therefore, it was asserted, Canada enjoyed the use of 20 per cent. of the wavelengths utilized on the North American continent. The population to be served was a little more than 9,000,000 in Canada and 120,000,000 in this country. The fact was also emphasized that in this country there were 733 stations while Canada has only 82.

The Commission's notice to American broadcasters follows:

"To all applicants for broadcasting licenses:

"Notice is given by the Federal Radio Commission that in view of the existing situation between the United States and Canada relative to the use of radio broadcasting channels the following channels will not be assigned for use by stations licensed by the Federal Radio Commission:

	Meters	Kilocycles
Channel	291.2	1030
Channel	312.3	960
Channel	329.5	910
Channel	356.9	840
Channel	410.7	730
Channel	434.5	690

"Applications for the above channels, therefore, will not receive favorable consideration."

Leon Adelman Joins Advertisers' Service Co.

Leon Adelman, formerly with the advertising, publicity, sales and service departments of the Chas. Freshman Co., has joined forces with Melvin Freud of the Advertisers' Service Co. with offices at 220 West 42nd Street.

Mr. Adelman has had an extensive experience in the radio industry, having first manifested interest when the art was still in its infancy and radio broadcasting was unheard of. For two years, he was associated with Hugo Gernsback as associate editor of "Radio News" and radio editor of both "The Experimenter" and "Science and Invention."

The experience which he has accrued during his active career has admirably suited Mr. Adelman for the duties he will undertake in his new venture.

Those fellers in Washington, says Blimp Sloagler, the town oracle, know when enough's enough. But, ask me, do they know when it's too much?

Censorship is Protested By Representative Celler

Not Allowed to Go As Strong As He Likes At WEA F, He Indites an Epistle to Sykes of the Control Board

Because his intended speech over WEA F was censored in a manner that he thought "indicated a dullness of mind which was most astounding," Representative Emanuel Celler of New York recently wrote a letter of protest to Eugene O. Sykes, acting chairman of the Federal Radio Commission. Representative Celler expressed the opinion that if radio censorship continued it would menace the industry and prove a detriment to adequate discussion of controverted questions through the medium of the air.

"When a radio broadcasting station receives a franchise and a certain wave length," said Mr. Celler, "the business conducted over that station becomes a public utility, and therefore the broadcaster incurs very definite obligations to the public to see to it that his business is conducted in the nature of a public trust. He cannot show favoritism and favor one school of thought as against another. He cannot refuse to broadcast something just because it is unfavorable to his way of thinking. In other words, the right of rejection is not an unrestricted right."

Letter to Sykes

Mr. Celler's letter follows:

"I desire to point out to the commission that Station WEA F at New York insists upon censoring talks made over its facilities. I am informed that other broadcasting stations are following the lead of WEA F and are likewise censoring.

"I had an experience with WEA F when I spoke on the subject of George Washington, and the type of censorship indicated dullness of mind which was most astounding. I think the matter should not go by unnoticed and ought to be made a subject of inquiry by the commission. If the commission is interested, I shall be glad to present the matter more in detail.

Asks for Rules

"However, the important factor is that WEA F maintains some sort of censorship, and I think the type and quality of that censorship is a matter for your consideration. I suggest, furthermore, that in the rules and regulations that you will very likely promulgate, consideration should be given to this important subject. You can very readily appreciate how dangerous it would be if censorship would be in the hands of bigoted or intolerant or ignorant persons.

"A radio broadcasting station like WEA F, with all its possible 'hookups,' conducts a business which is not unaffected by public interest. Broadcasting cannot be conducted like a private enterprise. It is for your commission to determine at this time whether or not there shall be censorship, and, if censorship, the type and kind.

"I await with interest your reaction to the observations made herein. Very truly yours,

"EMANUEL CELLER, M. C.,

"Tenth District, New York."

Silent Thought Broadcast In Test of Telepathy

Legion Post Conducts Experiment from California Station Along Lines Laid Down by Sir Oliver Lodge in England

A very interesting test in telepathy was held recently as part of the program of the Bell Post, American Legion, of Bell, California, when it broadcast from the new 1,000-watt station, KFXB. The experiment was the first of a series of feature programs scheduled for each Thursday night at 9 o'clock. The mental telepathy tests will be continued.

The Bell Post is putting this interesting experiment on the air as part of its campaign to raise funds for its own headquarters building, each listener-in being requested to send a two-cent stamp from the sale of which it is hoped enough money will be raised to cover the cost of the building.

Each person who believes he becomes conscious of or mentally aware of the objects used in the tests, is asked to write in his impressions, so they can be checked up, thus enabling the investigators to determine how valuable the tests may really prove from the scientific viewpoint.

The tests will be conducted as a voluntary means of cooperating with Sir Oliver Lodge in this field of research, and will contain new phases of the work.

Banning in Charge

The psychologist in charge of this work is Pierson Worrall Banning. Mr. Banning is a member of the Academie Latine des Sciences, arts et Belles-Lettres, and of the Societe Academieque d'Historie Internationale both of Paris. He has devoted more than thirty years to a study and investigation of the mind and mental action. He is the author of various works on these subjects and has written profusely concerning them for magazines devoted to such subjects.

This radio attempt in the United States to discover to what extent telepathy or thought transference is demonstrable was conducted with the greatest secrecy. Every precaution was taken to prevent any possible leakage of information in advance about the details of the test.

During the last forty years careful experiments have been conducted in telepathy, but few of them have been extensive enough to permit of any definite conclusions. On March 2, 1924, from an idea conceived by E. F. MacDonald of the Zenith Studio of Chicago, there was attempted the first radio test of telepathy. Other radio experiments have been held since, notably the one conducted recently in England by a number of students under the mentorship of Sir Oliver Lodge.

Chance Plays Big Part

Experiments of this nature are exceedingly difficult to gauge because of the part that chance plays in them. Much of our everyday belief in telepathy is based on pure coincidence. And this is the greatest enemy of the investigators.

How often have you heard a person excitedly declare: "There must be something in this telepathy business after all!" You simply had said something or done something that he thought had occurred to him previously. Remarkable, it appears, on the face of it. But what did you know of the physical and mental conditions governing him at the time; about his customs and habits; about his interests; about a chance remark he may have heard; about how frequently he had

such experiences; and about how many of these experiences came true?

It is this factor of coincidence that must be mastered before comprehensive laws of telepathy may be announced. To measure it is not easy, but possible.

Another element which enters into these experiments is that of unconsciously influencing the subject. This is almost as difficult a matter to overcome as that of coincidence. A word, a slight gesture of the hand, a movement of the eyes, leg, or face muscles may be just enough to provide the key to the problem to the subject.

How They Tested Him

An example of a properly instituted and managed experiment is that conducted in the psychological laboratory of the University of Groningen in the Netherlands.

Three professors there undertook a series of experiments with a man who thought himself especially sensitive to telepathic impressions. The subject was blindfolded and put in a wooden cage, and black cloth thrown over the cage. His right hand extended out from the cage and rested on a board marked off into forty-eight squares.

In half of the experiments the professors remained in the room with the subject, and in the other half were in the room above him, watching his responses through windows in the floor. They concentrated upon the board, selecting by lot which of the squares was to be used in each experiment. The subject would tap his hand twice on the square which he felt was right. In all 187 experiments were tried on him. According to the data on the laws of chance in the hands of the scientists, about four and a half of these experiments should have been successful. The actual result was sixty correct answers. The theory of probability shows that the likelihood of such a degree of success through coincidence only is one in 313 billion.

Distance Important

Distance from the subject is, of course, one of the means of avoiding unconsciously advising him of the proper response to the question, and it is in this respect that radio becomes so valuable for experimentation. While the radio tests conducted by Sir Oliver left the problem of telepathy in doubt, they did offer material for further study, and it is with this purpose in mind that the Bell Post tests are being conducted.

WODA Will Send N. J. Police Alarms

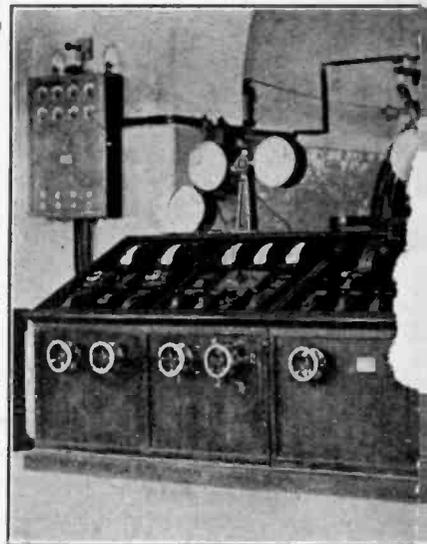
Colonel H. Norman Schwartzkopf, supervisor of the State Police of New Jersey, recently appointed WODA, in Paterson, N. J., the official station for New Jersey police alarms. Police alarms and bulletins will be broadcast daily in ten two-minute periods.

Captain J. Lamb, in charge of the State Police in Northern New Jersey, declared that all police stations of the constabulary now had receiving sets. He thought the radio would be especially useful during storms, when other methods of communication are affected, and for transmission of information about crimes to the police in neighboring States.

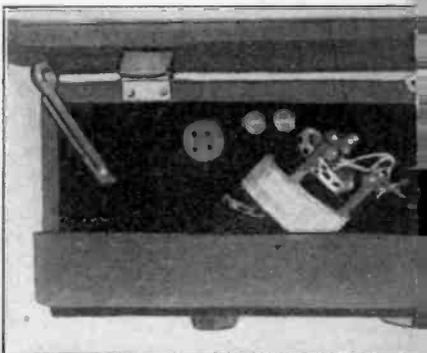
GOOD FOR THE



(Underwood & Underwood)
HUSTON RAY (left) celebrated concealed sound waves synchronize with penetrating cathode ray tube and pass directly through mental depression. At right is Dr. Ward to carry out the develop-

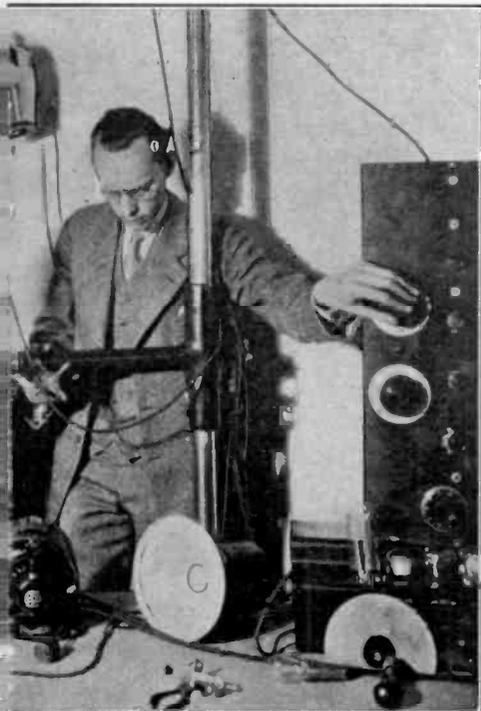


(Underwood & Underwood)
THE TRANSMISSION desks of the recently completed. Note the drum control toggle switch array.

