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EDITORIAL

By The Editor

The era of re-adjustment that our country is experiencing at the present time has been likened to a bloodless revolution! We are most certainly revolutionizing not only our government, but our business, commerce and professions as well.

The radio industry, as it affects the service engineer and technician, bids fair to be saved when it is on the very verge of plunging into a chaotic maelstrom from which a satisfactory recovery within a reasonable time was at best an optimistic prayer.

The phenomenal development of broadcast radio and its allied fields within the past decade has been such that the public has accepted radio as an absolute necessity without being conscious of the extensive background which has been a necessary accessory behind the scenes, so to speak.

The beginning of popular broadcast radio was in the manner of a plaything for experimenters and a spare-time hobby for those of us who became interested. The industry as it exists today is most certainly a far-cry from that of ten years previous. The change has been so rapid and phenomenal as to make it a practical impossibility for us in this field to be able to impress the public at large with the full extent of the industry in all its branches as have other industries with a slower and more gradual evolution.

We must realize that we have, because of unprecedented circumstances, the opportunity of saving our chosen profession. We not only have the opportunity, but we are invited, urged and commanded to set up rules and ethics of fair play and proceedure for our industry. Let us not be found lacking in the ability and perseverance to take full advantage of this wonderful opportunity. Let us take this opportunity to command the respect and cooperation due us from other industries and fields of endeavor. Let us take this opportunity to protect the public, at large, and the industry we represent by legislating fair and honest methods which, when made usable by government endorsement, will sound a death knell to the reign of unscrupulous chiseling and the operations of the members of the radio industry who were unfair and not far-sighted enough to do other than take advantage of the youth of our field for the purpose of immediate ill-begotten gain. By our honest and intelligent effort, as those who represent the element of integrity and square dealing within our profession we have the power within our grasp to save our reputation and respect.

Let us prove ourselves at the onset by laying aside petty personal considerations in favor of group well-being. Abraham Lincoln said: "United we stand--divided we fall." Benjamin Franklin said: "Let us all stand together or we will all hang separately." It is not necessary to dwell upon the oft-repeated wisdom and undoubted truth of this doctrine.

We who make our livlihood in radio must heed these warnings at this, the most critical time in the history of radio and combine our efforts and support in a united front which will demand and receive recognition and much-deserved respect.

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SEPT 33

Building and Using A Grid-Dip Oscillator for Service Work.

By RICHARD G. LEITNER

In service work it is often necessary to measure the inductance of an unknown coil or to compare the inductance of an unknown coil with that of a known coil. Since an inductance bridge is generally out of the reach of service men on account of its cost the next best instrument is a grid dip oscillator. With some care in design and the proper selection of calibrating condensers, considerable accuracy may be obtained with an oscillator of this kind.

The theory of the devise is simple. Referring to the diagram it will be noted that the oscillator proper consists of the center tapped inductance, L, the condenser, C1, the bias resistor, R1, the milliammeter, the tube and the plate by-pass condenser. This is a simple Hartley oscillator in which grid current is indicated by the milliammeter. The condensers C2, C3, C4 and C5 are calibrating condensers. The external circuit, or coil, to be tested, is connected to points X--X which couples it to the oscillator ci cuit through the coupling condenser C6. When the oscillator is brought into resonance with the external circuit current is taken by the external circuit from the oscillator. A reduction in the power in the oscillator coil results in a sharp reduction in grid current and this is read directly on the meter.

The Oscillator

The oscillator, as stated above, is of the simple Hartley type, in which the plate is operated at zero RF potential. The tube may be any heater type triode, 56, 27 or 37. The coil is a solenoid center tapped, having an inductance of about 250 microhenries. This is the average secondary of an RF transformer to cover the broadcast band with the ordinary 370 micromicrofarad condenser. R1 is a bias resistor and will vary 0 to 1000 ohms depending upon other circuit characteristics. The exact value should be chosen to produce about three-quarters scale deflection on the meter with the plate voltage used. With the optimum value of resistance in this position, there will be a negligible change in grid current through the swing of the tuning condenser C1. The plate by-pass condenser may be any value from one quarter microfarad up.

Power Supply

power supply consists of a small ~sformer such as is used in small TRF midgets. An 80 rectifier is shown but this may be any type of tube, such as a 27 or 56 used as a half wave rectifier. The voltage divider and filter system shown are for an 80 rectifier used with a transformer built for a 4 tube receiver. R2 and R3 are 100,000 ohms each. In this particular oscillator the voltage at the plate of the tube was 10 volts which is a very convenient voltage to work with. These values may easily be determined by the constructor to suit the equipment available.

