

RADIO

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WORLD

The First and Only National Radio Weekly
Twelfth Year *595th Consecutive Issue*

Vacuum Tube Voltmeter

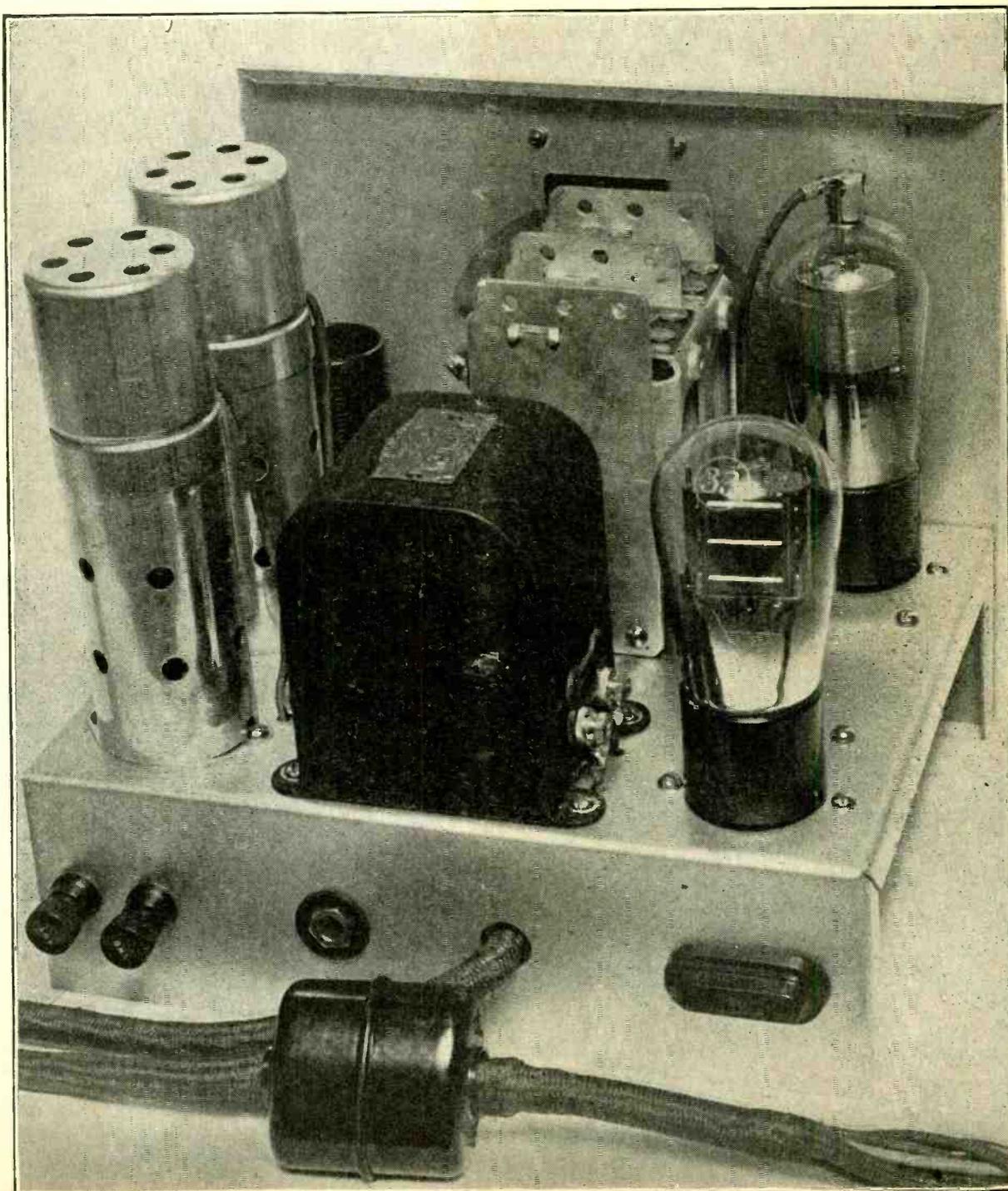
Two-Range Oscillator

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AUG. 19
1933

S-W BATTERY SET

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A battery type set, four tubes, for short waves. See page 3.

Control of Regeneration is made smooth in this set for short waves.

A 1934 Radio Achievement! THE "REGENT FOUR"

SHORT WAVE RECEIVER

Authentic Proof of World Reception

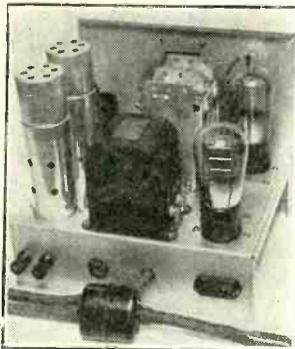
Described in this issue of RADIO WORLD by HERMAN COSMAN, Try-Mo Radio Engineer

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Designed by J. E. ANDERSON

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NEW RADIO AMATEUR'S HANDBOOK, 180,000 words, 207 illustrations, 218 pages (10th edition, issued 1933). Issued by the American Radio Relay League. Price, \$1.00 per copy. Radio World, 145 West 45th Street, New York, N. Y.

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FEEDBACK GANGED FOR SMOOTHNESS

Ease of Control in a Short-Wave

Battery Set

By Herman Cosman

Try-Mo Radio Corporation

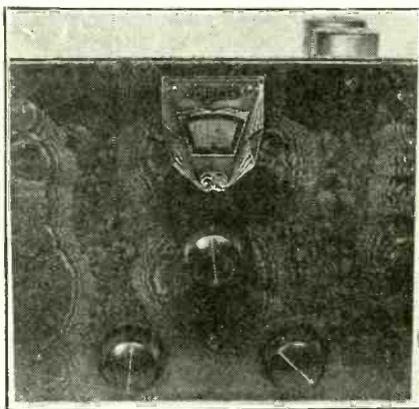
INCREASED smoothness of regeneration control was achieved by using two ganged 0.00014 mfd. condensers, one of which was for tuning proper, the other for feedback, with a vernier condenser across the regeneration control. It is not pretended that the method would work properly without this parallel trimmer, for the capacity setting of the throttle condenser is not exactly proportionate to straight frequency line, mid-line, straight capacity line, or any other form of capacity variation derived from commercial condensers.

However, if the feedback inductance is made great it results in dead spots due to choking in the plate circuit, or if too small, it prevents regeneration at the lower frequencies of any particular coil, but with correct coils the ganged feedback condenser will nearly track, the capacity, if off, being too low, and being made right by adjustment of the trimmer.

Tuned Plate Circuit

A screen grid tube, the 34, is used as the radio-frequency amplifier, and is not tuned at the input, but is biased negatively by 3 volts, to increase the input impedance and also to reduce the plate current drain and avoid distortion. This tube has a suppressor tied to the filament, but not represented by a separate base pin, so there are four base pins (UX) and a grid cap. The connections and equivalent pins are shown in the bottom-view socket representation on the diagram.

The plate circuit is tuned, as this is an excellent method of developing high sensitivity. To hold up the selectivity the leak should be high, and it is shown as 5.0 meg. in the grid circuit of a 30-S tube. This tube is quite similar to the



Ganging of the tuning condenser and the feedback condenser worked out well in the set when a parallel 0.00014 mfd. condenser was included in the shunt feed circuit. The front panel view is shown.

30 tube, but it has a much lower internal capacity and therefore is more suitable for short waves. Besides, the plate is brought out to the cap connection, which is one of the means employed to keep the elemental capacity low.

A two-winding coil of the plug-in type is used, and four coils cover the band from below 15 to around 200 meters. One of the windings is in the plate circuit of the radio-frequency amplifier (secondary) while the other is in the plate circuit of the detector.

Since the coupling is between circuits 180 degrees out of phase, if the windings are in the same direction they should be

connected in opposite polarities, i.e., top of secondary to grid, bottom of secondary to plate return, top of feedback winding to B plus, bottom of feedback winding to plate of detector. If regeneration is absent, reverse the tickler winding.

Hardly Any Detuning

The shunt feed method of regeneration control is used, as of course it is the most popular, and if the feedback winding is not tightly coupled to the tuned plate circuit the detuning effect of the feedback condenser will not be noticed except at the higher frequencies, when it is small in percentage, anyway.

This Side and That

It is admittedly difficult in many short-wave sets to get the feedback control just right, no matter what method of control is used, and the shunt feed capacity method may become as awkward and trying as any other. Therefore a means was sought to eliminate this trouble, if such it may be called, and the result was this circuit, the Regent.

The object at all times is to operate the detector just below the point of oscillation or spillover, as this is where the utmost sensitivity is found. A little bit to one side, where regeneration is too weak or absent, the receiver becomes almost dead, at least very insensitive and unselective. A little bit to the other side, and the squeaking, squawking spillover occurs, and there is nothing that could be truthfully called reception, unless it be continuous-wave code. And even this is mushy.

The inclusion of 0.00014 mfd. as the
(Continued on next page)

(Continued from preceding page)

feedback condenser, with aid from the manual trimmer of 0.00014 mfd., without using any dangerously large or closely-coupled feedback winding, there is enough capacity in circuit at the low frequencies of the range of any coil to maintain the circuit near the point of oscillation. And at the higher frequencies there is comparatively small capacity in circuit, thus avoiding spillover there, or awkwardness and trickiness of regeneration control. In fact, considering the minimum capacity setting there is only about 18 mmfd. of capacity in circuit when the two 0.00014 mfd. feedback condensers are at 0 dial reading.

Calibrating Instead of Fishing

The system works out well, but is not quite so good a solution of the difficulty when using the smallest coils as when using the other coils, for in the very high frequency region it must be expected that the feedback condenser setting is delicate, as is every aspect of the tuning. This much all experienced short-wave enthusiasts know, and they get around the difficulty as best they can by acquiring skill (which is mostly patience) in tuning, and by calibrating their receivers, frequencies against dial settings, so that they do not have to do any fishing.

The receiver is of the battery type and ought to appeal to those readers and customers who are constantly complaining that not enough is printed or said about battery sets, though they prefer them, or have no access to house current. The tubes are of the 2-volt variety, and a few words about them might not be amiss.

Data on Tubes

The 34 is a super control radio-frequency amplifier, takes a UX base, has a grid cap at top, and draws 0.06 ampere at 2 volts. If the plate voltage is 135 or 180 volts, the screen voltage should be 67.5 volts, and as 135 volts are sufficient for the power tube and the r-f tube, there is no occasion for the extra 45-volt B battery, and we maintain the maximum voltage at 135 volts. The minimum bias for this tube at 135 or 180 plate volts supply is 3 volts, whereupon the plate current will be only 2.8 ma, screen current 1.0 ma, and the a-c plate resistance (voltages as on diagram) 600,000 ohms. The mutual conductance is 600 and the voltage amplification 360.

The 30-S has a UX base, the plate, as stated, is brought out at the cap, the filament current also is 0.06 ampere at 2 volts, and the negative bias (in the audio amplifier) should be 4.5 volts for 90 volts on the plate, whereupon 2.5 ma will flow. The a-c plate resistance is 11,000 ohms, mutual conductance 850 micromhos, voltage amplification factor 9.3.

The inclusion of the 30-S tube in the audio amplifier is not imperative, as the 30 may be used there, with no change except the wiring of the plate lead to the conventional No. 2 position of the socket.

The Power Tube

The 33 power tube, also 2 volts on filament, draws 0.26 ampere, however, instead of 0.06 ampere, takes 13.5 volts negative bias, draws 14.5 ma plate current, 3 ma screen current, has an a-c plate resistance of 50,000 ohms, mutual conductance of 1,450 micromhos, voltage amplification factor of 70, requires a load of 7,000 ohms and has a power output of 0.7 watt.