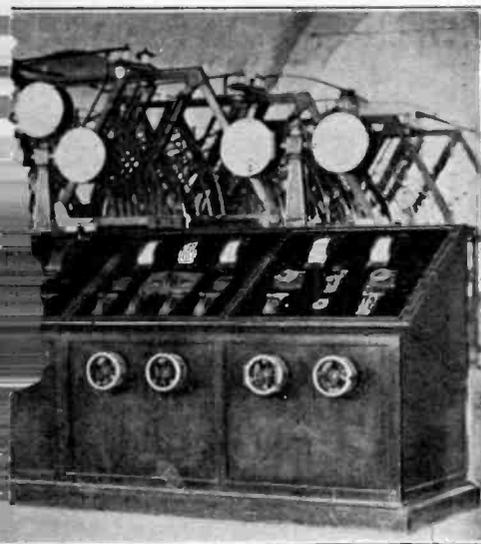


TOP view of the Three-Tube Compact—scribed in

BLUES—PERHAPS



A pianist, has developed a system whereby X-rays (powerful short waves emitted by a tube) are directed through the body, to aid relieving nervousness and fatigue. Dr. Gibson, scientist, testing the instruments used in the experiment. It's all very serious.



A new Belgian trans-ocean telephone station, rests on the upper portion of the panel, with the control mechanism on the bottom.



...built in an Atwater Kent cabinet, and described in the April 2 issue.

Man Replaces Woman for Household Talk

WBZ Finds Point of Feminine Remarks Often Lost, Due to Overtones, So Picks Masculine Voice to Tell How to Keep House

Boston.

It has long been known to those interested in the technical side of voice transmission that male voices are more easily understood on the air than are the voices of women. In line with this knowledge station WBZ has inaugurated a new feature known as the "Radio Chef and Householder," a period devoted to the broadcast of recipes and general hints to housekeepers everywhere: the feature being broadcast by a male.

Because of the peculiar overtones and harmonics found in the female voice, listeners have often experienced great difficulty in following talks of this nature which have become a very definite and integral part of the broadcast of many of the country's leading broadcasting stations.

There are so many instances brought to the attention of station managements, in which at the crux of a talk, when each syllable is necessary to complete understanding, seemingly by a whim of fate, seemingly were rendered unintelligible.

In an effort to overcome this situation to a degree, WBZ will foster the broadcast of household talks by a man whose voice and style are familiar to thousands throughout the country. The series of helpful household hints and recipes is scheduled for broadcast on Tuesday, Thursday and Saturday forenoons at 10:45 o'clock. The talks prepared will deal with such problems as house cleaning, care of plants and flowers, cooking and other topics which are of more than particular moment in the life of the average housekeeper.

"Roxy and I Best of Pals," Says Bowes, Denying War

And Rothafel Says He "Went Through One and That's Enough"—Both on Air Sunday at Different Hours

Both S. L. Rothafel (Roxy), conductor of the "gang" radio programs on Monday evenings and Sunday afternoons over WJZ, and Major Edward Bowes, director of the "family" broadcast on Sunday evenings over WEA, have denied rumors of a war between them. Several articles, appearing throughout the country, have stated that they sparred for the privilege of broadcasting on Sunday evenings.

"I have not lost my sense of humor," said Mr. Rothafel. "I do not want any war—I went through one, and that is enough. All my time is taken up in carrying on my business."

Major Bowes stated that the predic-

tions of a war between Mr. Rothafel and himself were wholly without basis.

Mr. Rothafel originated the Sunday evening programs from the Capitol Theatre, but when he resigned to take up his duties at his own theatre, the Roxy, Major Bowes continued the Sunday evening concerts.

"Who shall broadcast is not a question for either Mr. Rothafel or me to decide," said Major Bowes. "The broadcasting stations are the ones to make the schedules. The listeners, too, have a lot to say about it. If they tire of our programs, we try to change them. If they did not want to hear our efforts we certainly would not broadcast."

Austrian Prince Sits Up Until 6 A. M. to Hear KDKA

Eric, of Thurn and Taxis, Writes to Station from Semmering, Asking Reception Confirmation

Pittsburgh.

Eric, prince of Thurn and Taxis, Austria, has joined the ranks of international listeners. In a letter to G. Dare Fleck, program director of KDKA, Prince Eric congratulated the station on the excellence of its musical programs, and asked confirmation of a particular program.

Compositions by continental authors

had held the attention of Prince Eric and his family, as they sat until six o'clock in the morning listening to KDKA. "Traumerei," by R. Schumann; "Moment Musical," by Chopin and "Wiener Leben," by Strauss particularly had caught their fancy.

The family home of Prince Eric is Villa Sophia, Semmering, Austria. It is there the Prince does his listening.

Weather: Slightly warmer followed by (Part II, next week)

"Intelligensia Dementia"

* * * * *

5-Star Complete Final

THE RADIO TABLOID

Vol. Small, No. Less

Price—What Have You?

Parrot Raises Rumpus at Broadcast Tryout

Demolishes Microphones Until One Is Painted Cracker Color, and Then Develops Case of Fright Which Stumps His Trainer

What with a hypnotist displaying his suggestive powers by throwing them on the air through the microphone and befuddling the minds of his subjects, and other such weird stunts, the radio fan today never does know what will next come from the loudspeaker. A new wrinkle, though, was tried recently by some ambitious radio devotee, and with some amusing and startling results.

He determined, altruistic soul that he



(Wide World)

The broadcasting parrot in a peaceful moment before the microphone during a tryout.

is, that it was no more than fair to the radio universe as a whole that the delicate inflections of his pet parrot's voice be broadcast. With that as a fixed idea he put his parrot through a period of training. Unlike Gene Tunney, the winged creature did not take to it as a duck takes to water. There were left jabs down his throat and right and left wings in his trainer's eyes. But there was no welching on the part of either.

A Powerful Voice

After five weeks' of intense calisthenics the parrot acquired what was undoubted-

ly the most powerful voice of any member of the feathered kingdom, and his trainer suffered a nervous affliction which caused him suddenly to shoot his hands to his eyes and pick imaginary feathers from them. And so was the first step of the training accomplished.

The next move, no less important than the first step, was to hold a dress rehearsal. Now this, too, required delicate operation on the part of the trainer. For this was no ordinary parrot, and, if even for a moment, he got an inkling that he was to perform before a dead microphone, there was no telling what might not happen. But the fears of his trainer on that score were soon allayed. No sooner had the parrot been placed in the gold stand made especially for the occasion when with one full swoop of his left wing he knocked over the innocent microphone.

Coloration Helps

But this could not stop his trainer for long. Another microphone was produced with the same result. And so with vicious jabs and terrific onslaughts the parrot continued to change beautifully new "mikes" into dented masses.

The next microphone was painted the pale yellow of a cracker. Immediately there was a perceptible difference in the attitude of the parrot. So wise was he that he could tell that he had to deal with a superior foe. Slowly the thought came over him that he had met his Waterloo. His wings drooped. His eyes were half shut. His toes curled up. He buried his nose in his breast. His feathers commenced to ruffle and soon stood on end.

His trainer soon recognized unexpected symptoms in the bird. The dreaded disease "microfright" had taken its toll. That ended matters, for the trainer had never trained to train a parrot not to be mike-frightened.

EXPRESSES

(By wireless, more or less.)

London, England, April 7.—Alexander Bretherton Swab, a wealthy mule owner of Mile End Road, reports to the British Broadcasting Society that on Tuesday last, he, at 12:01 A. M., distinctly heard the murmur of the waves in Atlantic City, U.S.A., and asserts that he was even able to translate what they were saying. Mr. Swab is generally acknowledged to be one of the finest linguists in Great Britain.

Is your set working awful? Bring it to me and we'll make it worse. Jones and Bungle, at the sign of the Busted Horn. (Adv.)

Gambler-Wife Tortures Poor Fan-Husband

Yanks Out His Antenna Installations and Sends Him On a Thoughtful Walking Trip

Why men leave home is a problem that philosophers have worked on for centuries. But not until the advent of radio into this mortal sphere we live in were they able to discover more than the slightest superficial reasons for the phenomenon.

And with the development of radio came the long looked-for solution, and with great huzzahs the thinking giants wandered off into the fields to spend the rest of their lives chasing butterflies.

Of course this was hard on the younger philosophers, and one of the more stubborn ones decided to prolong his studies by writing of the manner in which the great problem had been solved. What follows, is from one of the stories that flowed from the learned pen of the stubborn young philosopher.

Tries a Loop

One night Clarence Z. Triggs, husband of the venerable Agatha Triggs, got the thought that a radio set would be a mighty pleasant thing to have about the house. So the next day he began the construction of a five-tube neutrodyne, and within the week had finished it. To say he was elated is to put it in clear Havana.

Then he went out and bought a beautiful loop, a loop that was made of highly polished rosewood inlaid with mother of pearl. Proudly he carried it home and installed it. Then along came Agatha, the same woman who, ten years before, had, on solemn oath, promised, among other things, to honor and obey him. But what a forgetful person she had turned out to be!

One look at the loop, and with a terrible bray, she lunged at the harmless thing and, in a moment, it littered the floor.

"No man is going to make me spend my time dusting extra furniture," she shrieked.

Then it was that poor Clarence realized his error—he certainly had no right to keep his spouse from the bridge club for even an extra moment. He apologized humbly.

The Wired Plate

On the next night he went home with a length of insulated, silk-covered wire. A friend had given him an idea that would certainly meet with the approval of Agatha. So he hitched the wire to one of the screws of the electric light switch plate. That gave him two grounds, but the set worked nevertheless. But not well or for long. When Agatha came home from the weekly meeting of the Ladies' Literature Club and saw what her husband had done, she almost turned purple, or maybe it was blue, with rage. Her hands, which she claimed were so weak that she had to have someone "in" every day to dress her hair, suddenly found their strength, and with one yank, the wire

LOCALS

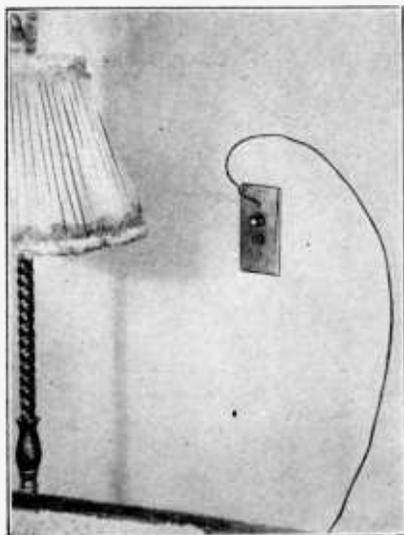
Mr. Hoover is having quite a time, they say.