Calibration

A tandem switch is shown in the diagram. This one is a two-circuit, three-position switch and is the type used frequently as short wave switches. When the switch is in position 1 no extra capacity is added to either the oscillator or external circuits, and the oscillator may then be used to check tuned circuits over the entire broacast band. This is particularly useful in detecting circuits that fail to tune, due to open coils, shortened condensers, etc. It must be remembered, however, that the coupling condenser C6 is a portion of both the internal and external circuits and accurate frequency determinations cannot be made when the L/C ratio is high. This condenser, incidentally, should be a small, variable, two-plate condenser of the type used as coupling condensers in RF amplifiers. Its maximum capacity should not exceed 15 micromicrofarads. It should be so mounted that it can be adjusted from outside the case. In adjusting this condenser set it so that the dip of the meter is smooth and occurs at the same spot on the dial when rotating it in both directions through resonance.

In position 2, the switch adds capacity to both internal and external circuits, and the band of frequencies covered by the oscillator is considerably reduced. This band may be used for measuring or comparing coils intended to tune through the broadcast band with ordinary variable condensers. This will cover inductances of from 220 to 260 microhenries. Let us say, for example, that the condenser in the oscillator has a maximum capacity of 360 micromicrofarads and that at one-half rotation the capacity is 150 micromicrofarads. In order to make the L/C ratio very low for this test, C2 has been made .0005

(Continued on page 8)

World Radio History

Point to Point Resistance Testing. Crosley Model 163

By E. A. FREITAS
Manager Service Dept., Kierulff & Ravenscroft, Inc.

The introduction of the universal Direct Current and Alternating Current receiver to the radio public introduces a receiver of small design and compactness of its component parts. In such receivers the old method of analizer testing has become inaccurate. The modern method of point to point resistance testing offers a method of accuracy as well as a saving of time and labor. Not many of the manufacturers include point to point resistance measurements with their service notes, but they can be calculated by following the circuit closely as in most cases resistance values are included with the notes. After a little practice it will be seen how easy this method really is.

In servicing the Crosley "Travette" model 163, a great deal of time can be saved by employing the above method. The chassis of this receiver is not common ground, but is connected to the common negative line through a 0.1 mfd fixed condenser. Tests are made from this common negative lead, also from the B positive output of the 12Z3 rectifier to the various points. The thirty foot antenna wire is connected to the antenna coil through a .003 mfd. fixed condenser. Resistance measurements are made with the volume control in Full ON position.

Following are point to point resistance measurements which include the major units of the receiver. One terminal of ohmmeter connected to B negative common (easiest accessible at the black wire of the speaker terminal strip mounted above the volume control). Other ohmmeter terminal connected to the following points of the various sockets. The socket positions are as follows reading from right to left facing the chassis: No. 1—78 modulator-oscillator next to condenser gang; No. 2—78 intermediate frequency amplifier; No. 3—77 detector; No. 4—38 output amplifier; No. 5—12Z3 rectifier assembled between- -38 and -77 in center of chassis.

Socket No. 1 -78: Plate 2750 ohms; Screen Grid 2700 ohms; Suppressor grid 5 ohms; Cathode 3050 ohms; Heaters open; Control grid 2725 ohms.

Socket No. 2 -78: Plates 2730 ohms; S. G. 2700 ohms; Sup. G. 160 ohms; Cathode 160 ohms; Heater nearest Cathode zero ohms; Heater nearest plate open; C. G. 25 ohms.

Socket No. 3 -77: Plate 3302700 ohms; S. G. 5003100 ohms; Sup. G. 150000 ohms; Cathode 150000 ohms; Heaters open; C. G. 60 ohms.

Socket No. 4 -38: Plate 3100 ohms; S. G. 2750 ohms; Cathode 750 ohms; Heaters open; C. G. 5000000 ohms.

Socket No. 5 -12Z3: Cathode 2700; ohms. All other points of this socket open.

Following are resistance measurements made from B positive to the various test points. Accessible at the rectifier socket the cathode terminal:

Socket No. 1 -78: Plate 625 ohms; S. G. 590 ohms; Sup. G. 2700 ohms; Cathode 5800 ohms; Heaters open; C. G. 5400 ohms.

Socket No. 2 -78: Plate 625 ohms; S. G. 590 ohms; Sup. G. 2700 ohms; Cathode 2700 ohms; Heater nearest cathode 2700 ohms; Heater nearest plate open; C. G. 2700 ohms.

Socket No. 3 -77: Plate 3300590 ohms; S. G. 5001000 ohms; Sup. G. 18000 ohms; Cathode 18000 ohms; Heaters open; C. G. 2700 ohms.

Socket No. 4 -38: Plate 1000 ohms; S. G. 590 ohms; Cathode 3500 ohms; Heaters open; C. G. 5002700 ohms.

Socket No. 5 12Z3; to all socket prongs open.