Thus the total filament current will be 0.44 ampere, total B current 25.3 ma (screen currents included). The A supply therefore may consist of four No. 6 dry cells, two in series, and each of two such series in parallel. Such cells, under normal use, should last nearly six months, and heavy-duty B batteries, under similar use, nearly a year.

A fused battery cable is used with the receiver.

Assembly

After the parts have all been collected, the assembly of the receiver may be started. As you will notice, the chassis is the inverted U type, with a top, a front and a back.

The panel in the kit is metal, drilled to match the front side of the chassis, with additional holes for the escutcheon plate of the dial. This metal panel is used for the three-fold purpose of supporting the dial, providing a neat front to the receiver, and preventing hand capacity. Such capacity is very annoying in some receivers, and is due to the capacity between the body of the operator and the coils and condensers of the set. This capacity changes the tuning, when the operator's hand is removed, making operation very difficult. It is recommended that a metal panel be used for this reason.

The positions of the essential parts of the set are shown in the illustration of the set. Looking from the back of the chassis, the socket on the left front side is the one used for the plug-in coils. The socket directly behind this is the detector and the third one on the left side is the first audio tube. These two tubes, as you will remember, are the new 30-S tubes, with the plate lead on the top of the glass bulb. To the right of the coil socket are the two variable condensers with the tuning dial assembly, and the socket on the right-front is the r-f tube socket. The last of the five socket holes is the second a.f. (33) tube. Between the two sockets at the back of the chassis is found the audio transformer, which is placed with the primary on the right.

On the panel are mounted the dial, the regeneration control condenser and the filament rheostat. The latter part is insulated from the chassis by suitable insulating bushings.

Wiring the Set

After the sockets, variable condensers, transformer, dial, rheostat and terminals are mounted on the chassis and panel, the wiring may be started. The remaining parts, such as the resistors and fixed condensers, are secured either to the chassis with suitable bolts or they are supported on the wiring of the set. They may be mounted as the wiring progresses.

It is a good plan to start the wiring by connecting all the grounded parts to the chassis and in the writer's estimation the grounding should be done either by soldering the terminal in question to the chassis, or by running a wire to another grounded object. Never trust a screw-tightened joint in a short-wave set. too many sets have refused to function properly because of a poor grounded circuit to take any chances. The grounded terminals can be easily seen by following the wire from the ground terminal on the diagram.

Rest of Wiring

After the grounded circuits have been completed the remainder of the wiring can be tackled. Connect a wire from the aerial terminal to the free end of the 200,000-ohm aerial resistor and to the control grid of the 34 tube (remember that the control grid of this tube is the cap on the top). Connect the screen grid of this tube to the free end of the 0.01 mfd. condenser and also to the 67-volt wire of the battery cable.

It is well to strap the end of the battery cable to the chassis by a suitable clamp to prevent any strain disrupting the wiring of the set.

Next, connect the plate of the 34-tube to the "G" terminal of the coil socket and run a wire from this same coil terminal to the free end of the tuning condenser

LIST OF PARTS

Coils

One set of four plug-in coils, to be used for 0.00014 mfd. tuning.
One radio-frequency choke coil, 25 mh. or higher inductance.
One audio-frequency transformer.

Condensers

One two-gang 0.00014 mfd. tuning condenser.
One separate 0.00014 mfd. tuning condenser.
One 2.0 mfd. bypass condenser.
Two 0.01 mfd. bypass condensers.
One 0.00015 mfd. grid condenser.

Resistors

One 0.1 meg. resistor.
Two 0.2 meg. resistors.
One 0.5 meg. resistor.
One 5.0 meg. resistor.
One 10-ohm rheostat.

Other Requirements

One chassis.
One panel.
Three four-prong sockets and one five-prong socket for tubes, one four-prong socket for coils, one socket for battery cable.
One battery cable.
One phono output post or phono jack.
Four binding posts.
One vernier dial.
Two knobs.
One battery switch.
Two tube shields and bases.
Three grid clips.
Two No. 6 dry cells for series-connected 3-volt battery.
One 22.5-volt C battery (C voltages used as diagrammed).
Hookup wire, hardware.

(the front section of the two-gang condenser). At the same time connect the "G" terminal of the coil socket to one end of the 0.00015 mfd. fixed condenser and run a wire from the other condenser terminal to the grid of the detector tube (the grid is the regular "G" terminal on the tube). From the grid terminal of the detector is also connected one end of the 5-meg. gridleak.

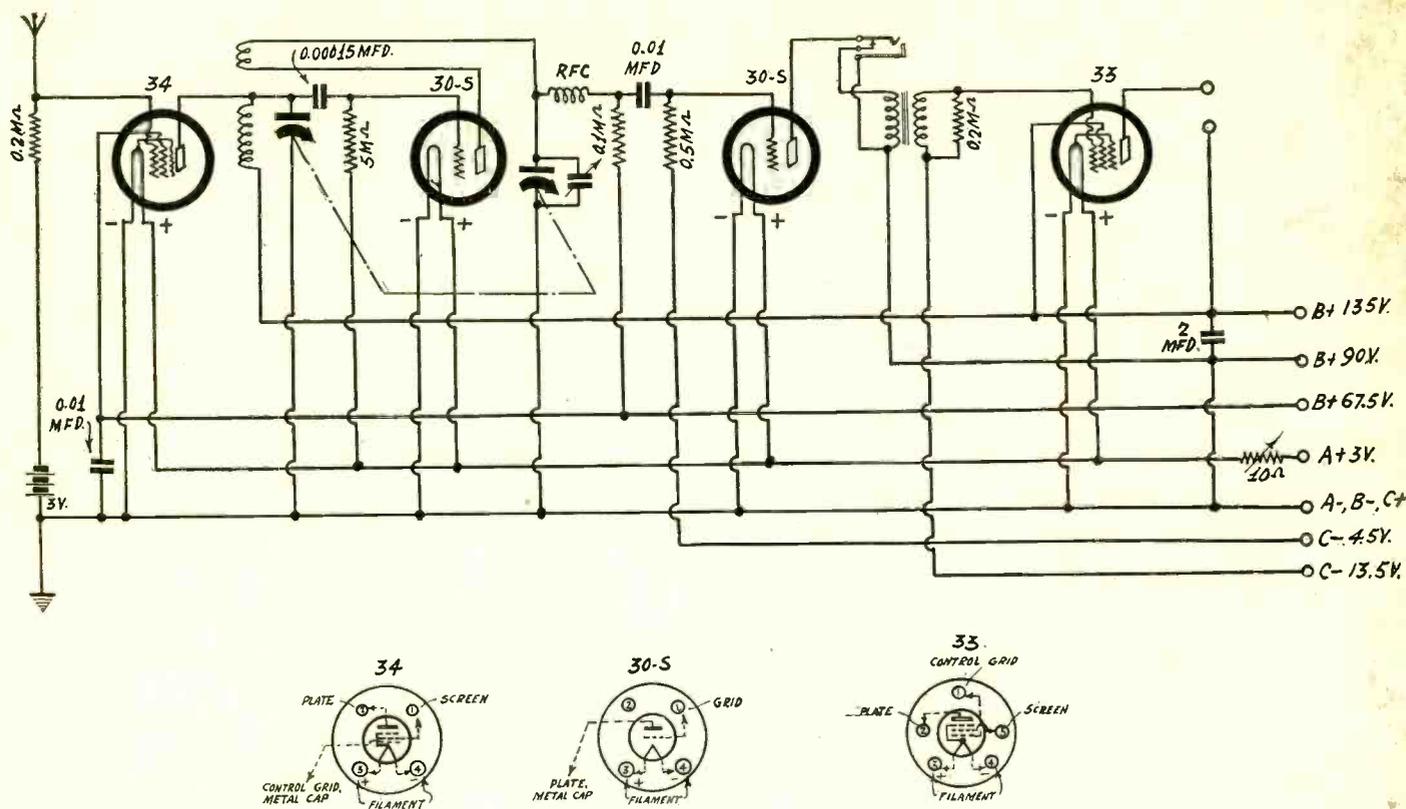
Audio Wiring

The plate of the detector, which is the cap on the top, is connected to the "P" terminal on the coil socket. Next wire the "B plus" coil terminal to the free ends of both the regeneration condenser (the first is the separate regeneration condenser below the chassis and the second is the rear section of the two-gang condenser). Connect a wire from the same coil terminal to one end of the r-f choke and connect the other end of the choke to one side of the 0.01 mfd. coupling condenser and one end of the 100,000-ohm resistor as shown in the diagram.

Wire the other side of the 0.01 mfd. coupling condenser to the grid of the first audio socket and to the free end of the 500,000-ohm resistor. Next run a wire from the plate terminal of the first audio tube (the cap on top) to the top leaf of the 'phone jack. Connect the second leaf to the "P" terminal of the transformer and the frame of the jack to the "B plus" terminal of the transformer. Then wire the grid of the transformer to the control grid of the 33 tube and the free end of the 200,000-ohm resistor;—connect a wire from the plate of this tube to one of the speaker terminals.

This leaves only the filament and battery leads to be completed. One side of

Short-Wave Regeneration Control



each filament is already wired to the chassis. The free filament leads of all four tubes are connected together and wired to one side of the rheostat, while the second terminal of this rheostat connects directly to the A plus lead of the battery cable. One of the remaining wires of the cable is connected to the chassis and becomes the A minus—B minus—C plus lead. The free end of the 100,000 ohm resistor in the plate circuit of the detector connects to the B plus 67 lead with the screen grid of the 34 tube. The B plus end of the audio transformer connects to the B plus 90 cable lead. The F end of the transformer is wired to the C minus 135-volt battery lead. The second speaker terminal connects to the suppressor grid of the 33 tube, the free end of the 2 mfd. condenser, the B plus ter-

minial on the coil socket and the B plus 135 lead of the battery cable. This completes the wiring.

Operating the Set

When the batteries have been connected according to the designations on the cable leads we are ready to adjust the set. This consists of placing the largest coil in the coil socket, turning up the filament rheostat about three-fourths maximum and turning the manually operated regeneration condenser to a point about mid-way between maximum and minimum. Next tune the set and notice if it is oscillating. Then turn the trimmers on the regeneration section of the gang condenser in or out until the set regenerates over the whole scale. Repeat the process with each of the other coils

and a point will be found on the trimmer that gives satisfactory action on all the coils. The manually operated condenser can then be used as the auxiliary regeneration control in the manner already fully explained.

The Results Obtained

In trying out the original model of the set a number of far distant stations were picked up. A list of some of these will give a fair indication of what may be expected from the set when it is properly constructed, adjusted and operated.

- GSA—England
- XETE—Mexico
- VE9JR—Canada
- VE9DR—Canada
- T14NRH—Costa Rica
- DJC—Germany

How Photo-Cell Registers Light of Stars

When Galileo invented the telescope he multiplied by millions of times the sensitivity of the human eye. Astronomy has made many advances since that time. Crude lenses have been tremendously refined and remarkably efficient mirrors have greatly increased the range of telescopes.

Today the electronic art has brought forth a refinement of that remarkable device, the photo-electric cell, which outdoes the human eye for astronomical purposes.

"A star must be classified according to its brilliancy or light magnitude," states Hollis Baird, chief engineer of Shortwave and Television Laboratory. "The human eye, being variable in its effects, cannot give an accurate reading of the relative light values of two weak distant stars. The photo-cell provided the means that would actually measure the light of the stars without the variable link of human mechanism, so that they could be compared and classified.

"Two tiny plates are used, one fixed, the other very delicately balanced. These are connected electrically so that a microscopic amount of electric current will cause them to repel each other. One being fixed, the other will move away from it, the distance it moves being determined by the amount of current received. This movement is marked off in degrees. So tiny is the actual movement that the degrees must be read through a microscope. This complete device is called a photometer.