Subscribe for Radio Tabloid and get news you can't get in any other paper. (Adv.)

Some poor simp opened a shoe store in Cortlandt St. last week. He doesn't know the half of it.

If you haven't the price in cash, send a dozen burned out tubes or a 15 control set of 1921 vintage for yearly subscription. (Adv.)

Cunningham sold some more tubes last week. They sold some the week before, too.



FOR trying to deface the appearance of his handsome home in this fashion Clarence Z. Triggs got an awful bawling out from friend wife. He used the lead as a ground.

was separated from both receiving set and switch plate.

Lays Down the Law

"No mere man is going to ruin the beauty of my blood-orange walls," she bellowed.

This time Clarence, who paid all the bills, even for walls, was offended. But discretion dictated that he maintain silence. That new-found strength of Agatha's . . .

On the following day, (No, this is not the story of the Three Bears), it being the Lord's Day, and Clarence's day of rest, Clarence stretched his antenna on the top of his sloping roof, the while Agatha held telephone conversations with a few of her friends. For a while all as well—until Agatha, bound for a friend's house, decided that Clarence should take her four pet "Poms" for an airing, and retraced her steps homeward. Her roving eyes spied the antenna and, breaking forth into a gallop, she ran into her house. And she didn't leave until Clarence had removed the offending copper for fear that a bird might trip over it. This time Clarence, safely distant from his wife, was so enraged that he grabbed his hat and went out for a walk, and he kept on walking. . . .

**The Aftermath
SUPREME COURT
PART II, SPECIAL TERM
Equity Causes
JUDGMENTS**

Triggs vs. Triggs:
Clarence Z. Triggs vs. Agatha Triggs; suit for separation; (Timothy Wheat, counsel for plaintiff). Decree for plaintiff signed. Settle order on notice.

TRUTHFUL GASH-IN-THE-FACE

(From our very special correspondent.)

Tuscarora Indian Reservation, Oklahoma, April 7.—This seething metropolis is all het up over a recent occurrence in one of the most hated and exclusive families in the state. Chief Gash-in-the-Cheek has been sued for absolute divorce by his wife, Sweet Wind of the Prairie. Sweet Wind charges her husband with mayhem, arson, drunkenness, measles, and defamation of character, the latter charge based on the allegation that he has been telling his friends that she married him for his money. The truth is, she declares, that all Gash, etc. had, when they were married, was a plug of tobacco and a bad temper. Sweet Wind further alleges that he stays up until three in the morning working his radio set and swears most terrible when she snores.

The husband's defence is one of the most novel and comprehensive ever placed on the court's records. He says simply but quite unanswerably, it's all right as far as he is concerned.

It is expected the case will finally reach the White Chief, Hoover, in Washington.

Article on Current Flow Denounced as Fallacious

Arthur James McLean, Jr., M.E., "L.E.," Lays Down the Law, but Parker, Rofpatkin and Turkey Learnedly Dissent

EDITOR RADIO WORLD:

It is indeed interesting to Read Some of the articles written by Some of our would be Radio Engineers the in this case Deals with that of Mr. Radcliffe Parker in your March 26 issue of RADIO WORLD it is Here that Mr. Parker so wrongly Describes current flow in a Radio tube that I couldnt Help but complement Him on

In the first Place let me Refer to the fundamentels of Electricity unlike it attracts like it Repels and that current current flows from the negative to the Posetive Pole of any Electrical circuit

and Does in no way flow from the Posetive to the negative as outlined by Mr Parker in

His article How Does current flow in a vacuum tube

so begins with Mr. Parker Claiming that the Plate current in a vacuum tube is Positive from the Plate to negative so the fillement this However is Electrically Im-possible

I will now give you Direction of Curent flow in a vacuum tube Starting at the Positive end of the B+ Bat this End we conect to the Primary End of any trans-former the other end on the other Sid to the Plate of the tube after the tube is turned on with the Rest of the Bats and circuit complete we Have in the Primary of the transformer a Perfect Electro magnet the Plate being Positive in most cases with Respect to the grid to the grid negative Electrons flow from fillement Plate Repr-isingent Plate curent as we Read it on a miliampmeter when the grid becomes more Positive than the fillement the Plate curent will be les because the Positive grid as it Has been Stated Many times Repels fil-ement curent is wrong.

What Happens when the grid becomes more Positive than the fillement is more Proof that curent flow from negative to Positive the grid only Eats up most of the Electrons is of its Positive nature when the grid goes negative the fillement curent will again go to the Plate increasing Plate curent now let us go in to the Rest of the tube circuit

Let us now impress a Signal curent on the grid this current which Represents the any modulated frequency travels on by Pick up of the fillement curent from the grid to the Plate at reaching the Plate the curent Superimposes a Beat curent in the Primary winding of a transformer or speaker winding this Superimposed curent Sets up a beat curent in the Secondary of the trans and to Plate and So on till it Reaches the Speaker

now for instance let us asume that the curent flows from Plate to grid of fillement we would Have to conect our antana and ground to the Present Day Speaker terminal and the Speaker to antana and ground tirminals because in no other way can Signal curent git from antana to the loud Speaker if acording to Mr Parker the curent flows from Plate to fillement I am Sure that if Mr Parker would Read up more on Radio and write less about it it would indeed be a Help to the fan who is looking for tichnical Data.—ARTHUR JAMES McLEAN, JR., M.E., L.E.

EDITOR RADIO WORLD:

At your request I have read both Mr. Radcliffe Parker's article and Mr. McLean's criticism of it. It seems to me that the criticism is wholly unfounded and that Mr. McLean missed the point of the article. There is nothing technically wrong with the statements in that article.

In reference to the imputation that Mr. Parker is a would-be radio engineer who spends more time writing nonsense than reading wisdom, I must say that I have known Mr. Parker all my life and that during most of that time he has done very little else but read about radio. We were teachers of college physics together at a time when the vacuum tube was a laboratory curiosity. At that time we had many prospective M. E.'s and possibly "L. E.'s", who sweated through their physics. Many a time I saw Mr Parker tap a student on the shoulder and invite him to try again next year when he saw the student show more interest in his next elbow neighbor's examination paper than his own. Many of these, no doubt, turned out to be "L. E.'s" in radio engineering.

Let us have more articles by Mr. Parker.

FEODOR ROFPATKIN.

EDITOR RADIO WORLD:

I have carefully studied Mr. McLean's criticism of my article on current flow in a vacuum tube and, profiting by his suggestion, I have since read several books on radio. I cheerfully acknowledge the correctness of my ways and thank Mr. McLean for prompting me to get further corroboration. I promise my readers that I shall not write another article on how current flows in a vacuum tube until the laws of electricity are changed by referendum vote.

RADCLIFFE PARKER.

EDITOR RADIO WORLD:

At your request I have gone over very carefully the article by Radcliffe Parker on current flow in a vacuum tube and also the criticism of this article by Mr. McLean. There is no doubt in my mind that Mr. McLean is right on one point and that this point is well taken. There are too many who set themselves up as radio experts after they have assembled a receiver and gotten a squawk out of it. They are an imposition on a trusting radio public, particularly when they undertake to write authoritively on the subject for the instruction of the radio fans. What right have these men to impose themselves on the public?

TIM TURKEY

P. S. What chance is there for the publication of some of my articles which you had for so long?

Bring in your old set and if it cost you \$200.00 we'll allow you \$2.00 towards the purchase of our new rip-and-at-em set. Fordfeller and Vandschwab. (Adv.)

"Garcles," anon. Published nowhere and costs little or nothing. A book of jingles in the original Gaelic. Noteworthy is the ode entitled "I Gat Los Angeles last Monday night, Now I Can't Get Oscawana."

Radio University

A FREE Question and Answer Department conducted by RADIO WORLD for its yearly subscribers only, by its staff of Experts. Address Radio University, RADIO WORLD, 145 West 6th St., New York City.

When writing for information give your Radio University subscription number

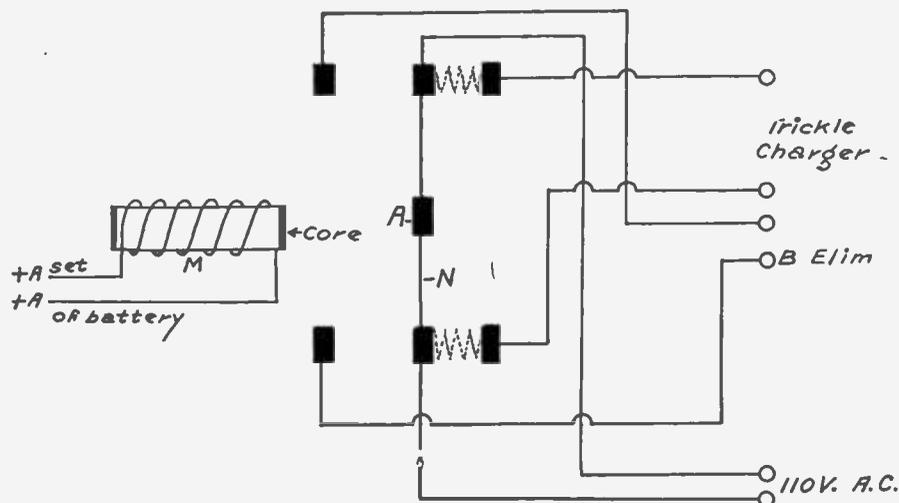


FIG. 524

The circuit diagram illustrating how an automatic power switch is hooked up, as requested by Grant Mordan.

ABOUT TWO months ago, a friend of mine gave me a Brach "Controlit," which is an automatic power control switch. That is, it is used to automatically connect or disconnect the trickle charger and the B eliminator from and to the house line, etc., by simply turning on or off the filament switch in the set. The device operated very satisfactorily until a week ago. Somehow or other, I cannot get the switch to connect the line to the trickle charger. I think if you printed a circuit diagram of this device, and explain its internal operation, it will not only cure my trouble, but will also set other fans straight, as to the operation of such a device.—Grant Mordan, Portland, Me.