"The photo-cell registers accurately, and by comparative readings stars can be classified. In addition, the cell is so much more sensitive than the human eye that it will detect stars invisible even through the most powerful telescope.

"Curiously enough, the man responsible for the equation which made the photo-cell possible is Albert Einstein. He is best known because of public interest in his theories on the abstract. Yet in 1905 Einstein presented the technical world

with his photo-electric equation, which states that a given amount of light will cause a photo-cell to give forth a given amount of electrons. He received the Nobel prize for this work. From this has sprung the photo-cell and its great contribution to the electronic art, with the astronomical electro-scope one of its major contributions.

"In order that the fullest amount of the spectrum may be received the electro-scope uses a photo-cell made of quartz. This development is the work of Professor Jacob Kunz, of the University of Illinois.

"Dr. Francois Henroteau, Canadian government astronomer, who a few years ago discovered the mysterious Planet Y, is credited with being the first astronomer ever to apply a photo-cell to astronomy and in fact it was the outgrowth of this work which resulted in his super eye or photo-cell camera for television, as well as to increase greatly astronomical knowledge."

CAR-SET TROUBLES

Aerial and Ignition Problems Solutions

From Engineering Department, Sparks-Withington Co.

A LOW capacity shielded lead-in wire should be used on an automobile receiver. This shield must be grounded as close to the antenna post as possible. Keep lead-in wire as short as possible.

When under-hood mounting is found necessary, the antenna post may pick up motor noise, in which case it will be necessary to shield it. The lead-in wire should be brought down to the body post nearest the end of the receiver that has the antenna post so as to keep the lead-in wire as short as possible. The shielded portion of the lead-in should extend from the receiver to a point approximately eight inches from the aerial proper and the shielding must be grounded at this point to the metal framework of the car by soldering a piece of wire to the shield and fastening the wire under a convenient screw head.

There are various types of antennas, but the recommended type is the roof antenna. Many automobile manufacturers install antennas in the roofs of the cars at the factory. The lead-in wire is usually coiled up under one side of the instrument panel.

Away from Metal Parts

Insist upon having a good antenna. An automobile radio is no different than a house radio in that good reception can only be had by use of a good antenna.

Roof antennas should be kept at least three inches away from all metal parts of the body, and from the dome light and dome light wires. The wires running from the dome lights or corner lights should be shielded, and the shielding securely grounded to the metal of the body and to the dome light case, by soldering a wire to the shield and fastening the wire under a convenient screw head. This can be easily accomplished while the top liner is lowered for antenna installation. When installing roof antennas in cars with tops supported by wooden roof bows, use No. 16 mesh copper screen.

Some cars have the top deck supported by poultry wire, which is grounded to the body. This will necessitate the cutting out and removal of three inches of the poultry wire all of the way around between the wires and the body and away from the dome light and the dome light wires. The poultry wire can then be used as an antenna. A large antenna is always advisable, and should be at least three feet square (nine square feet), or a like number of square feet in some other shape. In most automobiles at least twelve square feet can be installed.

Under-Car Antennas

Every antenna should be checked for ground in the following manner: Using a continuity tester consisting of a low range high resistance voltmeter (1.5 or 3.0 volt scale) in series with a dry cell, touch one lead from the continuity tester to the antenna and touch the other lead from the continuity tester to the body or other grounded portion of the car. If any reading is obtained, even though very small, the antenna is grounded and cannot be used for an aerial until the ground is removed.

If a continuity tester is not available, connect 200 volts of B battery in series with a 200-volt, 1000-ohms-per-volt voltmeter. Touch one lead from the meter to the antenna and touch the other lead from the batteries to a grounded portion of the car. If the sensitive meter reads more than two volts, even when the roof of the car is damp, it indicates that the antenna is grounded. The ground must then be removed.

Under-car antennas are not recommended, but where it is impossible to install a roof antenna, an antenna formed by placing not less than four square feet of copper screen between two pieces of water-proof material, such as leatherette, and sewing it in, will work satisfactorily. The water-proof insulating material is then fastened to the frame of the car. It may be necessary to make the antenna in two pieces in order to obtain four square feet of screen. Care must be taken to make sure that the screen is not or cannot become grounded to the frame of the car. Test for ground in the same manner as instructed for roof antenna.

The antenna circuit must be adjusted to be in perfect resonance with the particular antenna to which the receiver is connected.

Tune in the station on which the receiver will be operated. A distant location, or a point of low signal strength, will permit the best adjustment, for a weak signal produces the sharpest resonance point. With a small insulated handle screw-driver, turn the antenna adjusting screw to the right or left slowly to the position of maximum volume. Once made, the adjustment need never be changed unless the antenna system is altered.

Three Interference Types

There are three kinds of interference that have their source under the automobile hood. They are caused by:

1. Generator commutator sparking.
2. High-tension spark discharge.
3. Low-tension breaker point arcing.

1. General Commutator Sparking. The brushes on the generator cause an interference "whine" which increases in pitch as the motor is speeded up. A 1 mfd. condenser is used for filtering out this "whine." Fasten this condenser to the frame of the generator or cut-out housing. Connect the condenser lead wire to the terminal on the generator side of the cut-out.

Lead Reversal

2. High-Tension Spark Discharge. The high tension spark discharge can be eliminated practically 100 per cent. by means of the spark plug suppressors and the distributor suppressor. Place one spark plug suppressor on each spark plug, and the distributor suppressor on the center high tension terminal of the distributor. It might be well to clean all of the spark plugs, and to properly adjust the points to spacing recommended by the car manufacturer. In cases where the idling of the motor is affected by the suppressors, it is advisable to increase the spark plug

air gaps an additional 0.004 inch over the recommended spacing.

3. Low-Tension Breaker Point Arcing. The low tension breaker point noise is the hardest to cure. With the spark plug and the distributor suppressors in place, all of the remaining interference generally comes from the low-tension breaker points. Try connecting the lead of a 0.25 mfd. condenser on the primary terminal of the ignition coil which runs back to the ammeter and battery through the ignition lock. Mount the condenser to a good ground close to the coil. If this does not reduce the noise, try reversing the primary leads to the ignition coil.

Where the ignition coil is mounted on the instrument panel, the high-tension lead from the coil should be shielded. This shielding need not extend farther than through the bulkhead into the motor compartment, where it should be grounded directly to the motor head.

The metal shielding covering the speaker cable should be securely grounded to the bulk head or to the frame of the car.

Radiation from the dome light may be checked by turning the dome light on and off or by removing the dome light wire from the ammeter and grounding this wire to the metal dash instead. If the interference decreases, the dome light leads are radiating into the antenna. Proper shielding, as outlined under the "Antenna" section, will eliminate this source of interference. Sometimes it is necessary to place an additional 0.25 mfd. condenser or one of greater capacity, from one terminal of the ammeter to the metal dash. Where an under-car antenna is used, it may be necessary to by-pass to ground one or the other of the tail light wires with a 0.25 mfd. condenser.

To check for additional low-tension interference, operate the receiver with full volume while both the antenna and the antenna shielding are completely disconnected from the receiver. If a 0.25 mfd. condenser, or one of greater capacity, connected from ammeter to the metal dash, does not eliminate the remaining interference, try grounding the following controls to the frame of the car; choke, throttle, spark, starter, speedometer cable, gas gauge, etc. Also try by-passing to ground with a 0.25 mfd. condenser, the following objects: electric cigar lighters, electric windshield wipers, electric gasoline gauge, electric clock, hot water heater, fan motor, stop light switch, etc.

Lead-in Shift

Try shifting the aerial lead-in wire, speaker cable and battery cable lead to the different positions. Also try grounding these leads at different points. It may be necessary to ground the hood at two points on each side by winding bare wire or thin metal around lacing which prevents the hood from contacting the metal underneath the lace.

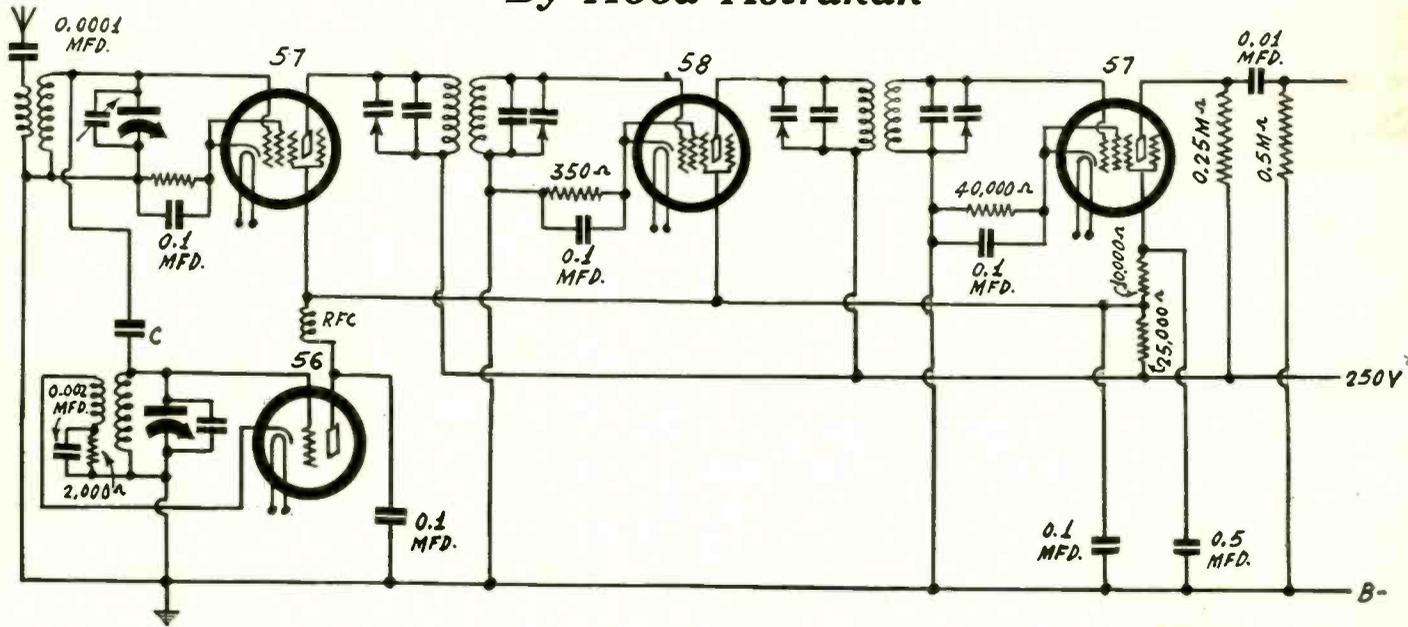
To eliminate spark coil interference in Ford V-8 automobiles, remove from the cable running into the high tension conduit on the driver's side of the motor, the red wire that goes to the distributor head and the yellow-black tracer wire that goes directly to the cut-out box on the

(Continued on next page)

CHANGING THE I. F.

WHAT ADVANTAGE THERE IS IN THAT FOR SHORT WAVES

By Hood Astrakan



CHANGING the intermediate frequency in an all-wave or short-wave set is not beyond the realm of ready practice. It is quite possible to have regular broadcast coils, with condensers across the secondaries that yield different frequencies by switching. For instance, the intermediate frequency may be 465 kc in one instance and 1,520 kc in the other.

The only reason for making the change is to improve the selectivity, which is greater the greater the difference between the signal frequency and the intermediate frequency. Any of the popular intermediate frequencies cause the necessary difference to become a small percentage of the signal frequency. Suppose the intermediate frequency is 465 kc and one is tuning in a signal on 9,300 kc. The percentage of difference between the base signal frequency and the oscillator frequency is only 5, and still we are only in the 30-meter region. As the frequencies become higher the percentage of difference becomes less.

The Switching Method

There is no question that 465 kc or thereabouts as an intermediate frequency works well, even with only two manually-tuned stages, and even though the modulator and oscillator frequencies for the higher frequency region are approximately the same. But there is some loss in selectivity and moreover it is conceivable that image trouble will result.

The method of changing the intermediate frequency, using doubly-tuned transformers, is illustrated, where the intermediate tuning condensers shown as fixed produce the high frequency, say, 1,520 kc, and those shown as variable produce the low frequency, say, 465 kc, and when the larger condensers are switched in they are parallel with the smaller ones.

One of the troubles with this system is the mechanical one of switching, as there are no switches readily obtainable that operate from a shaft at right angles to the front panel and yet actuate a mechanism parallel with the front panel, to serve the usual direction in which i-f coils are placed. But in attempting to use the system the intermediate tubes and coils would have to be in a front-to-back direction to be near the switch.

Of course, if the intermediate frequency is to be one or the other optionally, or even if it remains unchanged, there would have to be oscillator padding for single control operation, and no padding is shown. The padding condenser would have to be different for each band under the normal system, and the inductances would be chosen according to the highest frequency to be tuned in.

The padding when switching to the higher intermediate frequency would call for a much smaller inductance in the oscillator coil than if the intermediate frequency remained low.

Another factor is the degree of coupling. A condenser C is shown as uniting the two grids in the mixer. This would have a very small capacity as a compromise, say, 0.6 mmfd. (0.000006 mfd.) Really the capacity should be smaller for the very highest frequencies and might be larger for the lower ones in the short-wave band, and most certainly higher for the broadcast band, but adding the variation factor to the coupling condenser is one extra operation that makes for complication.

In fact, all improvements on short-wave sets that look toward the satisfaction of theoretical considerations, and such satisfaction is not always inconsistent with best results, bring about complications of a mechanical nature at least. The construction of a well-performing short-wave set is quite difficult, and it is hard to say that the commercial set manufacturers have achieved it yet.

AUTO SET PROBLEMS

(Continued from preceding page)

generator. Shield the red wire and the yellow-black tracer wire separately with metal shielding and bond the two shielded wires together by soldering them every three inches. Ground the two bonded wires to the copper carburetor supply line by taping them to it. At the distributor connect a 0.25 mfd. condenser between the terminal to which the red wire fastens and the ground. Connect another 0.25 mfd. condenser between one side of the ammeter and the ground.

The change of intermediate frequencies may be tried experimentally without any of the hard work attached to following the diagram with pliers and soldering iron, but merely by utilizing a broadcast receiver that tunes to 1,520 kc or a somewhat higher frequency.

If a gang condenser is used on the mixer tuning assuming the modulator secondary inductance is correct, as supplied by commercial plug-in coils, for instance, then set the gang at or very close to minimum capacity and take turns off the oscillator secondary until the maximum response prevails. We now have a low-frequency setting to consider. We can tune in a frequency at about five-sixths of the lowest frequency to which the modulator will respond with a given coil, and since we have the oscillator inductance correct already (even though we do not know what it is), we can pad the oscillator condenser for maximum response.

Coil Hints

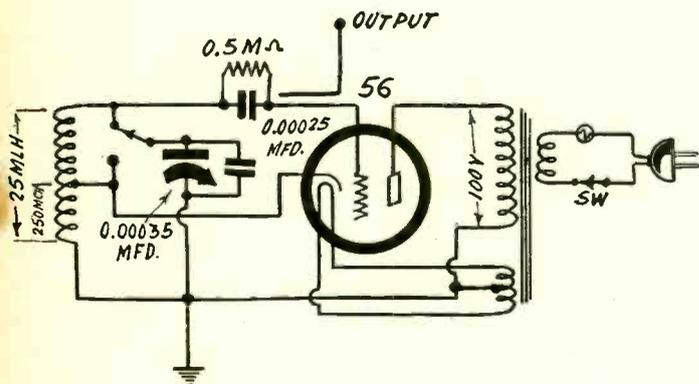
For the broadcast band, 465 kc intermediate, for 410 mmfd. modulator tuning, equal section for the oscillator, the values would be: 230 microhenries, 126 microhenries, padding capacity 400 mmfd. For the first short-wave band we could stick to 465 kc and tune from 1,500 to 4,500 kc, whereupon the values would be 27 microhenries, 25 microhenries, padding capacity, none.

For higher than 4,500 kc we would use 1,520 kc intermediate, and the values for this band would be 8.2 microhenries, 6 microhenries, padding capacity, when the tuning capacity is reduced by a series condenser to 0.00015 mfd. for modulator and to 0.00012 by a 0.0006 mfd. padder for the oscillator. We have reduced the frequency ratio of tuning from 3-to-1 to 2-to-1 to get a better spread, and there is no reason (except further complications of a mechanical nature mostly) why the ratio should not be reduced for succeeding bands, again or still in the interest of getting better spread. It can not be said that standard practice, if simpler, is quite satisfactory, when within the span of a dial the frequency difference in short waves is twenty times as great for the smallest coil than for the largest coil.

R CIRCUITS

TWO-RANGE TEST OSCILLATOR

by J. Buckle



A modulated test oscillator, with a-c on the plate, covering the frequencies from 50 to 150 kc and from 1,500 to 500 kc, using either a tapped coil, as shown, or two separate coils.

tance, across which is a
The reason for this
measurements is that the
vacuum tube voltmeter
measured circuit, lowering
a coil is included that
hunted across the coil
uit.

compensation
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mmfd. effective in re-
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ion for detuning is not
but of course it is of
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1,300-turn honeycomb
than 1-inch total out-
with a tap included, the
and only the two ex-
in service. Connect
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of values in between, or
sitive than 0-10 ma, if
ount of current flowing
by the insertion of a
te circuit. If the meter
sitive types, the resistor
and B plus may be repr-
ch more than 100 volts.

of Operation

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y be, but not exceeding
000 ohms. Since radio
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ir escape, the 0.01 mfd.
e connected to include
er, instead of only the

The meter M measures d-c only, but the a-c voltage put into the diode section is rectified, and appears as d-c across the 0.5 meg. rectifier load resistance. The amplifying triode of the 55 has this rectified voltage as its bias, and therefore higher a-c voltages cause lower d-c plate current.

The other circuit is a now-standard oscillator, using a-c on the plate. To get around difficulties an equal-voltage secondary is used. Thus danger of shorting the line is eliminated, as also is a series resistor to prevent similar trouble if the oscillator is shielded and shield grounded, while line also is grounded.

One Calibration for Both

The hum is the modulation. It is heard in the tested receiver when the frequency of the test oscillator is the same as that to which the receiver is tuned. The coupling between the test oscillator and the receiver is by means of capacity mostly. The "condenser" consists of 3 inches of wire parallel to the grid lead, and brought out to an insulated binding post. This may be the only post on the device.

The tuning coil may consist of a 25-millihenry radio frequency choke coil, tapped at 250 microhenries, or the 250-microhenry section may be an entirely independent honeycomb coil mechanically, but coupled to the other. Then one extreme of one coil and one extreme of the other coil would be grounded, the other extreme of the larger inductance going permanently to the grid leak and grid condenser, and the other extreme of the smaller coil to cathode permanently. The tuning condenser is switched from the second extreme of one coil to the second extreme of the other.

If both of the inductances are honeycomb coils, then the dial itself may be frequency-calibrated. This would be from 50 to 150 kc for the low frequencies, and 500 to 1,500 kc for the broadcast band. The coincidence will be close enough to enable multiplying the low-frequency calibrations by 10 to represent at least 2 per cent accuracy for the broadcast band.

Costly Mistakes

By Francis F. Brush

EXPERIMENTERS still make costly mistakes. In the old days of battery-operated sets, of course, it was nothing unusual to ruin a whole row of tubes when tubes cost real money, around \$6 each, because the high B voltage was applied to the filament. There was no use sending the tubes back to the maker for replacement. It wouldn't work then any more than it works now when tubes are much, much cheaper.

With a-c sets in vogue, using heater type tubes, the heater may be independent of the B supply, although if heater is grounded, and B voltage that is grounded at its low end is accidentally applied, one can still work mischief. The transformer winding may go if the tubes don't. Yet these accidents don't happen much. Maybe it is true, after all, that people learn as they live, and that experience is a real teacher.

Power Transformer Connections

One of the most common mistakes made these days is to misconnect the windings of a power transformer. Many transformers as used in home-building of sets, or as replacements, of the type supplied to manufacturers, may have no hint on them as to the connections. In the absence of a code one may take a chance, but does so at his risk.

Getting a filament winding in the 110-volt a-c circuit may ruin that secondary, and at least will blow a house fuse, or an apartment fuse. So it is good practice to have the receiver fused at relatively low current value, say, 1 ampere for a 50-watt set. In fact, the underwriters' code requires fusing, although the warning is not heeded as much as it should be.

Some sort of test should be made before the transformer is wired into the set and the juice turned on. Even if one has only a small dry cell and a flashlight lamp, he can be relatively certain of the high-voltage secondary, as the lamp won't light on a continuity test. The primary would show no light or a dim light, whereas the filament secondaries would show a bright light equivalent to the illumination prevailing on test of a short circuit.

Identifying Filament Windings

If there are three filament windings, and two are center-tapped, then the 5-volt winding most likely is the one not center-tapped. If only one filament winding is center-tapped it is most likely the one intended for the power tube or tubes. Frequently in to-day's practice the same 2.5-volt winding serves all the tubes in the set excepting only the rectifier. Even if a 2.5-volt-filament rectifier is used (82), this winding would have to be separate, since it represents a high voltage.

Connecting an electrolytic condenser the wrong way may cause it to blow out to the damage of power tube or tubes, or rectifier tube, and therefore the rule should be followed of using the case as the negative terminal. The positive terminal would be the central lug at top or bottom of the container.

Some electrolytic condensers do not have case representing negative, nor have they a lug, but two leads are brought out. If these are red and black respectively, then black is negative and red is positive, and no particular connection need be made to the can.

Two in One Can

Instead of one condenser there may be two in the same can. If there are two lugs, both of these are positive, and the can negative. The can itself may have a long side lug, for condenser types that do not contact the can with the chassis, and in such instance a soldered connection should be made between the negative lug and the chassis.

Sometimes electrolytic condensers of high capacity are small in physical size, and of low-voltage rating, say, 30 to 50 volts. These should not be connected across any terminals where a larger voltage may develop. Between cathode and ground m, or between ground and some r-f potential, would be about the only safe positions. Although a series resistor in a screen grid audio circuit may result in 30 to 50 volts on the screen, a condenser of that type could not be used between screen and ground, because before the tube begins to emit sufficiently, the voltage drop in the series resistor is negligible, and the condenser "goes West," as practically the full B voltage is applied to it.

Pilot lamp cords that, due to traveling light dial, work loose and finally short to ground are another source of trouble.

The shorting of any primary or secondary winding may blow the house fuse, or, in the absence of any fusing, cause a fire.

Radio University

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RADIO WORLD, 145 WEST 45th STREET, NEW YORK, N. Y.

Plug-in Coil Ranges

IN THE AUGUST 12th issue you have the data for winding short-wave plug-in coils with great completeness as to numbers of turns on 1.25-inch diameter, the same as used in the coils wound on Alden's forms and sold by Alden and by Sickles. Will you please give the frequency ranges for the respective coils, when used with 0.00014 mfd. tuning capacity, also the diameter of the winding space and data on the pin connections?

—A.L.S.