One of the springs on the center blade must have broken or loosened up to such an extent, that no contact is now made between the contacts on this blade, which go to the house line and to the contacts on the other blade, which are connected to the terminals of the trickle charger. This can be best understood by referring to Fig. 524. An electromagnet is used to break or make contact with the house line. M is the magnet winding which is wound over a core of soft iron laminations. A is the iron armature fastened to a piece of insulating material, mounted between the blades, which are connected to the AC line. You will note that one terminal of the winding is brought to the plus A post of the set, while the other terminal is brought to the plus A post of the battery. Thus, when the filament current is turned by the switch, current flows through the tubes, and thence through the windings. The core of the magnet then becomes energized, and pulls the armature to the core. The trickle charger is then disconnected, while the B eliminator is connected to the line, and the set is consequently placed in operation. It will be noted that the house line is not in any way used to operate the magnet, neither is an extra battery employed. The dotted lines between the center contacts and the trickler contacts indicate the spring action present between these contacts. Thus these contacts are held together when there is no current flowing through the magnet coil winding. As soon as the set is turned on, the spring action is broken, pulling the center contacts away from the trickle contacts.

I BUILT a four-tube set, utilizing a regenerative detector, with a three-circuit tun-

er, and three stages of impedance audio frequency amplification. The primary of the tuner consists of fifteen turns. The secondary consists of fifty turns. Both are wound on a three-inch diameter tubing using No. 22 double cotton covered wire. No space between the windings. The tickler consists of forty turns wound on a one and one-half inch diameter tubing, using No. 30 enameled wire. Up to 400 meters, the results are excellent. Beyond that, I cannot hear a thing. A local station, WOK, which operated on 410 meters is the only one above 400 that can be heard. I suppose this station can be only heard, due to its proximity and to the great amount of power used. I use a 100-foot antenna, with which I get excellent results, with other sets. (1)—What can I do? (2)—I have tried reversing the tickler, decreasing the number of turns, placing the coil tuner coil in different positions, but I still find it difficult to control oscillations. Would installing a rheostat, say of the twenty-ohm type, in the filament lead of the detector tube, as well as a 2000-ohm resistance in series with the B plus lead help?—William Lengley, Homewood, Ill.

(1)—Probably when the plates of the condenser reach that point where the higher wavelength stations will come in, they touch. Take a battery and a pair of phones, which are hooked up in series, disconnect the variable condenser from the rest of the circuit in the set, and test it out for continuity. (2)—The fact that you cannot control oscillations probably lies here, also. The insertion of the rheostat and resistance will help considerably.

REGARDING the six-tube receiver shown on page 11 of the Feb. 26 issue of RADIO WORLD, (1)—Would it be practical to add regeneration to the detector tube? (2)—Could two, three to one ratio audio frequency transformers be used? (3)—Could I use a battery cable? (4)—Could I use phone tip jacks for the speaker? (5)—Could I use a choke coil and condenser unit on the output to prevent the DC from entering the windings of the speaker? I intend to use a power tube with 180 volts on the plate.—Charles Chester, Atlanta, Ga.

(1)—No. (2)—Yes. (3)—Yes. (4)—Yes. (5)—Yes.

I AM about to construct a five-tube receiver shown on page 21 of the Feb. 19 issue of RADIO WORLD and would like to have the following queries answered. (1)—Are

the primary windings wound opposite to that of the secondary windings? (2)—If so, would the plate of the tube be connected to the end of the primary winding next to the filament end of the secondary? (3)—Could I use a tuned radio frequency coil in place of the untuned radio frequency transformer, it being wound so as to match the variable as used in the other circuits? (4)—Could I improve the volume by adding regeneration condenser, this being of the same capacity to this set? (5)—If so, where and how should the addition be made?—Lester Murans, Yonkers, N. Y.

(1)—No. (2)—No. (3)—Yes. (4)—Yes. (5)—In the second RF stage. Procure a one and one-half inch tubing and some No. 26 single silk covered wire. Wind thirty-six turns of this wire on this tubing. It is, of course, inserted in series with the plate of the tube. Place a .0005 mfd. fixed condenser from the plate post of this socket to the minus A post.

ABOUT A year ago, I built a six-tube receiver consisting of two stages of tuned radio frequency amplification, a regenerative detector (using a three-circuit tuner) and three stages of resistance coupled audio frequency amplification. The receiver gave excellent results. I recently moved. I hooked the set up here, with an antenna and ground, etc., and again received good results. However, I was informed by my landlord that I must remove my antenna. I did so, and hooked up the set with a loop following directions that my friend gave me. I couldn't hear a peep. As soon as I attached an indoor antenna and ground, the set worked O. K. However, the indoor antenna is very ugly and I would be very happy to get the loop to work. I hooked it up in the following way: I disconnected the secondary windings of the first tuned radio frequency transformer, which is connected in the antenna circuit. I then procured a double circuit jack. I connected the top spring to the stationary plates of the variable condenser. The second spring from the top went to the end of the secondary winding of the first radio coil. The third terminal from the top went to the beginning of this winding. The bottom terminal of the jack was brought to the rotary plates of the variable condenser. The loop I purchased was tried on other sets and gave excellent results. Where could the trouble lie and how may it be corrected?—Alexander Paters, East Pittsburgh, Pa.

The trouble either lies in the jack or the plug attached to the loop. Probably the sleeve of the plug is too short and doesn't make contact. Probably when the plug is inserted, the inner springs do not pull apart, causing the coil to be shunted across the loop, giving you too small an inductance, which will cause the set to be responsive to the lower waves only, where there are no broadcast stations, etc. Suggest you disconnect the jack connections, bringing the beginning and end of the windings to binding posts. Also bring the stationary and rotary plate posts of the condenser to binding posts. Now disconnect the plug tips from the phone tip terminals of the loop. Then bring the terminals of the loop to the rotary and stationary plate variable condenser posts. Of course, for rough testing, plain clips may be also used. Another way of testing the jack and plug is with the aid of a pair of phones and small battery, connected up in series. Insert the plug in the jack, disconnecting all connections to it, and running the terminals from the battery and phone thereto. A loud click should be heard. The leads from the testing unit should be placed on the top and bottom springs of the jack. When connected to the center posts, you shouldn't hear a click.

HOW MANY stations operating on more than 500 watts power are now operating on the 545.1 meter wave? Name them, stating their location. (2)—The 461.3 meter waveband? Name, location? (3)—The 384.4 meter wave? Name, location?—Boris Raiden, Ferndale, Mich.

(1)—Three. KFUV, St. Louis, Mo.;

KSD, St. Louis, Mo.; WTAG, Worcester, Mass. (2)—Four. KFNF, Shenandoah, Ia.; KMA, Shenandoah, Ia.; WAPI, Auburn, Ala.; WCAE, Pittsburgh, Pa. (3) Nine. KJR, Seattle, Wash.; KLZ, Denver, Colo.; WBET, Boston, Mass.; WAAW, Omaha, Neb.; WGWB, Milwaukee, Wis.; WMBF, Miami, Fla.; WLWL, New York City, N. Y.; CKY, Winnipeg, Manitoba; CNRW, Winnipeg, Manitoba.

ARE THERE any C battery eliminators on the market? (2)—What tube is used as a rectifier? Please give any other information you can.—Sol Keing, Los Angeles, Calif.

Yes. The Acme Apparatus Co., of Cambridge, Mass., make one. (2)—The X-99 type tube is used. The filament of this tube is heated with A.C. voltages up to 50 volts are available.

IN THE Mar. 12 issue of RADIO WORLD, on page 10, there appeared a circuit diagram illustrating how telephone conversations could be heard through the speaker via the audio portion of a radio set. Is there any special type of audio frequency amplifier necessary to successfully carry out this test?—Morris Fordson, Cleveland, O.

No. Any type of audio can be used. Just follow the same plans shown in the diagram.

THE LOCAL radio store recently held a sale. I purchased a non-adjustable fixed crystal; a two to one ratio audio frequency transformer; a pair of .00035 mfd. variable condensers; a seven by twenty-one inch cabinet and panel; a twelve inch long, three-inch diameter tubing, and some No. 24 double cotton covered wire. The clerk gave me a circuit diagram of a one-tube reflex set, with regeneration somewhere in the circuit. I have lost the diagram and cannot recall how the set was wired up. Could you favor me with a diagram of such a set giving me the coil, as well as all data necessary for the successful construction of it.—Wallace Marwell, Atlantic City, N. J.

The circuit diagram of such a receiver is shown in Fig. 525 Regeneration is used in the combination radio frequency and audio frequency amplifier. The crystal is used as the detector. The audio frequency transformer is used to feed the signals from the detector back to the radio amplifier. The primaries L1 and L4 consists of ten turns. The secondaries L2 and L5 consists of fifty-nine turns. Each primary and secondary is wound on three-inch long, three-inch diameter piece of tubing with a one-quarter inch space between the two windings. You will have to purchase a one and three-quarter inch diameter tubing, which is one and one-half inches long to wind the tickler. This winding consists of thirty-five turns, using No. 26 single silk covered wire. This winding is, of course, made in two sections, eighteen turns on one-half and seventeen turns on the other. So as to allow the shaft to pass through, between these two windings, allow about one-quarter inch. This tickler coil should be placed near the end of the secondary winding, the terminus of this winding being brought to the grid post on the socket. The .00035 mfd. variable condensers are shunted across these secondaries. The filament of the tube is controlled by a twenty-ohm rheostat. C3, C6 and C4 are used for bypassing, they all having a value of .0005 mfd. C5, across the phones, has a capacity of .00025 mfd. The grid return of the tube is made through the secondary winding of the audio frequency transformer, to the minus A post. The energy from the crystal detector is brought back to the tube via the primary of the audio transformer. The -01A tube should, of course, be used for best results. About forty-five volts should be applied to the plate of this tube. However, any voltage from forty-five to ninety may be tried. The arrow in the diagram of the crystal indicates the cat-whisker or high potential portion of the crystal. The solid portion in the diagram indicates the crystal itself. This is called the

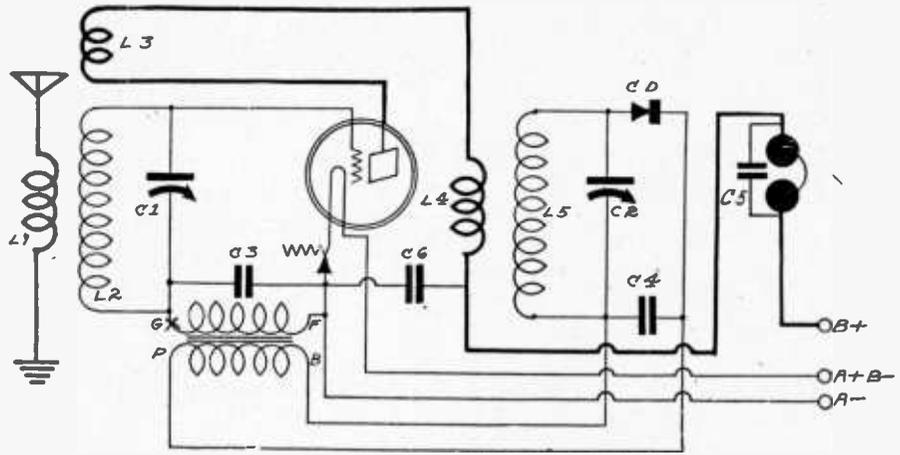


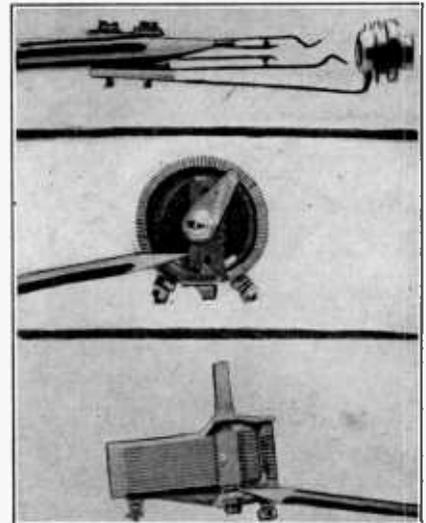
FIG. 525
The circuit diagram of a one-tube reflex, with regeneration in the radio frequency amplifier tube, as requested by Wallace Marwell.