You will find the requested information classified in an adjoining column. Any

who desire the detailed winding specifications, for use in conjunction with the data now furnished, are referred to last week's issue (August 12th).

* * *

Aspects of A. C.

AS I AM NOT very familiar with radio I find that some things do not appear quite clear to me. One of them is the root mean square, peak and average a-c voltage, or heating effect. Another is the impedance factor. Another is phase shift. Will you enlighten me?—B.D.

Consider a vacuum tube hooked up as a negatively biased detector. There is a

Frequency Ranges with 0.00014 mfd.

- Coils No. 1, 80 to 200 meters; 4.25 to 1.5 mc.
- Coils No. 2, 40 to 80 meters; 7.5 mc to 3.7 mc.
- Coils No. 3, 20 to 40 meters; 15 to 7.5 mc.
- Coils No. 4, 10 to 20 meters; 30 to 15 mc.

Diameter and Winding Space

The outside diameter of the form is 1 1/4" and the axial length or winding space available is 2 1/8".

Pin Connections

Four-Pin, RMA code and equivalent pin of a UX tube: 1 (grid) to grid; 4 (negative filament) to grid return; 3 (positive filament) to antenna; 2 (plate) to ground. The secondary consists of 1 and 4 and the primary of 3 and 2. The coil forms fit OX tube sockets.

Six-Pin, RMA pin code and equivalent pin of a 57 or 58 tube: 4 (negative heater) to grid; 3 (positive heater) to grid return; 2 (plate) to detector B plus; 1 (screen) to detector plate; 6 (suppressor) to r-f plate; 5 (cathode) to B plus r-f. Thus the secondary consists of 4 and 3, the tickler of 2 and 1, and the primary of 6 and 5. The coil forms fit the standard six-hole sockets as used for tubes.

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static or no-signal operating point. Let us assume the plate voltage is 100 volts and the negative bias is 6 volts. As an a-c signal is put into this tube, a d-c milliammeter in the plate circuit will give a different reading. This depends entirely on the effect of the input voltage on the bias and the effect of the grid-voltage, plate-current characteristic curve. Since the operating point is nearer the so-called plate-current cutoff than it is to saturated plate current, the effect of the positive half of the a-c input voltage is greater than that of the negative cycle. In other words, the tube's rectifying properties are used, this lop-sidedness constituting rectification, or detection. Hence the greater the a-c input voltage the more it bucks the bias, or the operating point is driven positive, and the plate current increases.

The d-c meter measures the average plate current, since part of the signal (negative half) tends to increase the negative bias and the other half drives it positive to a greater degree, so the plate current registration is the average difference. So the average is the current read at any time, and as the current is related to a-c input voltage by calibration, the average voltage is read. This has not general use in measuring, as the peak and root-mean-square values are the most important ones. The peak voltage is the maximum voltage of the cycle, or half-cycle (alternation), and it is obvious that a-c, that starts from zero voltage and goes through a periodic rise and fall, as to both negative and positive alternations, must have a crest, and that is the peak. The root mean square voltage (or current) is the square root of the sum of the squares. This is the same as the heating effect. If 1 ampere r-m-s of a-c is passed through a non-reactive resistor the heating effect is the same as that of 1 ampere of d.c. Considering the tube again, the current deflection changes are readable in the plate circuit, and therefore these changes have to be related only to r-m-s to peak values for calibration in r-m-s or crest volts. The peak voltage is 1.414 times the r-m-s value and the r-m-s value is 0.707 of the crest or peak value. Now consider the tube biased negatively to the so-called plate current cutoff point. The effect of the negative cycle is suppressed, as there is no readable current, for has not the current been "cut off" already? Therefore only the positive cycle is effective, and this lowers the negative bias. So if a reading is taken in the plate circuit as before, when a-c input is used, the bias may be increased by batteries, etc., until cutoff is restored, and the bias difference equals the peak a-c voltage. The impedance factor is that attribute of a constant whereby the unit behaves differently at different frequencies, or the constant is altered to make the behavior the same. The alteration of performance due to frequency really is called the reactance, but when the d-c resistance itself is considered along with the reactance we have the impedance factor. Phase shift is simply the failure of two or more components, or two or more factors of one component, to keep in step. It is the faster or slower action of one in respect to the other.

* * *

Auto Power Amplifier

AS ELECTIONS will be along soon, and I would like to make some extra money, I was thinking of rigging up a few automobiles with sound systems, so that political speakers could be heard much farther and better when talking from cars. Would it be practical to use a motor generator, and thus dispense with B batteries? Some cars have 12-volt batteries (a few cars, anyway), but most have 6-volt A batteries. Would the power output be sufficient?—J. D.

The cars can be equipped as you suggest. There are motor generators on the market that are particularly suitable for

this work, being of higher output voltage and current rating than the general run of such generators as used in automobile receiving sets. Also, there are 6-volt and 12-volt models, although the 6-volt models could be used on 12 volts with a 50 per cent. extra loss or waste of power, which is serious, and not recommended. A microphone feeding a driver stage and working into push-pull output would be satisfactory. The output would suffice at 10 watts or so.

* * *

Modulation Measurement

CAN THE PERCENTAGE modulation be ascertained without knowledge of the carrier amplitude?—H. B. D.

No, the carrier amplitude is a requisite. The modulation may be regarded as the variation in amplitude of the carrier by the sound waves impressed on it. With voice and music the measurement is complex, or at least requires use of an oscillograph. So the effective percentage modulation is really what is meant most of the time, and this refers to modulation by a single tone, or by two tones to constitute a good approximation of a complex speech wave. Percentage modulation is defined as the ratio of half the difference between the maximum and the minimum amplitudes of a modulated wave to the average amplitude, expressed in per cent. The maximum and minimum represent the peak values in the presence of modulation. The average is simply the average a-c voltage or current of the carrier. The peak voltage of the carrier may be read or the peak voltage of the rectification of the carrier. But such measurements may be vitiated by the presence of harmonics. That's where the oscillograph becomes necessary. In modulation by simple sinusoidal wave (single tone and single carrier) the measurement is simplified and the result is the effective percentage modulation. It is the ratio of the amplitude of the fundamental component of the envelope to the amplitude of the carrier, expressed in per cent.

The percentage modulation is $\frac{2 \times Ec}{100 \times (Emax - Emin)}$

$2 \times Ec$

where Emax is the maximum amplitude of the modulated wave, Emin is the minimum amplitude of the modulated wave and Ec is the average unmodulated carrier amplitude.

The effective percentage modulation is $100 \times \frac{Ec}{Ef}$ where Ef is the amplitude of

$\frac{Ec}{Ef}$

the fundamental component of the envelope and Ec the amplitude of the carrier.

* * *

Microphone Connection

I HAVE a single-button lapel microphone of 500 ohms impedance and I desire to connect it to the audio amplifier of my set. As I have no means of coupling, would it be all right to put the microphone directly in the grid circuit?—K. F.

An impedance of 500 ohms in the grid circuit would result in considerable loss of sensitivity, and it would be much better to use a matching transformer, such as microphone makers supply, so that the microphone is connected to a matched line, and there is a high impedance secondary for inclusion in the grid circuit. Microphones of the type you mention give stronger results when polarized by a small battery. Write to the manufacturer of the particular microphone you have for details as to matching transformer, and whether external voltage is to be supplied, and if so, how much voltage.

* * *

Form-Fitting Tube Shields

REGARDING the form-fitting type tube shields just announced, what is the meaning of the statement: "The successful use of the shield jacket requires the

positive contact with the chassis frame. This can be accomplished by the use of the connector described herein." Does the shield remain on the tube when the tube is extracted from the receiver socket? Is there an extra shield cap to go on top, over the grid cap? In what sizes are these shields obtainable, that is, for what type tubes?—L. W. C.

The statement you quote is a little confusing, but evidently means that there must be a positive contact to the chassis by way of the cathode resistor, that is, non-grounded type chasses do not enable satisfactory results for this type tube shield. The form-fitting shields come in two equal parts, are placed tightly against the tube, and a ring, furnished with them, is slipped on, to engage a groove near the widest flange of the bulb. This ring holds the two halves snugly in place. The connector referred to is a slim copper or phosphor bronze slip that has a hole at one end for being slid over the cathode pin of the tube. The connector is then bent toward the glass envelope, and when the two halves of the shield are tightened by the ring, one-half, at least, contacts with the connector, and of course the two halves connect with each other. The tube shields come in two types, one for the 57, 58 and equivalent size tubes, the other for the 35, 24 and equivalent size tubes. As might be understood from the foregoing, the tube shield and connector stay in place, hence removing tube from socket removes shield with it, but not from the tube. No tube shield base is required. This type of tube shield looks very promising. No extra piece goes over the grid cap.

* * *

Audio Distortion

IS IT TRUE there is likely to be less distortion from a tube of the indirectly-heated type, in an audio amplifier, than in a filament-type tube?—J. C.

Yes, there is a little preference in the direction indicated, though for a single stage (output tube, for instance) the difference would not be worth mentioning. The preference arises from the structure of the cathode, which cathode is maintained at a single potential, since it is

caused to emit electrons due to thermal radiation from the heater. However, in a filament-type tube, where the heater and the cathode are one, there is a resultant increased fluctuation of bias with signal, due to the voltage drop in the filament changing. This change is due to the change in plate current, as all the plate current flows through the filament. Therefore the filament type tube would have a vari-potential cathode.

* * *

Metal Chassis Effect

NEED ANY ALTERATION in computation be made because of the fact that plug-in coils are used on a metal chassis? There will be no shielding used, and the nearest part of the coil would be 1.75 inches from the top of the chassis.—W. S. C.

No consideration need be given to the fact that a metal chassis is used, under the circumstances as described.

* * *

Wrong 2B7 Screen Voltage

IN A SET that I built I use the 2B7 and have 0.1 meg. in the plate circuit and 0.06 meg. in the screen circuit, both to same voltage source, but get poor results.—L. P.

Yes, the results should be very bad. You probably get audio oscillation as well, by the dynatron principle. Leave the 0.1 meg. resistor in the plate circuit but use around 1 meg. or more in the screen circuit.

Wanted: A Decision

BY ALICE REMSEN

Will my readers kindly answer a question? Shall I continue to use a poem dedicated to various radio artists and programs to head my department? It is very necessary that I should know what your decision is. Please drop me a card and tell me. Thanks!

Address me:
Alice Remsen, c/o Radio World,
145 West 45th Street, New York, N. Y.

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Name

Street

City and State

SET-MAKERS SEEK 'ALARM'

A canvass of leading manufacturers shows that they are interested in auxiliary apparatus in conjunction with radio receivers, and are expected to take up the subject with broadcast station executives and associations of broadcasters, so that "alarms" can be sent.

The growing interest in radio due to broadcasts of spot news from the scene of its occurrence, as well as bulletins received from affiliated telephone and cable companies, and by co-operation with newspapers and news-gathering syndicates, has led to a trend toward sounding an alarm when anything unexpected and of great importance or interest is to be broadcast.

Orestes H. Caldwell, former Radio Commissioner, and now editor of radio periodicals, suggested that this be done by having the station send out a "flutter" that would actuate a small electrical device at the receiving end that would connect the speaker.

One Presto! Method

Other forms of doing this also are being considered, and if enough of the manufacturers show an interest the stations may aid in the endeavor.

One method suggested was for a fixed alarm frequency of transmission to be established, and all use it, the auxiliary apparatus at home to consist of a tuned circuit that would cause the radiated power at this frequency to light a lamp or throw a switch to operate the set. The user would leave his set tuned to the frequency of a co-operating station, so when the alarm is sent and the set turned on, at another frequency, the red-hot news would indeed be heard.