low potential point. When placing these parts in the cabinet, use a baseboard which is eighteen inches long and six inches deep. The three circuit tuner, L1L2L3, is placed directly in the center of the cabinet. The other coil is placed in the furthest right hand corner (looking at the baseboard and panel from the front). The socket should be placed directly in back of the tuner coil. The crystal detector should be placed in back of the second radio frequency coil. The variable condenser C1 should be placed to the right of the tuner. The other variable condenser C2 should be placed to the left of the tuner. The centers of the tuner knob and condenser dials should all be in line. Binding posts, clips, or a single circuit jack may be used to connect the phone to the output. If the jack is used, place it in the left hand corner. The rheostat should be placed directly underneath the tuner knob. A battery cable, binding posts, or clips may be used for the battery connections. In any of the cases, it should be placed in the rear of the board to the right. When making the grid and plate leads on the socket from the tuner, be sure to make them short and keep them away from the panel. Any standard length antenna, e.g., 100 feet, may be used. If you find it necessary to use a longer antenna, say 125 feet, insert, a .00025 mfd. fixed condenser in series with the antenna, or reduce the number of turns on the primary of the tuner coil to eight.

I WOULD appreciate information regarding common noise production. That is, I have a two-tube receiver employing a regenerative detector, using the Hartley system, and a single stage of transformer coupled audio frequency amplification. I am troubled with scratchy sounds. I have tested the coils, batteries, tubes, ground and antenna and

sockets. They all show up O. K. Could the trouble lay in the double circuit jack, or rheostat or condenser? Where?—Frank L. Johns, Brooklyn, N. Y.

Figs. 526, 527 and 528 illustrate the places where noise may be produced in the articles you mention. In the jack, between springs; in the rheostat, between the contact arm and wire and in the condenser, in the shaft. In the jack, the screws holding the insulating strips and springs should be tightened down, also front nut. Poorly soldered connections to any of the objects may cause trouble. Tests should not be made visually, but electrically with the popular series battery and phone testing unit.



FIGS. 526, 527, 528 (top to bottom)

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Funds to Pay off Aliens Are Tied Up As Bill Dies

Sayville Station, Built by Germans, Involved—Tuckerton Transmitter Is Basis of Ownership Quarrel
—Both Seized During War

The failure of Congress to pass the alien property bill at the close of the sixty-ninth session involves patent claims concerning the high-powered radio telegraph stations situated at Tuckerton, N. J., and Sayville, L. I., both of which were owned and operated by German interests and were seized by the Navy Department when the United States entered the war in 1917.

When the Tuckerton station was seized, Navy engineers changed the equipment to a 200-kilowatt arc transmitter and the station was then used to communicate with the Allies.

Immediately after the war it was sold to the Radio Corporation of America which now uses it for commercial telegraph connections with ships at sea and for trans-Atlantic traffic.

Involved in Litigation

Originally built by Germans for French interests, the Tuckerton station is now involved in litigation over ownership because of unpaid balances between the Germans and the French.

The Sayville station was also built by the Germans, but for their own use. Erected in 1911, it was seized by the United States on her entering the war. Af-

ter seizure the Navy Department used it for communicating with the American fleet, along with other naval stations at Washington and on the Atlantic seaboard.

The Navy Department has now leased the station to the Independent Wireless Telegraph Company, who plan to use it for communication with vessels at sea and for international traffic. However, it is said the company failed to obtain a license before the passage of the new radio law, and is now awaiting action by the Federal Radio Commission.

Funds Tied Up

The value of the station is declared to be centered about patent rights. According to a report, the Navy Department paid the Alien Property Custodian \$43,116 for the apparatus, \$56,222 for the rental of the station, and \$32,363 for the use of the patents. However, \$19,000 was deducted for repairs. But these funds are now being held until Congress provides a measure for reimbursing the former German owners.

HOLLAND-U. S. PHONE SOON

Trials of radio-telephonic communication between Holland and America will commence shortly, in connection with the Marconi Beam System now employed on the New York-London circuit. Since the German tests are said to have proved successful, it may be anticipated that Dutch communication with America will not present unsurmountable difficulties. Hence within a measurable time conversations may be conducted between the Netherlands and the United States. The connection will be effected via line and sea cable to London, thence via the wireless route across the Atlantic.

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Class Distinctions Exist Among German Fans

"Amateur" Has Set That Gets Only Locals, While the "Auditor" Receives European Stations— Report on Leipzig Fair

The radio exhibition at the Leipzig Spring Fair, which recently closed, gave ample evidence that the radio industry in Germany has established itself on a firm foundation. The Spring fair, far superior to the Leipzig Autumn Fair, was a success in all respects. The exhibit contained a complete assortment of radio apparatus, and a good business was done, especially with the Balkan countries.

There were exhibited at the Fair some very excellent reflex sets. They were mostly complicated valve sets with several tuned circuits.

In connection with these the electric current coupling accessories and the charging apparatus for storage batteries got much attention.

Rectifier Tubes

There were many glow-cathode valves for charging from alternating current supply line. Such apparatus requires no attention whatever. It needs no measuring instruments, no adjustments of voltage, and regulates itself absolutely automatically by the qualities of the valve.

In Germany there are two different requirements that receiving sets have to meet, and outfits of both types were shown at the Fair. The "wireless amateur" in Germany is the listener-in of modest means who contents himself with a set that picks up for him all that his local station broadcasts; the more pretentious person, or "auditor," desires more than this and demands a set that will enable him to get all European stations.

The crystal detector sets with tube amplifiers are very popular with the wireless amateurs. The Neutrodyne receivers appeal to those of more than modest means.

Fine Transmission

Transmission apparatus in Germany has reached an almost perfect state. This is

due to the work of the government's physical and technical institute on the supervision of the transmitting frequency with piezo-electrical resonance fittings, permitting an adjustment of the transmitter with extraordinary precision.

The radio accessories, too, have attained a high degree of perfection. The loud speakers, especially, have been improved, and words and music are heard without distortion and with brilliancy of tone.

MR. FENWAY EXCEPTS

Leo Fenway, designer of the Fenway Super-Heterodyne, took exception to a recent article in RADIO WORLD setting forth that a different RF coupler arrangement than he specified did away with self-oscillation in the RF stage. Mr. Fenway said that self-oscillation arose when fans used No. 20 or No. 22 wire for the primary, instead of the much finer wire (No. 30) as specified by Mr. Fenway in his articles in RADIO WORLD last year.

ACCESSORIES IN LEAD

According to statistics gathered by the National Electric Manufacturers' Association more money was spent on radio accessories, such as batteries and loudspeakers, than on complete receivers in 1926. Sixty per cent. of the total sales were accessories and 40 per cent. complete sets.



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The Use of Power Tubes

Radio fans who desire to add a power tube in the last stage often are deterred by the fact that they believe the job to be far more difficult than it really is. There are only two wires which must be changed in order to make the installation—the positive B wire for that stage so that additional B battery voltage may be added, and the grid return disconnected and joined instead to an additional C bias.

Power tubes, contrary to the general belief, do not give greatly increased volume. Their purpose is, rather, to decrease distortion where good volume is already obtained. A large amount of actual electrical power must be handled when tremendous volume is had from the speaker, and the general purpose tube is not designed to handle an enormous output.

In conjunction with power tubes, use

some form of out-put coupling whenever more than 10 milliamperes are drawn in the plate circuit of the output stage.

* * *

YOUR ARTICLE on prevention of corroded terminals was very timely as I have been experiencing this trouble.

(1)—Have been dealing with a set using toroid coils apparently wound with No. 24 and 26 silk covered wire. In the construction of the set, coils were damaged (3-circuit tuner and RF) and these coils were tuned by two 27 plate condensers made by the Lubree Co. of N. Y. Please tell me the capacities of these condensers, also if the standard tuner of solenoid type will operate with these condensers, and if not kindly advise type and make toroids to replace damaged coils as it is a 4 tube set and will not get any DX.

(2)—I purchased a UX 200-A detector tube and inserted it in the set, but found no difference in operation of set. The carrier-wave whistle was missing as in the old 200. I would like to know how to rewire my set for use with the 200-A as the negative grid is a puzzle to me. I used 45 volts on the plate and the tube seemed paralyzed, but when I used 22½ it operated well. Please explain how I can obtain carrier-wave whistle and DX with this tube. I am confused as to the changes in wiring for this tube.

(3)—I bought two 1A Amperites for my set and installed them in my set wiring them in the A—lead. The first audio tube lit, but the second one didn't light, so believing this Amperite to be defective I purchased another and experienced the same results. Please explain if soldering

to the mounted type is in any way injurious to it.

(4)—Would you advise a 112 in the RF; 201A, 1st AF and 112 2nd AF? I get good results with the UX 112 in RF but haven't tried a 112 in the last audio, a 201A being used.

(5)—Please comment on the merits of the Vitalitone Cone speaker and the 36" Cone made by the Accousticone Co. which has an agency in Philadelphia.

D. P. NORMAN.

(1)—Are you sure that you had toroid coils? I have never yet heard of a three-circuit tuner made in toroid form. If your set consists of a three-circuit tuner and a stage of radio frequency, it was doubtless tuned by .0005 mfd condensers. These condensers will work very well with a standard three-circuit tuner and the radio frequency coil to match.

(2)—When you added a 200-A detector to your set, the grid return from the secondary of the detector was to the positive A battery lead. You must disconnect this wire from the positive A battery lead and connect it to the negative filament post of the detector socket for use with a 200-A.

(3)—If you are experiencing difficulty in getting the last tube to light, I would suggest that you short circuit the Amperite with a piece of bus wire for a moment and see if the tube lights when the Amperite is out of the circuit. If it does, the Amperite is defective. If it does not, your wiring is.