It has been suggested that if there is nobody home the automatic device should be apprised of this, so the set would not be running without any one listening to it.

The Off-Again Problem

One engineer suggested that the flutter be used to keep the set on, and as bulletins are brief, even if no one was home the set would be turned off automatically when the flutter went off the air.

The idea embodies in reality two receivers, as the flutter frequency would be at least a bit outside the broadcast band, and the tied-in station, of course, would be within the broadcast band.

Plenty of Changes in Code Prophesied

The radio code in its present form is not likely to survive the public hearings to be held, but will be changed in regard to price-fixing, discrimination as to pricing and in other particulars. The code of ethics no doubt will go through nicely. List prices and maximum discounts, with minimum selling prices fixed later, affect set makers, but not tube makers. However, there is a vulnerable restriction on new tubes.

It reads thus: "For a period of one year from the date of the adoption of this Chapter no new radio receiving tubes will be introduced, except for experimental purposes, by the radio tube industry without the approval of the executive committee."—Herman Bernard.

Answers to Questions About the Recovery Code

Based on the Code of Fair Competition for the Radio Manufacturing Industry, as Submitted for Revision

Minimum Pay for Office Boys

DOES THE MINIMUM pay of \$15 a week for other than processing employees apply to office boys?—G. A.

No. Office boys or office girls, and also learners and casual employees, are excepted, and may be paid 80 per cent. of the minimum wage (\$12), provided that in any calendar month the total amount paid to such excepted classes shall not exceed 5 per cent. of the total payroll.

* * *

Maximum Hours of Work

WHAT ARE the maximum hours beyond which employees may not be worked?—H. B.

For employes engaged in processing, usually referred to as factory help, the hours per week must not exceed 36, for all other employes they must not exceed 40 hours, but there is no limit put on the number of hours applying to executive, administrative, research, engineering and supervising employes, also travelling salesmen and commission salesmen. During emergencies, or seasonal peaks, the maximum hours stated above may be exceeded, but at the end of each month a report has to be made by the manufacturer to the administrator of the code, giving full information about such excess.

* * *

No Option on Signing

IS THE SIGNING of a code compulsory, and, if the code is signed, are there any punitive clauses for violations?—K. D. W.

The signing of a code is practically compulsory, either the President's blanket code, or the code of the particular industry, if such particular code exists. The radio code is made applicable to all in the industry, hence assumptively effective though not signed. However, the industries are consulted as to what they consider the code should contain, though not all their tentative provisions are accepted by the National Recovery Administration. At least as important as signing the code is the necessity of living up to it, and the punitive clauses are incorporated by reference to the Recovery Act itself. Operation under the code constitutes the equivalent of a license to do business and violations are punishable by revocation of such license and by fine and imprisonment. The punitive clauses are specifically in the Act, and therefore apply to all codes.

* * *

Products in Process

ARE products manufactured or in the process of manufacture when the code is effected considered as coming under the code?—B. L.

Yes, as coming under the code, for they are specially mentioned in it, but such products may be sold though made when hours were longer, pay lower, and some employes younger than 16 years, but products begun after the code is in effect may not be sold if made in violation of the code. Nor may any product be sold at less than the cost of production, no matter when made, unless advance permission is obtained from the administration under the classification of close-outs.

* * *

List and Net Prices

DOES the tentative code compel the institution of list prices by a concern that

has been operating on the net-price basis?—P. O.

No, the manufacturer may add to his cost of production "such amounts or percentages as he may deem advisable to constitute the net prices or list prices," but these prices must be national in scope, and applicable whether sold within the State in which manufactured or elsewhere. That is, no more "slightly extra west of the Rockies." An exception to non-compulsion of list-price is a receiver manufacturer, who "shall establish a national list price, the national list prices so established, and changes, to be published in circulars, bulletins or trade publications, and a copy thereof mailed to the Radio Emergency National Committee."

* * *

Premiums Prohibited

MAY THE PRACTICE of giving away premiums to retailers be continued under the code, such as tube checkers and testers given to stores by tube manufacturers, also special price concessions hidden in various ways?—J. W.

These are expressly prohibited. Material or merchandise sold at a general price to any group has to be sold at the same price to all members of the group, without any special concessions or rebate, and the fact of the concession must not be hidden by overshipments compared to billing, or by operating through a subsidiary. The signatory is prohibited from "doing anything whatsoever which directly or indirectly gives any purchaser more favorable terms" than permitted. Extra discounts for quantity are permitted, also allowance for sales promotion, but these are limited to an extra 5 per cent. on \$25,000 and over, an extra 10 per cent. on \$100,000 and over, and as to sales promotion, 3 per cent. of billing.

* * *

Provisions Amendable

ARE the provisions of the code as they will be adopted final, or are they subject to change?—R. W.

They are subject to change.

* * *

Price-Raising

DOES the code provide for price-raising, and is this not a part of the recovery plan?—T. W. S.

The code does not so provide. It is recognized, however, that prices will be affected. For instance, where the costs of executing contracts entered into prior to the approval of the code are increased as a result of the Recovery Act, appropriate adjustments "would be just and equitable," and an agency is set up to act as an arbitration tribunal in the event the contracting parties do not come to an agreement. With prohibition of sales under the cost of production, and fixation of minimum wages and maximum working hours, plus a detailed fixation of discounts, higher prices would be expected, unless checked by the effect of increased production. The fixing of minimum prices manufacturers are to charge is contemplated in the code itself, and even a preliminary fixation of that type, prior to more authentic cost accounting data to be obtained later. That is, data may be obtained from manufacturers as to their recent costs of production and fixation temporarily predicated on that. Manufacturers suspected of selling below the cost of production, meanwhile, would be

subject to having their books audited, and if the suspicion is confirmed, the case would be turned over to the United States Attorney for prosecution.

Discounts

WHAT are the discounts established in the standard agreements?—J. W.

They are as follows for manufacturer to distributor and distributor to dealer, in percentages:

List	Mfr.-Dist	Dist.-Dealer
\$30 or less.....	40-15	36
\$31 to \$50 inc.....	50- 5	40
\$51 to \$100 inc.....	50-10	40- 5
\$101 and over.....	50-10-5	40-10
Each part	50- 5	40

The manufacturer-to-dealer discounts are the same as the distributor-to-dealer discounts, in the receiving set classification, and therefore the manufacturer who does not use the distributor method of selling cannot sell to the dealer at a greater discount than he would to a distributor, if he used distributors. The discounts are maximum values. Lesser discounts are permissible, not greater discounts. Also the standard agreement between the manufacturer and the distributor absolutely forbids the distributor to sell to the consumer at less than list. The quotation follows: "... the distributor agrees that he will not, directly or indirectly, sell to a consumer in any manner, radio receiving or television sets and/or parts covered hereby at less than list prices fixed by the manufacturer from time to time nor to dealers nor agents at discounts greater" than those enumerated above.

Effect of Not Signing

IS THE CODE applicable even to concerns that do not sign it, and if so why?—J. H.

The code provides that after approval by the President of the United States it applies to persons, partnerships, corporations, etc., engaged in the radio industry, as that industry is defined in the code, and therefore the fact of one's actual classification in that industry then would make the code applicable whether the code is signed or not.

Labor Sections Approved

DO THE LABOR SECTIONS of the proposed code for the radio industry conform exactly to those in the President's blanket agreement? What is the effect of signing the blanket agreement, in the light of the special code for the industry?—H. W. S.

The labor sections in the industry's code are a little different. Pending action finally by the President on the industry's code it is satisfactory to sign the President's blanket agreement, and to effectuate the industry's labor provisions by adding the following to the standard statement of compliance in the President's blanket code: "To the extent of N. R. A. consent as announced we have complied with the President's agreement by complying with the substituted provisions of the Code submitted for the Radio Industry." Tentative approval of these labor provisions has been made by the Recovery Administration, but when the code is finally effectuated for the industry (approved by the President) it will then be whatever it is, and tentative approvals meanwhile furnished may not be continued. When an employer signs the certificate of compliance with the additional note thereon as above, he should bear in mind that the President's agreement ceases upon formal approval, after public hearing, of the entire Code for the Radio Industry, and he should also understand that the previous provisions substituted, as these may appear in the formal code of fair competition, may vary as to their form from

those now existing and tentatively approved by the National Recovery Administration. As initials are used in some official announcements it is convenient to know that N. R. A. stands for the National Recovery Administration, and P. R. A. for the President's Re-Employment Agreement (blanket code).

Net Price to Chain

WE MANUFACTURE a radio receiver which may be classed as a speciality. It carries a list price. In another and more elaborate form the same type of receiver, totally different construction, is at a higher list. Just for convenience I might call them the low-priced and the high-priced models. The low-priced model was our first one and has been practically withdrawn from the market, except that quantity shipments are made to chain of retail stores through one of its central stores. Naturally, the quantity purchases are at better than the prevailing discounts, and a few of the higher-priced models are included at such better terms, though not at as low a price as the others, in shipments. The sales are made through a subsidiary of the manufacturing company, which subsidiary buys from the manufacturer and sells to the central chain store. Our principal business is selling direct to the consumer. Is there any limitation under the code as to the discount that can be allowed to the central chain store on both models, and any limitation on the price to be charged to the consumer? The chain business is substantial and we don't want to lose it, but of course do want to and will abide by the code.—M. N. T.

The sale of the receivers is one made by the manufacturer to the dealer, as the subsidiary is manufacturer-owned, and the operation through a subsidiary can not be used to avoid the legal fact that the manufacturer is the real seller. Therefore the discounts as listed in answer to a previous question would apply. The net price method you have been using on a list-price set with the chain is not permitted under the code, as list prices, and discounts not exceeding those stated, are required. Your net prices are obviously lower than the figures represented by applying the standardized discounts. Moreover, discrimination in selling prices is prohibited. The manufacturer-to-dealer discounts are the same as distributor-to-dealer discounts. Whether under the circumstances the chain would prefer to operate through a distributor is for the chain to decide. Another way of looking at it would be the termination of the low-priced model as a national item, since it has no national distribution by you, and its treatment instead as a special model made exclusively for the chain on a quantity basis, putting it in the private brand class. But the high-priced receiver, being nationally distributed by you, could not be considered in the same light as the other, and must not be mixed up with the other shipments and prices in the manner that has been prevailing. The substantial nature of the transactions has nothing to do with the situation so far as compliance with the code is concerned. The price to consumer is not fixed in the code as yet but nothing may be sold at less than the cost of production. For manufacturer-to-consumer sales a new list price would be in order so that the sale is at list, and as there are no middlemen there would be no discounts.

Blanket Exceptions

WILL THERE BE any blanket exceptions to the President's Re-Employment Agreement?—E. W.

There will be no blanket exceptions. Prior to final acceptance by the President of an industry's proposed code there may be what seem to be exceptions, so the

WAVE PARLEY FACES FAILURE

Mexico City.

While the sessions of the first North and Central American Regional Radio Conference are secret, and therefore nothing official is known of what is going on, reports have been rather free about this place that the conferees have been experiencing trouble.

It has been learned that no agreement has been reached. A stumbling block is said to be the refusal of the Mexican delegates to subscribe to a proposal to cancel the licenses of stations erected by Americans who simply moved over the border, under the protection of Mexico, to transmit programs on high power that are received over wide areas of the United States. For instance, XEW and XER are heard in the middle-Atlantic and New England States, and also even in Canada.

Curtis Represents Brinckley

Dr. John R. Brinckley is the owner of XER and is represented by Charles Curtis, Vice-President of the United States in the Hoover administration. Dr. Brinckley got into trouble with the United States Radio Commission that resulted in loss of his license to transmit in the United States. He then moved the transmitter to Mexico. He had been a very prominent figure in radio and in politics.