(4)—Your set should work all right with the tube arrangement you mention. It is more essential to have the power tube in the last stage than in the radio frequency.

(5)—The speakers you mention are good.

* * *

I HAVE a Howard five-tube Netrodine of the 1925 model. I use a Willard 120 ampere A battery and Radiola 104 loud speaker and B eliminator. Am using 100 feet aerial and as this causes somewhat broad tuning would like to shorten it to 50 feet, but any attempt to operate the set on a short aerial causes it to choke up and howl when the rheostat on each tube is turned over more than half. This is all right for stations nearby and when tuning out our local, but does not permit bringing any very great distance.

H. S. HALL

I would suggest that you add a .0005 mfd. fixed condenser in series with your lead-in and keep the aerial at 100 feet length. This will give you considerably sharper tuning without decreasing the distance getting ability of your set very much. Should you find that tuning is still too broad, use a .00025 mfd. condenser instead of the .0005. RENEUTRALIZATION may be necessary when the fixed condensers are used.

* * *

I HAVE a Maxim B Eliminator which delivers 90 to 100 volts. How can I put a dry B block 45 volts in series with this eliminator so as to obtain 135 volts?

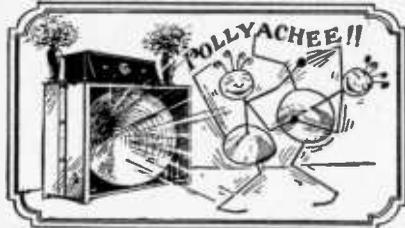
(2)—I would like to ask you if I could

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satisfactorily use an automobile coil for a choke coil in the output to protect the loudspeaker windings? I have an old coil which I repaired having only to unwind a few turns of the very fine wire to make new connections, after it has burned out. In testing this coil for continuity, I find it O. K. The coil is from a Star Car. Could you tell its inductance in henries?

(3)—Can you also tell me how to make a large by-pass condenser say 20 or 30 mfd. electrolytic type to use across the B+ and B- of the B battery eliminator.

R. P. CHRISTIE.

(1)—To obtain your 135 volts of B battery, you may add a 45 volt dry cell B battery in series with the eliminator.

(2)—Yes, you can use it. I do not know the inductance of the coils found in the Star car. Use the terminal which is marked C on the coil as one terminal and either of the others as the other.

(3)—Do not try to make a large electrolytic by-pass condenser.

I WOULD appreciate if you will help me get my four-tube Diamond of the Air working properly. The tickler coil seems to be dead. I can turn it all the way around and still it has no effect on the tuning. I also get a hum, similar to an airplane motor when I tune in on the stations. I never got this when I used any other sets in the same location. Tubes and batteries are OK. 22½ to 45 volts on the detector; 67½ on RF, and 90 on the AF. Am using Farrand speaker and the new GenWin tuner and coil. Federal transformers, No. 65.

J. F. O'LONGHLIN.

Try adding more turns to your tickler coil to get regeneration. Also try putting a .001 mfd. fixed condenser from the +B post of the first audio transformer to the -A battery. Look for loose grid returns which may cause the hum you mention and see that the socket prongs are all right.

BEING A subscriber for RADIO WORLD I would like to have some information on my five-tube Diamond of the Air. I have tried to use a -00A tube for a detector, but it is so noisy that I can't hear anything. The tuning is very broad. I have tried the returns on the minus A, and plus A. By changing the aerial and ground connections there is absolutely no change in the signal. I have to use about a ten-foot ground wire and have 120 feet of aerial and lead-in wire.

S. E. CARRIGAN

You do not state what B battery voltage you are using on your -00A type tube, neither do you state the make of this tube. If it is one of standard make, you will probably find that it works best with a 22½ volt B and a negative grid return. Try installing a 2 megohm grid leak. Also a 6 megohm type. The tuning, of course, will be broad with an aerial as long as you have. Put a .00025 mfd. condenser in series with the antenna lead.

I AM a subscriber for RADIO WORLD I have just completed the two-tube De Luxe set by Lynch as described in the Jan. 1 issue. Every detail and all parts

were purchased as per directions. The set works fine. Am using two B Burgess heavy-duty dry batteries with 90 volts on detector tube. I wish to build a two-tube transformer coupled to follow. I have an Atwater Kent cone speaker Model K which is about ten inches in diameter. I wish to obtain the best transformers in the market and best of parts to give best quality possible. I have been considering the Samson transformers. Would it be best to use radio frequency choke coils with audio frequency choke coils with their respective by-passes for best results

Will the volume control on the 1st tube be sufficient. What tubes in audio unit would be best? J. E. EMEISON.

The transformers you mention are very good. It would probably help you to some extent to put a radio frequency choke coil between the plate of the detector and the P post on the first audio transformer. Use the AF chokes, if you use a B eliminator. The volume control of the first tube should be sufficient to enable you to use phones. Use a 301A tube in the first audio stage and a 112 or a 371 in the second. The 112 should be satisfactory, but if you are obtaining tremendous volume from the 1st AF output, a 371 should be used.

I WOULD like to know if you can give me any help on my St. James Super. I have a frame for a loop and do not know how much wire to use on it and where to make the center tap. Frame is 12 inches wide and 24 inches high and space for the wire is ¼ inches apart.

J. F. NOLAN.

Wind about 80 feet of wire on your loop and make your middle tap, 40 feet from either end.

International Code Proposed for Doctors Who Send to Ships

As a means of overcoming the difficulties of language differences, an international medical code whereby remedies for diseases would be transmitted by standardized code signals in the case of wireless medical consultations at sea between doctorless ships and those carrying doctors is being urged by British physicians.

CHAPPELL WITH WHAM

Ernest E. Chappell, former director of WFBL, Syracuse, N. Y., has taken up his new duties as manager of WHAM, Rochester, N. Y., owned and operated by the Stromberg-Carlson Telephone Manufacturing Company.

Self-Denial

Many of us go through life denying ourselves too many things. We're satisfied to let the other fellow enjoy the sweets.

Well, one sweet thing you must not deny yourself is a copy of the Fifth Anniversary Number of RADIO WORLD, dated April 2. Here's some idea of the contents:

Facts every real experimenter must know, by J. E. Anderson, prominent consulting engineer and authority on radio engineering. This excellent discussion is accompanied by diagrams, which clearly illustrate the more difficult topics.

Why voices sound as if they come from a barrel, is lucidly explained by Capt. Peter V. O'Rourke, one of the most popular writers on radio topics for the fans today.

Part I of a four-part article on how to construct the Nine-In-Line Super-Heterodyne receiver, a sensitive selective and voluminous set, by Lewis Rand, authority on Super-Heterodyne receivers.

How to construct a ship model speaker, employing the popular colonial ship model for housing the speaker, by Herbert E. Hayden. This article is profusely illustrated.

How to build a 3-foot cone speaker, by Clyde Fitch. Excellent photos and diagrams accompany this article.

How to build the Universal, Radio World's newest four-tube receiver, for use with a loop.

How to make a two-step resistance coupled audio frequency amplifier that will afford ample volume for a speaker, by Herman Bernard, Managing Editor of Radio World.

The three-tube receiver is still a very popular set. How to construct one in a cabinet, which is only 19 1-2x5 1-2 inches is described by Jasper Henry.

How to build a Power Compact, which consisting of a B eliminator and one stage of power audio frequency amplification, all operated off the AC line, was described by Lewis Winner, Technical Editor of Radio World. This was the first part of a two-part discussion.

The complete list of stations in the United States, corrected up to March 23.

Send 15c for copy of April 2 issue to Radio World, 145 West 45th St., N. Y. C.

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New Hi-OHM
Volume Control



An improved Volume Control built to Carter specifications. Carter parts are the choice of discriminating engineers in all the really popular circuits.

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Type 260
UX-Tube Socket
Price 20c.

Detailed Blueprint of the COMPACT-THREE

GIVES COMPLETE
List of parts and prices, front lay-out of panel, position of parts on, and drilling of front panel, arrangement of parts on sub-panel, wiring diagram, full information for building this wonder set.
Send \$1.00 to
C. P. HALL CO.,
233 Mulberry St., Newark, N. J.

COMPLETE DATA on "How to Build a DC A and B Eliminator," were given in the Dec. 4 issue of **RADIO WORLD**, by Lewis Whinner. Lucid photos and diagrams accompanied this excellent article. Either send 15c for this copy, or begin your subscription with this issue. **RADIO WORLD**, 145 West 45th St., N. Y. City, N. Y.

D. X. ON A LOOP WITH THE TROPADYNE



SUPER-HETERODYNE

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It gets volume, clarity and marvelous D.X. reception, all on a loop antenna—No outdoor cumbersome aerial necessary.

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THE RADIO TRADE

Raycroft Speculates on Cost of Law Delay

Delay in enacting the radio law and the resulting chaos in broadcasting has cost the radio industry \$100,000,000, according to L. B. F. Raycroft, vice-president of the Radio Division of the Electrical Manufacturers' Association. He said the radio industry feared even now that the Federal Commission would not sufficiently reduce the number of broadcasting stations.

"A number of radio manufacturers own

broadcasting stations," he said, "but judging from an expression at the Policies' Division meeting of our association I believe that there is a general agreement that the greatest good to the radio public can come only if the number of stations is cut down to under 200.

"I am in favor of revoking the license of every station which jumped to the wavelength reserved for Canadian use under the gentlemen's agreement of the Hoover radio conferences of the past several years. They should be banished from the air. I believe that every one who took unfair advantage of the situation because of the absence of legislation should be treated similarly and nuisance stations wiped out. I believe in priority, provided it includes constructive service to the radio art and industry.

"The stations which established themselves as competent broadcasters early in this work should be given due credit. They should be recognized regardless of the question of ownership. If the listener is satisfied and well served, the radio industry will be content.

"Undoubtedly pressure will be brought upon the Control Board to approve the re-issue of practically every license now in effect and others, but we hope that they will cut the number down to the bone, insuring nothing but high-grade service to the radio public regardless of all factors, political or otherwise."



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COMPLETE LIST OF BROADCASTING STATIONS appeared in **RADIO WORLD** dated April 2. 15c per copy, or start sub. with that number. **RADIO WORLD, 145 W. 45th St., N. Y. C.**

4-tube Universal described in March 12, 19, 26 issues. Send 45c to **RADIO WORLD** for these issues.

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Indicate if renewal.

Offer Good Until

April 21, 1927

Name
Street Address
City and State.....

Europe to Be Scanned for Tube Refinement

With the waning of a very busy season, alert manufacturers are already preparing for what is expected to be the most active year in radio history.