The American delegates point out that stations in Mexico, owned by Americans who got into trouble at home with their Commission, broadcast so largely in English that the intent is quite obvious. Also the use of high power, it is maintained, proves the desire to reach really the United States, and this is held to be unfair.

More Waves Sought

Mexico is seeking additional wavelengths, as is Canada, and while Canada is deemed to have a good case, the conference depends on a unified solution, and this in turn would require a gentlemen's agreement or code of practice, such as now exists between the United States and Canada. Until there can be an agreement on a code under which the radio affairs of the North and Central American countries could be administered it is believed there is no possibility of the conference obtaining results.

The conference has not broken up yet but unless an agreement can be reached soon there is danger of complete failure. Mexico is deemed to hold a key position, and as yet the Mexican Government has shown no sign of yielding.

progress of the code of an industry you are particularly interested in should be watched. When an industry has submitted a code of fair competition, Section 13 of the President's Re-Employment Agreement authorizes the administrator to accept provisions of the code as a sufficient compliance with the Agreement for the period between the date of submission of the code and final action thereon by the President. But it must be clearly understood that such an exception does not in the slightest degree obligate the Administrator to approve such provisions on final hearing. In each case in which such modification is permitted the hearing will be called for as early a date as possible and the code in final form, when approved by the President, will supersede the Agreement.

Station Sparks

By Alice Remsen

The Radio Rialto

WFDR PAYS SALARIES

The best piece of news in recent days is the announcement that the Ed Wynn Station, WFDR, has already begun to pay salaries to its staff, which seems to indicate that WFDR is really on the radio map and means business. . . . Report has it that NBC has sold all its spare time commercially on both outlets, and that Columbia is not very far behind. . . . Ethel Waters is still very ill at this writing. . . . August 18th will witness the debut of Phil Spitalny and his orchestra, with Julius Tannen as master of ceremonies, on a beer program over WABC. . . .

SOME CBS DON'TS

The Columbia System has put out a handbook of rules for its announcers and production men containing plenty of "don'ts"; for instance an announcer must not tell radio listeners that they have just been enjoying a program; perhaps they haven't . . . neither must he say: "You have just been entertained by—;" nor must he say: "We hope you have enjoyed so-and-so as much as we have here in the studio," tiresome ad-libbing about musical selections and excess wordage of all kinds is taboo. Included in the manual, prepared under the direction of John Carlile, Director of Production, is a list of program restrictions. One of these forbids direct solicitation of funds by speakers. It is pointed out that in a few instances after a speaker's continuity has been read and approved by the continuity department, he may attempt to inject spontaneous pleas for money in an already-approved script. The production man or announcer is instructed to read every speaker's script just before he goes on the air and cut out any last-minute insertions of such a character. "Please bear in mind" reads the rule, "that, though we should be tactful and polite in all instances, these instructions apply regardless of the importance or prominence of the speakers." . . .

WHAT FAVORITES ARE DOING

Don Hart is the sweet singer you hear with the Meyer Davis Orchestra playing from the St. Regis; Don's right name, by the way, is Bill Englehart, and he is the son of William Englehart, Sr., of the Tower Publications; a right nice-looking boy is Don and a good radio bet for commercial purposes. . . . Teddy Black, the band leader, looked almost black from the Atlantic City sun when I ran into him on Broadway recently; Teddy had just finished an engagement at the Gateway Casino and was taking his band down to Virginia Beach for a two-week combination of pleasure and business; he'll be back in town soon to prepare some programs for an NBC spot. . . . Aren't some people nice! The veteran blackface comedian, Claude West, donated over a hundred books to the N. V. A. Library last week. Thanks, Claude; you're okay! . . . "Skippy," the popular dramatization of Percy Crosby's well-known newspaper series and a juvenile favorite over the WABC-Columbia network for the past two years, is now being presented under the sponsorship of Sterling Products in the interests of Phillips Dental Magnesia; the same cast will continue to enact these episodes in spite of sponsor change; five times a week—every day except Saturday

and Sunday—from 5:00 to 5:15 p. m., EDST. . . .

BIG DOINGS IN CHICAGO

Highlights of the Fourth Chicago Land Music Festival will be broadcast direct from Soldiers' Field in Chicago over WABC and a nation-wide Columbia network on Saturday, August 19th, from 10:00 to 10:30 p.m. EDST. Among the features scheduled are a massed band performance with a thousand pieces under the direction of Arthur Pryor, Sr., and Victor Grable, music director of the Festival; one thousand negro voices in choral spirituals, directed by James A. Mundy and J. Wesley Jones, and a chorus of five thousand mixed voices led by Noble Cain and George Lee Tenney. Sponsored by the Chicago Tribune and other newspapers of the middle west, the annual Chicago-Land Festival includes contests of bands, drum corps, choruses and vocal soloists. The colorful musical pageant attracts participants from as far away as Vancouver, B. C., and the crowd of spectators usually numbers over a hundred and fifty thousand. Quin Ryan, of Station WGN, will describe the spectacle. . . . If shoemakers should stick to their last, Mills' Blue Rhythm Band at the Cotton Club would be minus its first trumpet, for he was a shoemaker before he switched to manipulating a derby; the drummer used to be a boiler-maker. . . .

DUKE ELLINGTON HONORED

They're drinking Duke Ellington highballs in dear old London now—champagne and gin; they say it's a honey! . . . The Duke made high society; the Prince of Wales expressed a preference for Duke's rendition of "Sophisticated Lady;" Prince George went for "Swampy River," while the rest of the British elite were divided between "Mood Indigo" and "Black and Tan Fantasy." . . .

THAT'S A LOT OF MONEY

And now it comes out that three of the Mills' Brothers refused a hundred thousand dollars in bookings while Brother John was sick; so great was their loyalty to their brother that they refused to consider a substitute; that's what I'm told, anyway. . . . Have you heard Ada Patterson's interesting period over Station WHOM, each Thursday morning at 10:30 a.m., EDST? She calls her program "Interesting People I Have Met," and it's well worth while, for this clever woman has met thousands of folk during her career as a newspaper woman. . . . Hilda Kosta, the International Girl, is a good bet on WHOM, each Thursday at 8:15 p.m., EDST. . . . Of course, you know that Irvin S. Cobb is Paducah's favorite son, but did you know that if you chanced to stop off at that Kentucky city the chances are that the cab driver would take you to the city's most pretentious hotel—the Hotel Irvin S. Cobb? No; Irvin doesn't own it—it's just named after him, that's all. . . . Something happened to the old typewriter; had to stop and take it apart; what a job—you should have seen my fingers after I got through with monkeying around underneath the keys and other gadgets; finally found a little bit of bent tin wrapped around a couple of typearms; the old machine works a little better now, except that the "b's," "y's" and "h's" stick together; well, so long as I get this copy out I don't care. I can take the machine apart again.

TRADIOGRAMS

By J. Murray Barron

AS WE APPROACH the Fall and Winter seasons it seems that something in television really worth while promises to break. That there are actual developments can not be denied, and now that everybody is behind the National Recovery Administration's movement and thousands will be in a better position to spend money, most anything may happen. Possibly developments in television will be released to the public.

* * *

The Spokane Radio Co., Inc., announces removal to 611 First Avenue, Spokane, Wash. This organization started in 1927 in a small way and has made steady progress as parts jobber in the Northwest. The new quarters have more than 4,000 square feet devoted exclusively to radio parts, accessories and sound equipment.

* * *

Lewis Winner, of the Hammarlund Co., reports continued installations of the Comet Pro by nationally-known organizations. Members of the Balbo Flying Fleet made the Comet their choice to bring back home. The variety of businesses and classifications of individuals who have picked the Comet reads like a city directory or, better still, a Red Book.

* * *

What a distinction it is to be associated with quality products, and how little competition one has! In the long run, with first-class merchandise at fair prices and even with fewer customers there is satisfaction in conducting a business along these lines, whereas with the gyp made-to-sell-merchandise there is rarely satisfaction for anybody and the cut-throat prices leave little profit for anyone.

* * *

A word to servicemen or those who resell radio merchandise, especially in the smaller cities or places. It is now possible to furnish your customers with standard Underwood typewriters at regular prices. The family who buys a radio or seeks radio service has in many instances some members who are interested in a typewriting machine, so why not take advantage of this opportunity to take their order? Free information with all details and wholesale prices may be had from The Fanning Radio Labs., 377 Eighty-seventh St., who are authorized distributors for the Underwood typewriter through the radio field.

* * *

All branches of the radio field are anxious to get in on the new N.R.A. code. Both the radio retail stores in the Cortlandt Street district and downtown generally have made up their code and will close at 8 p. m. and the mail order catalog houses have had their meeting and have drawn up a code. Both of these are expected to be in force soon. What is needed now in addition to this is for the better radio stores to reform some of the unethical methods as practiced by some of their neighbors.

* * *

One of the first radio organizations in New York City to employ additional employees under the N. R. A. agreements is the Hammarlund Mfg. Co., 424 West 33rd Street, N. Y. City.

* * *

A short-wave manual of unusual make-up and of real interest shortly will make its appearance, announced by Sydney Bass, advertising and merchandise man for the Try-mo Radio Corp., 85 Cortlandt Street, N. Y. City. It will contain very desirable information, including resistors, tube data, public address systems, color code and charts and various other information.

R-K-O Foreclosure Sought by Bank

Radio - Keith - Orpheum Corporation, which is in the hands of a receiver, was the respondent in a suit by the Chemical Bank and Trust Company of New York to foreclose the assets of the corporation because of failure to pay principal of \$1,118,500 on extended notes, originally issued in December, 1931.

Federal Judge Bondy gave permission to the bank to bring the action. Permission was legally required because of the existence of the receivership. It is expected a special master will be appointed to hold hearings on all contested claims. The present action is in line with the receivership and works a sort of consolidation of causes.

The Irving Trust Company, receiver, listed more than \$23,000,000 in claims against R-K-O, mostly in leases, but not including the claim of Rockefeller Center for leases on the two theatres in Radio City (the Music Hall and the New Roxy) or the office space there.

Buenos Aires to Lead with 200-kw Station

An experimental construction permit has been issued to WLW, Cincinnati, to use 400,000 watts power, and it is expected that in due course the experiments will be made, in an attempt to achieve national coverage with one station, but meanwhile Buenos Aires, Argentina, will have a 200,000-watt station on the air, and it will be the most powerful broadcaster in the Western Hemisphere.

The frequency will be 830 kc, the same as used by KOA, Denver, but it is believed there will be no interference, due to the great distance and also to the curtain of static separating the two geographically.

The aerial masts are 750 feet high and an improved method of radiation, with minimum loss, has been installed by the British Marconi Company. It is said the station also hopes to reach listeners overseas and will have a British announcer during such special attempts, as well as some programs in English, French, Spanish, and German. The language of the country is Spanish.

R.C.A. Loss \$1,268,212 in First Half of 1933

For the first half of the present year a net loss of \$1,268,212 is reported by Radio Corporation of America. For the first half of the previous year a net income of \$219,406 had been reported. During the current year no dividends were paid, whereas last year for the first half \$343,019 was paid to holders of Class A stock.

The report for the first half of this year compared with the same 1932 period shows:

	1/2 of 1933	1/2 of 1932
Gross income from operations	\$27,149,824	\$35,952,369
Other income	369,614	589,794
Total income	\$27,519,438	\$36,542,163

POSTAL WIDENS LINE

An announcement comes from Postal Radio, 135 Liberty Street, that it will feature a line of wired amplifiers and public address systems with from 8 to 50 watts output. Early this Fall it will have a complete line of radio merchandise for the mail order and export trade.