What the trend of new developments may bring before we again shoulder a new season are not to be prophesied, but one thing is certain, that in order to develop improved receivers, the set manufacturers must have the proper tubes to design their circuits around, for the type of vacuum tubes used must determine the proper transformers, condensers and practically all parts used in such circuits.

Therefore, the industry is rightfully focusing its interest on the tube manufacturers, and one who is being watched with special interest is the C. E. Manufacturing Co., of Providence, R. I., makers of the well-known "CeCo" tubes.

The "hard" type special detector was produced by this company after much research, and their tube of this type has not yet been duplicated. The development of the latest special purpose tube for use in radio frequency stages of receivers was pioneered by this manufacturer and a perfected special R. F. tube was released by them recently, which has been acclaimed a very important step in the progress of radio.

That this organization that has contributed so much to the advancement of radio may be counted on for their continued efforts is evidenced in an authoritative statement is-

sued from their Providence Headquarters that William Cepek, executive secretary of that firm, will sail on April 15 for an extended European trip.

England, France, Germany and Russia will be included in Mr. Cepek's tour of European radio conditions and it is expected that many efficient methods, processes and manufacturing technique will be utilized in part and combined with already proficient American systems and ideas. Continual research work has enabled the C. E. Manufacturing Co. to attain the high standard of quality they have set for the tube indus-

try, and we are watching with interest their new development announcements that appear so frequently.

While Mr. Cepek is preparing for his voyage, George Coby, president of the company, has left for a long sojourn at Palm Beach.

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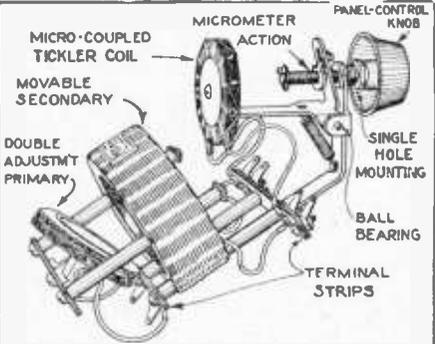
How to Build Radio World's
UNIVERSAL,
Four-Tube Receiver

Fully described by Herman Bernard, and fully illustrated, in the March 12 and 19 issues of Radio World. Trouble shooting set forth in the March 26 issue. Send 45 cents and get all three issues.

Blueprints of the Universal, \$1.00 each. The March 12, 19 and 26 issues and the blueprint, will be sent immediately on receipt of \$1.30. Or send \$6 for a year's subscription (52 numbers) and get the three copies and blueprint as a premium. No other premium with this offer.

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You must use Karas Micrometric Vernier Dials if you want to have your Radio World Universal 4-Tube Receiver give best results. (Read the story about this great receiver in this issue of Radio World.) Editor Bernard, in last week's issue, stated: "It is important to use Karas Dials in this receiver because any dial that permits hard contact with even the ordinarily grounded side of a coil will not do at all. The whole dial front must be insulated so that no metal can touch you. . . Dials having exposed metal parts will introduce body capacity." Karas Micrometric do not.

Not only can "no metal touch you" when you tune your Universal 4 Tube with Karas Micrometric Vernier Dials, but you also will discover a marvelous precision of operation that gives a closeness of tuning of 1/1000th of an inch, due to the 63 to 1 vernier ratio of Karas Micrometrics. You can easily bring in stations that you never heard before. Micrometrics tune with a velvet, liquid-like smoothness that no other dial can even imitate. Micrometrics have large, handy knobs, are made throughout of Bakelite and have red inlay markings. They operate with an entire absence of backlash, nor can any ever develop. Your dealer can supply you with 2 Karas Micrometrics for your Universal, price \$3.50 each. If he is out of stock and you are in a hurry, you may order them direct from us by filling out and mailing the coupon. SEND NO MONEY. Just hand the postman the price of the dial upon delivery, plus a few cents postage. Remember, you must use Micrometrics in the Universal, so order them today, and build the smoothest tuning set you ever owned.

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of Radio World, published weekly at New York, N. Y., for April 1, 1927.

State of New York,
County of New York, ss:

Before me, a Notary Public, in and for the State and County aforesaid, personally appeared Roland Burke Hennessy, who, having been duly sworn according to law, deposes and says that he is the Editor of the Radio World, and that the following is to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation, etc.) of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor and business managers are: Publisher, Hennessy Radio Publications Corp., 145 W. 45th St., N. Y. C.; editor, Roland Burke Hennessy, 145 W. 45th St., N. Y. C.; managing editor, Herman Bernard, 145 W. 45th St., N. Y. C.; business manager, Fred S. Clark, 145 W. 45th St., N. Y. C.

2. That the owner is (if owned by a corporation its name and address must be stated, and also im-

mediately thereunder the names and addresses of the stockholders owning or holding one per cent. or more of total amount of stock. If not owned by a corporation the names and addresses of the individual owners must be given. If owned by a firm, company or other unincorporated concern, its name and address, as well as those of each individual member must be given). Hennessy Radio Publications Corp., 145 W. 45th St., N. Y. C.; Roland Burke Hennessy, 145 W. 45th St., N. Y. C.; Mrs. Mary McArthur, 1886 East 82nd St., Cleveland, Ohio.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent. or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of

the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is.....weekly. (This information is required from daily publications only.)

ROLAND B. HENNESSY,
Editor.

(Sworn to and subscribed before me this 29th day of March, 1927). ESTHER M. GUERIN.

Notary Public, Bronx County, Bronx Co. (Clerk's No. 109; Register No. 2839. New York County Clerk's No. 218; Register No. 8213. Term expires March 30, 1928.

Note.—This statement must be made in duplicate and both copies delivered by the publisher to the postmaster, who shall send one copy to the Third Assistant Postmaster General (Division of Classification), Washington, D. C., and retain the other in the files of the post office. The publisher must publish a copy of this statement in the second issue printed next after its filing.

Benjamin Condensers Increase Popularity

The new Benjamin variable condensers put out by the Benjamin Electric Manufacturing Co., 120 South Sangamon Street, Chicago, are proving their efficiency as evidenced by the growing demand for them by fans everywhere. The S. L. F. Condenser is made in three sizes, .00025, .00035 and .0005 mfd. and logs evenly all over the dial in exact ratio to the broadcasting frequencies, thus eliminating bunching of stations and increasing selectivity and sensitivity. There is no body capacity and no absorption losses. The

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S. L. W. type may be had in the same three sizes and give definite control of the slightest changes in condenser capacity, as well as allowing the broadcast range a greater spread over the dial settings particularly where this is needed, on the lower wave lengths. Both of these types are beautifully finished and rugged, long-lived jobs. The list price is very reasonable. Other quality Benjamin products are, the "Lekeless" tuned radio frequency transformer and the regular T. R. F. transformer, used in many fine circuits; the Benjamin shelf supporting brackets and adjustable shelf supporting brackets; the Benjamin battery switch, and last, but not least, the renowned Benjamin sockets, used by discriminating set builders and manufacturers all over the world. J. T. Whitehead, Jr., is the Benjamin representative in New York and is well known and liked in the radio field. He has done great work for Benjamin in this territory. His headquarters are the Benjamin local offices at 247 West 17th Street, New York City, where all inquiries are cheerfully answered.—J. H. C.

Camera Department

In response to a wide demand, and to accommodate their customers who are interested in photography in addition to being radio fans, the City Radio Co. has added a line of cameras and photographic goods in their palatial new store, recently opened at 42 Cortlandt street, New York

City. Every standard make of camera is in stock, including two makes of motion picture cameras and projectors, from the smallest Brownie to the 5x7 Graflex and the 8x10 view camera. A wide assortment of accessories will supplement this line, ranging from films, film packs and plates to developing accessories of all kinds. High-grade lenses from f.8 to f1.3 may be had by the advanced amateur and a feature of their service will be the procurement for a customer of anything in photographic apparatus that is difficult to obtain. The City Radio Co. has been very successful with the camera department in its 42nd street store, as a great many radio fans are skilled in picture making as well as set building. Dave Schloss, manager, and Henry Berman, assistant manager, are well equipped to handle this new department as both are as well posted on photography as they are deeply grounded in radio.

Eagle Eliminator

The Eagle A & B Eliminator Co., Inc., 109 West Broadway, New York City, manufacture a high-grade socket power unit to take the place of A and B batteries. This unit is made for DC. Uniform reception is assured and there is no hum or buzz. No water, acids or rectifying bulbs are used. The unit is purely mechanical and is quickly attached to the set and plugged in on the line.

Operating costs are approximately 1/2 cent per hour on a five-tube set. It is fitted with a switch which automatically shuts off the eliminator when the set is not in use, and an ammeter which shows what the tubes are drawing. The unit is handsome in appearance and sturdily made for long wear. It has taps for all variations of current and is guaranteed. This concern is preparing a similar unit for AC. A handsome booklet will be sent to those interested upon application to the above concern.

Mail Order Dealers

The Graymore Radio Co., 142 Liberty street, New York City, has been established by Eddie Rosenbaum and W. B. Spiegel, both well known to the radio trade. This concern intends to serve dealers all over the country by mail order. All standard radio parts and accessories may be had, and they will specialize on the hard-to-get kind. Mr. Spiegel was formerly with the Magnavox Company and is known to the trade as the man who magnified Magnavox.

GET THE UTMOST

in tone-quality and volume. Use the New Lynch Metallized Resistance-Coupled Amplifier Kit in connection with the new Cunningham or Radiotron Hi-Mu Tube. Adaptable to any receiver.

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Time Constant Affects Tuning

(Concluded from page 6)

in series with the grid circuit for the purpose of preventing radio frequency currents from passing into the audio frequency amplifier. A choke coil in series with the grid lead has just as great a choking effect on the radio frequency as it would have if it were hung on a peg in the wardrobe. In a typical case the choking effect at 100,000 cycles was found to be one hundred millionth part. That is, a voltage or a current of hundred units would be decreased by one millionth of a unit. If the choke coil had been short-circuited and placed within a mile of the receiver the effect would have been just about the same. The fallacy is widespread. When a choke coil is used for the purpose of preventing radio frequency currents from going into the audio frequency amplifier a short circuit path should be provided, and this may best be provided by a moderate sized condenser.

The Tuned Circuit

A tuned circuit also has a time constant. If the resistance of the condenser can be neglected in comparison with the resistance of the coil, which it nearly always can be, the time constant of the circuit is the same as that of the coil, namely L/R . This is a direct measure of the selectivity of the tuned circuit, that is, of the power of the circuit to discriminate between neighboring frequencies. The greater the time constant, the greater the selectivity. The so-called low loss coils are coils in which an attempt has been made to have the time constant very large.

The resistance in a tuning coil depends on the frequency of the circuit, or on the frequency to which the circuit is tuned. For small frequency ranges the resistance may be taken as directly proportional to the frequency. When this is the case a better measure of the selectivity of the circuit is obtained by taking the ratio of the reactance of the coil to the radio frequency resistance. (The reactance is the opposition to the flow of alternating current.) If L is the inductance, w is the frequency in natural measure, and R the radio frequency resistance, the selectivity is proportional to Lw/R , or modified time constant. This is very nearly a constant over a frequency range not greater than the broadcast range. The higher the value of Lw/R ,

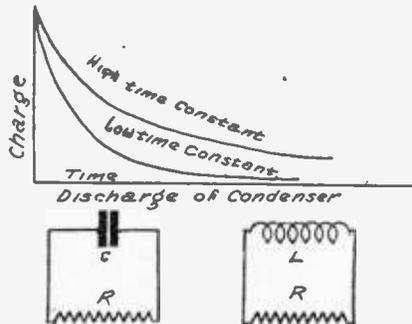


FIG. 5.

The discharge of a condenser through a resistance takes place as shown in these curves. The higher the time constant of the circuit the slower is the discharge.

the better the circuit as regards selectivity.

The term "frequency in natural" measure used above is 211 times the frequency.

At Best a Compromise

The fan should know that perfect selectivity and perfect quality cannot be realized in practice. The two terms are opposite. If the selectivity were perfect all but one frequency would be tuned out, and after the detector this would correspond to a zero frequency. Not a thing could be heard in the loud speaker. If the quality were perfect all the frequencies would be amplified to the same degree, and the selectivity would be zero. The best that can be done in any practical receiver is to compromise between the two.

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- July 3—Set with a 1-Tube Primary, by Herman Bernard. Part 2 of the Victoreen Portable, by E. Bernard. Trouble Shooting Article for The Light 5-Tube Portable.
- July 10—A Rub in Single Control, by Herman Bernard. A DX Double Regenerator, by Capt. P. V. O'Rourke. A 3-Tube Dry Cell Receiver, by Samuel Schmalz.
- July 31—What's Best in an AF Amplifier, by Herman Bernard. A 6-Tube Reversed Feedback Set, by K. B. Humphrey.
- Aug. 14—The Improved Browning-Drake, by Herman Bernard (Part 1). Storage Batteries, by John A. White.
- Aug. 21—A New Stabilized Circuit, by E. H. Loftin and S. Y. White (Part 1). The Browning-Drake by Herman Bernard (Part 2).
- Aug. 28—The Constant Coupling, by E. H. Loftin and S. Y. White (Part 2). The Browning-Drake, by Herman Bernard (Part 3).
- Sept. 4—The Four Rectifier Types, by K. B. Humphrey. A Simple Battery Charger, by J. E. Anderson.
- Sept. 11—The Beacon (3-tubes), by James H. Carroll. The 1927 Model Victoreen, by Herman Bernard.
- Sept. 18—The 1927 Victoreen, by Arthur H. Lynch. Eliminator in a Cash Box, by Paul R. Fernald.
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- Oct. 16—The Bernard, by Herman Bernard. How to Box an "A" Supply, by Herbert E. Hayden.
- Oct. 23—The 5-tube P. C. Samson, by Capt. P. V. O'Rourke. Getting DX on the Bernard, by Lewis Winner.
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- Nov. 13—The 4-tube Hi-Power Set, by Herbert E. Hayden. A Study of Eliminators, by Herman Bernard.
- Nov. 20—Vital Pointers About Tubes, by Capt. P. V. O'Rourke. The 4-tube Diamond of the Air, by Herman Bernard.
- Nov. 27—The Antennaeless Receiver, by Dr. Louis B. Blan (Part 1). Short Waves Yield Secrets, by M. L. Prescott.
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- Dec. 25—A New Coupling Device, by J. E. Anderson. Functions of Eliminators, by Herman Bernard.
- Jan. 1, 1927—The 3 Tube DeLuxe Receiver, by Arthur H. Lynch. The Twin-Choke Amplifier, by Kenneth Harkness.
- Jan. 8—Tuning Out Powerful Locals, by J. E. Anderson. A Choice Superheterodyne, by Brunsten Brunn. The 3-Tube De-Lux Receiver, by Arthur H. Lynch (Part 2).
- Jan. 15—The DeLuxe Receiver, by Arthur H. Lynch (Part 3). The Simple Motor Test Circuit by Herbert E. Hayden. The Superheterodyne Modulator Analysed, by J. E. Anderson.
- Jan. 22—The Atlantic Radiophone feat, by Lewis Rand. An Insight Into Resistors, by J. E. Anderson. A Circuit for Great Power, by Sidney Stack.
- Jan. 29—The Harkness KH-27 Receiver (Part 1), by Kenneth Harkness. Use of Biasing Resistors, by J. E. Anderson.
- Feb. 5—5-Tube, 1 Dial Set, by Capt. P. V. O'Rourke. The Harkness KH-27 (Part 2), by Kenneth Harkness. What Produces Tone Quality, by J. E. Anderson.
- Feb. 12—Phone Talk Put On Speaker, by Herbert E. Hayden. All Batteries Eliminated, by Herman Bernard. The Harkness KH-27 Receiver, by Kenneth Harkness (Part 3) conclusion.

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Oscillation Control Easy In Universal

Negative Bias on RF Amplifier Tube May Be 3 or Less, Being Reduced Until Neutralizer Is Effective

By Herman Bernard

Associate Institute of Radio Engineers

The new Universal receiver, described in the March 12, 19 and 26 issues of RADIO WORLD, has been constructed by hundreds of fans, as their letters attest. Most of these are obtaining highly gratifying results, and say so. Some of those who built the receiver live in air-congested neighborhoods, and are glad to report that the selectivity of the set is indeed all-sufficient. They are happy to have a receiver that employs only four tubes but which nevertheless accomplishes so much. Especially do the distance-hunting fans like the volume with which DX stations

are received, and the ease of regeneration control afforded by the tiny variable condenser used for feedback.

The construction of the set is greatly simplified by following the blueprint. Most of the fans who have built the set evidently have followed the life-sized prints which enable them to place each part exactly right and make the wired connections just as they should be.

Control of Oscillation

As for trouble in the receiver, the only complaint made by more than two or three fans is that they have not been able to balance the receiver properly against self-oscillation. The complete neutralization of the receiver is a simple matter, as the balancing condenser on the baseboard takes care of this provided only that the bias is right.

As those who read the articles on how to build the set will remember, the radio frequency amplifying tube, a CX 301-A, takes a negative grid bias. This was shown in the diagrams, and appears in the blueprint, as minus 3 volts, the same bias as is put on the first audio tube.

But those who run into balancing difficulties may increase or decrease the bias on the RF tube—letting the bias on the first audio tube stay as it is.

The Test

The test is that the neutralizing condenser must neutralize, and the bias should be arranged accordingly.

Of course, if the set is self-oscillatory, in other words not neutralized, there will be trouble from body capacity. But with proper biasing and correct setting of the neutralizing condenser, there will be no body capacity effects, provided completely insulated dials are used, such as the Karas Micrometric. These dials have no exposed metal parts, and only these dials should be used.

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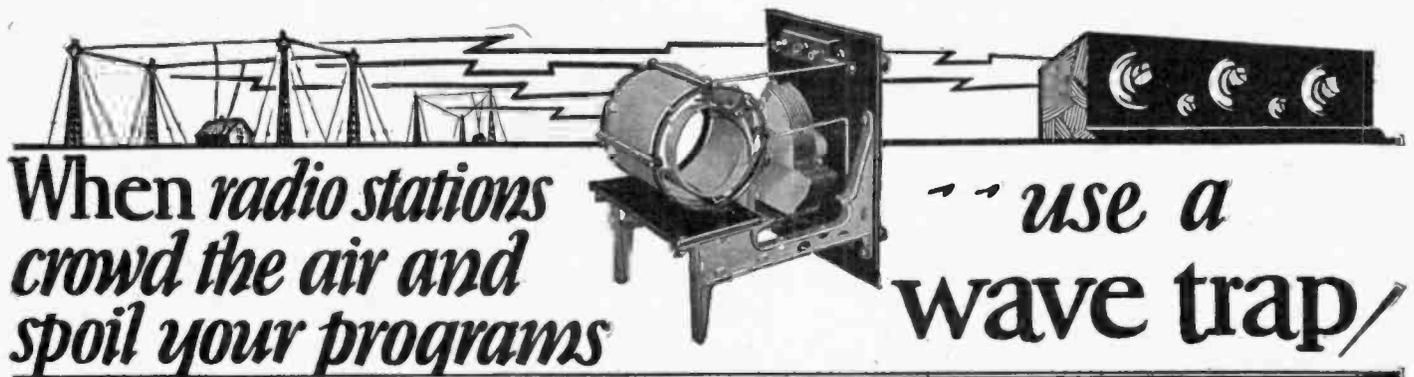
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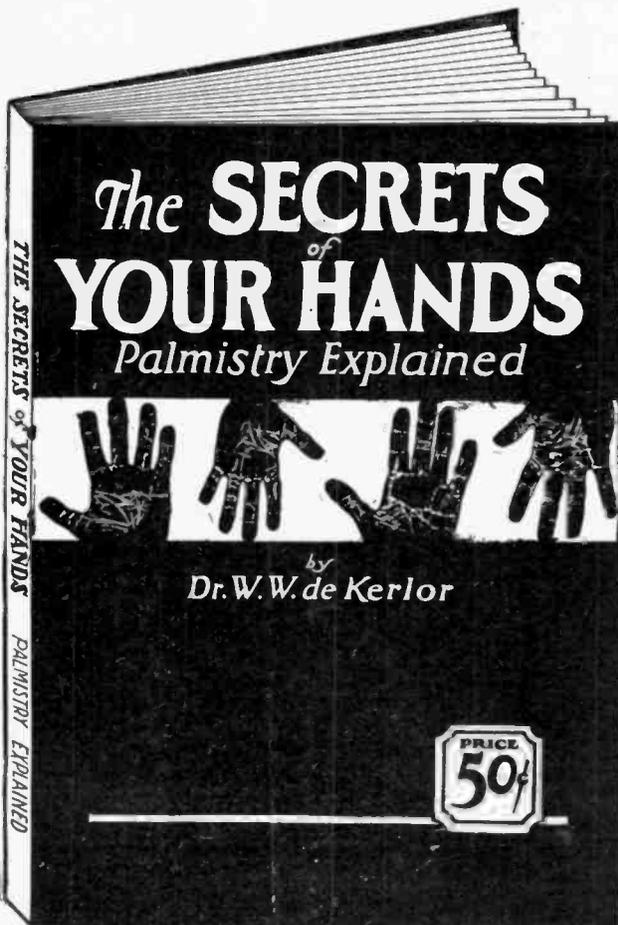
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