Literature Wanted

Readers desiring radio literature from manufacturers and jobbers should send a request for publication of their name and address. Address Literature Editor, RADIO WORLD, 145 West 45th Street, New York, N. Y.

- Frank Leone, 425 Baldwin Ave., Jersey City, N. J.
- C. S. Staugaard, 1017 Mulford St., Evanston, Ill.
- A. J. White, 4809 Fannin St., Houston, Texas.
- Elvin B. Chapman, Box 691, Camas, Wash.
- E. H. Kurth, California Institute of Technology, Pasadena, Calif.
- H. S. Courtney, 648 Warsaw Ave., Winnipeg, Man., Canada.
- L. La Valle, 2829 N. 11th St., Philadelphia, Pa.
- R. A. Thomas, Fayetteville, Ohio.
- John Meehan, 1307 Taylor Ave., Utica, N. Y.
- Robt. L. Harris, Blue Springs, Missouri.
- Walter I. Gillis, E. 2825 Mission Ave., Spokane, Wash.
- Orval C. LaFrance, U. S. Dredge "A. Mackenzie," Astoria, Oregon.
- M. A. Wesling, 1901 Denver St., Covington, Ky.
- Chester W. Mebus, 5 W. Oakdale Ave., Glenside, Penna.
- A. K. Warner, Grandview, Wash.
- Jack H. Campbell, Sardis, B. C., Canada.
- R. L. White, Fournier Rubber & Supply Company, 236 North Third Street, Columbus, Ohio.
- E. W. Grimes, 810 Lincoln St., Middletown, Ohio.
- Ralph B. Brehm, 92 Nutt Ave., Uniontown, Penna.
- Birdwell Radio Service, Box 892, Iowa Park, Texas.
- W. F. Poat, Riverside, Calif.
- William L. Herr, 1918 Penn St., Harrisburg, Penna.

Tubes Exclusively for Auto Sets Held Taxable

Radio Manufacturers Association, Inc., has obtained a ruling from the Internal Revenue Bureau of the Treasury Department, advising that the full 5 per cent. tube tax applies even though such tubes are specially designed and suitable only for automobile radios.

In connection with the administration of the 5 per cent. tax law there had developed a belief by some tube interests that if the tubes were specially made for automobile sets they would not be subject to taxation, or at least not more than 2 per cent. The question was presented to the Treasury Department and following written ruling received from Adelbert Christy, Acting Deputy Commissioner:

"You are advised that all radio tubes which are suitable for use with any radio receiving set are subject to the tax imposed by section 607 of the Revenue Act of 1932 irrespective of the type of radio with which such tubes are to be used.

"Your attention is invited to the fact that such tubes may be purchased tax free under exemption certificates by manufacturers of automobile radio sets as provided in Article 7 of Regulations 46.

"In view of the facts set forth above, it is held that radio tubes are subject to the tax of 5 per cent. of the manufacturers' sale price as imposed by section 607 even though such tubes are suitable for use only with automobile radios."

RADIO'S SHARE

ADVERTISERS in 1932 spent \$116,200,000 on newspaper space, \$52,201,000 on magazines and \$25,321,000 on radio, according to the bureau of advertising, American Newspaper Publishers' Association. It is easy to imagine stations' salesmen of time on the air have had these figures called to their attention by their superiors, with a warning that there must be an improvement. And advertising solicitors for newspapers and magazines probably have had the same experience. That these three elements do not compete with one another is pure fiction.

More Sets in Canada Are Licensed, but Sales Don't Gain

During last year 133,454 sets were sold in Canada, and the number of receivers licensed for use exceeded 737,568 in February, 1932, the end of the fiscal year, according to the Canadian Pacific Railroad.

It is pointed out that the number of sets licensed is increasing considerably, although the number of receivers sold is not. This is privately accounted for in part by the licensing of sets that had been previously operated without a license, and also to sets constructed by licensees.

Lower Freight Rates Effective August 31st

Lower freight rates on receiving sets will be effective August 31st. Minimum weight on console type sets, in carloads, will be reduced from 18,000 lbs. to 16,000 lbs. The same reductions will apply on combined radio and talking machines in carload lots.

On mixed carloads minimum weight will be reduced from 24,000 lbs. to 20,000 lbs. The present second-class rating will apply on both console sets and combined articles, in carload quantities; also, the present third-class rate will be retained on mixed carloads.

In addition to the above reductions in minimum carload weights, Radio Manufacturers Association, Inc., obtained a reduction in the less-than-carload rating on other than console type sets from one and one-quarter times first-class rate to the first-class rate.

The above reductions mean a saving to set manufacturers of \$25.05 in the minimum charge per car between Chicago and New York City, for example. On console type sets and on mixed carloads there is a difference of \$42.40 per car. On box type sets in less-than-carloads the saving in freight rates is 38c per hundred pounds.

Set Worked Too Well, Sale to Dealer Off

A case that could have spelt retributive justice with a vengeance but didn't, is reported to "The New York Times" by its special correspondent at Charlotte, N. C. A negro tried to sell to a store a second-hand radio with a short-wave switch. He offered to demonstrate it. The store-owner told him to do so.

The set worked well, even on short waves. In fact, so well did it work on short waves that it picked up the local police station:

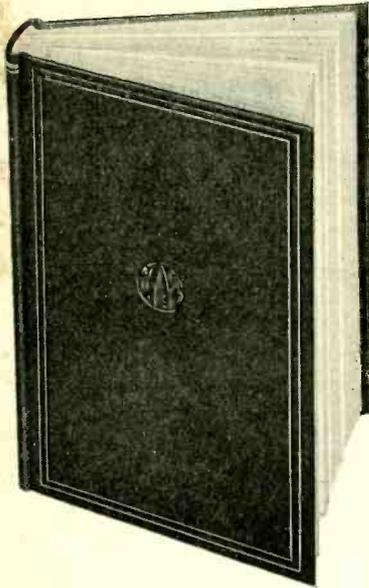
"Stolen—a radio with a short-wave attachment—"

The police sent out an accurate description of the set and as the store-owner compared the proffered receiver to the description the coincidence was heightened by the rapid exit of the prospective vendor.

The true owner got back his stolen radio, but the thief escaped.

A THOUGHT FOR THE WEEK

THAT radio code is for me and for you, Though some may aver it is rough on a few;
But there stands the code, sir!
We'll carry the load, sir!
What else, let us ask, are you going to do?



**MORECROFT'S
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HERE is a new book by John H. Morecroft, consulting engineer, professor of Electrical Engineering, Columbia University, N. Y. City, a book many had been hoping he would write. It is a practical authoritative book on tubes and their manifold applications. Those acquainted with his previous books will not be disappointed for he has written the sort of book which every technician, engineer, experimenter, and student will find of incalculable value and inspiration. The whole story of tubes is here—written in clear, direct and forceful English.

The first part of the book discusses a general treatment of the subject of extracting electrons from metals and methods of utilizing them. The succeeding chapters deal with the characteristics and applications of all types of commercial tubes. Written in a simple and direct manner, this book will be of great service to the engineer who is at present working in the profession and whose achievements must depend upon his ability to improve processes and products—and from the many applications covered in the book he is almost sure to find tasks in his own field for which they will efficiently serve. 458 Pages, 6 x 9 inches. Order Cat. MET @ \$4.50. Remit with order and we pay postage. Order C.O.D. and you pay postage.

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**"THE INDUCTANCE
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[A NEW BOOK]

THE ONLY BOOK OF ITS KIND IN THE WORLD, "The Inductance Authority" entirely dispenses with any and all computation for the construction of solenoid coils for tuning with variable or fixed condensers of any capacity, covering from ultra frequencies to the borderline of audio frequencies. All one has to do is to read the charts. Accuracy to 1 per cent. may be attained. It is the first time that any system dispensing with computation has achieved such very high accuracy and at the same time covered such a wide band of frequencies.

A condensed chart in the book itself gives the relationship between frequency, capacity and inductance, while a much larger chart, issued as a supplement with the book, at no extra charge, gives the same information, although covering a wider range, and the "curves" are straight lines. The condensed chart is in the book so that when one has the book with him away from home or laboratory he still has sufficient information for everyday work, while the supplement, 18 x 20 inches, is preferable for the most exacting demands of accuracy and wide frequency coverage.

From the tri-relationship chart (either one), the required inductance value is read, since frequency and capacity are known by the consultant. The size and insulation of wire, as well as the diameter of the tubing on which the coil is to be wound, are selected by the user, and by referring to turns charts for such values the number of turns on a particular diameter for the desired inductance is ascertained.

There are thirty-eight charts, of which thirty-six cover the numbers of turns and inductive results for the various wire sizes used in commercial practice (Nos. 14 to 32), as well as the different types of covering (single silk, cotton-double silk, double cotton and enamel) and diameters of 3/4, 7/8, 1, 1 1/8, 1 1/4, 1 3/8, 1 1/2, 1 3/4, 2, 2 1/4, 2 1/2, 2 3/4 and 3 inches.

Each turns chart for a given wire has a separate curve for each of the thirteen form diameters.

The two other charts are the tri-relationship one and a frequency-ratio chart, which gives the frequency ratio of tuning with any inductance when using any condenser the maximum and minimum capacities of which are known.

The book contains all the necessary information to give the final word on coil construction to service men engaged in replacement work, home experimenters, short-wave enthusiasts, amateurs, engineers, teachers, students, etc.

There are ten pages of textual discussion by Mr. Shiepe, graduate of the Massachusetts Institute of Technology and of the Polytechnic Institute of Brooklyn, in which the considerations for accuracy in attaining inductive values are set forth. These include original methods.

The curves are for close-wound inductances, but the text includes information on correction factors for use of spaced winding, as well as for inclusion of the coils in shields.

The publisher considers this the most useful and practical book so far published in the radio field, in that it dispenses with the great amount of computation otherwise necessary for obtaining inductance values, and disposes of the problem with speed that sacrifices no accuracy.

The book has a flexible fiber black cover, the page size is 9 x 12 inches and the legibility of all curves (black lines on white field) is excellent.

Order Cat. IA @ \$2.00 (book and supplement). Remit with order and these will be sent postpaid to any destination. Order C.O.D. and you pay the postage.

Vol. III of RIDER'S MANUAL (A New Book)

Just out, John F. Rider's Vol. III Manual weighs nearly 11 lbs. and has 1,100 pages, all diagrams of commercial receivers, etc. (no text). Sets announced up to May 1st, 1933, are included—and complete information on every one, including resistance values. The volume is original and necessary and does not repeat data that are in Vols. I and II.

A Chronological Catalog and Index of all nationally-advertised radio receivers manufactured and sold in the United States between January, 1921 and January, 1933 are contained in Volume III. This list will be of tremendous aid in the identification of receivers for which the model number is not known.

Complete data include schematic wiring diagrams; chassis wiring diagrams; parts layouts; photographic views of chassis; socket layouts; voltage data; resistor values; condenser values; location of alignment and trimmer condensers; alignment and trimmer adjustment frequencies; intermediate-frequency amplifier peaks; alignment and intermediate-frequency adjustment instructions; color coding; transformer connections; point-to-point data; continuity test data; parts list with prices; special notes.

Complete tabulation of tube data showing electrical characteristics and constants for all of the tubes employed in radio receivers and amplifiers since 1921. Also a table of interchangeable types.

A complete table of I-F. peak frequencies as used in radio receivers. This list augments the information of this type shown upon the diagram pages. Intermediate-frequency amplifier peak information is very important because quite a few of the manufacturers employ more than one figure in their year's production. A wrong guess on your part means trouble.

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Volume III of Rider's Manual has a page sequence in accordance with Vols. I and II, and is not cumulative, or repetitive of the earlier volumes. However, it contains an index for all three volumes.

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