Readings obtained may vary as much as 10 percent from the averages listed. Following are a few defects to be found if readings are zero ohms or to any extent lower than the average. B negative common to S. G. -38 shorted 8 mfd. 200 volt section of electrolytic condenser part No. W25857B. B negative common to cathode of -38 socket; shorted section 8 mfd 25 volt of No. W25857B condenser. This condenser is mounted on the underside of the chassis on the left side with chassis upside down.

B negative common to cathode -77 socket; shorted electrolytic condenser part No. W26870A 6 mfd. 25 volt, mounted on top of chassis in front of condenser gang.

B negative common to cathode of 12Z3

(Continued on page 7)

World Radio History

SEPT 33

STATIC — A Challenge to Experimenters.

By GERALD MOSTELLER, B. A.
Instructor in Physics, Franklin High School

Static is one of the greatest detriments to the enjoyment of radio entertainment by those people who live more than fifty miles from broadcasting stations. Those who live near stations, yet take pleasure in receiving signals from distant towns also find their enjoyment marred by that crashing and roaring caused by natural discharges.

On summer evenings in the San Joaquin Valley and other similarly located places many radio sets stand idle because even with high power signals such as those from KFI and KNX the noise to signal ratio is so high that one cannot stand the din.

The nature of these disturbances is not well understood. It is possible during an electrical display to hear a crash at the same time that a lightning discharge occurs. Thus we know that lightening will cause static but there are other causes too. One theory is that bundles of electrons discharge into the Heavyside Layer and cause these static disturbances. This theory leaves much to be worked out in the line of exact mechanics of the discharge. Static disturbances are known to affect radios at great distances. directional tuning with loup antennae and triangulation by two or more stations is a method employed to locate electrical storm centers very accurately. A great deal of our static seems to originate in the region of the Gulf of Mexico.

Local storms will induce voltage in the antenna around thousands of volts. The writer has seen an intermittent discharge across a half-inch gap to ground when a charged cloud passes nearby. Thus it does not take an actual jumping of lightning to the antenna to cause noise and break down. The average static impulse is several thousand times as strong as the impulse from a station, say 100 miles away. The static impulse has no particular frequency unless it be a highly damped oscillation and seems to "shock" the set into oscillation by brute force.

An interesting experiment shows the strength of the energy picked up from the natural and artificial disturbances of the ether. It consists of tying an antenna to the grid of a radio tube through a grid leak and condenser, and by-passing the antenna to ground through an audio choke, then passing the output from the tube through a galvanometer. When this is done the galvanometer will start to swing in a series of short jerks interspersed with a violent jerk now and then. If the same antenna be coupled to a receiving set the static may be heard while the needle is being watched. An oscillograph instead of the galvanometer would show the nature of the disturbance.

Radio News of August, 1933, gives a very good discussion of methods used in an attempt to eliminate static. It is not, however, very optimistic about the outlook.

John Carson (Proc. of I. R. E. Ju. '28) shows theoretically why it is impossible to balance out an unwanted noise by bucking the demodulated or audio output with a demodulated signal from a separate tuning channel tuned slightly off the frequency of the wanted signal. This method, at first glance, looks to be the solution. The joker is in the phase relation of the static noise in the modulated channel and the unmodulated channel. This phase relation is shifted by the presence of the modulation. Now if some method can be found whereby the energy of one wave might buck that of the other, in spite of the phase shift, the problem would be solved. Possibly this can be accomplished by some device which will pull the two equal disturbances into the desired phase.

Other remedies recommended are directional antennae favoring the broadcasting station over the storm area or resistor across from antenna to ground allowing the signal to go through the tuning circuit which will have a low impedance to the frequency it is tuned to but shutting out a part of the static.

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TECHNICAL QUESTION AND ANSWER DEPARTMENT

Conducted by CHARLES MILLER
Chairman, Technical Board

Q. 1. When a 227 is used as a diode detector why is the plate sometimes connected to the grid and at other times to the cathode?—R. L. C.

A. 1. When functioning as a diode, with the grid acting as the diode anode, the plate of a 27 has no effect upon the diode characteristics of the tube. Hence, the plate may be connected to either grid or cathode without effecting its operation as a diode. Tieing the plate to the cathode is the usual practice as the plate then serves as a shield for the active elements.

Q. 2. What determines the "speed" of an AVC circuit?—K. C. A.

A. 2. The "speed" of the circuit is determined by the electrical time constant of the RC network in the AVC circuit. It varies inversely with the product of R and C.

Q. 3. What may cause a gradually increasing distortion as the set warms up in a receiver using plate detection, (Victor R-78?—L. Y.

A. 3. Leakage thru the cathode to B plus bypass condenser of the second detector will cause this trouble. As little as 10 microamperes leakage will cause serious distortions and is insufficient to produce a noticeable change in any socket voltages.

Q. 4. Why has the trend been toward higher intermediate frequencies?
—A. P. R.

A. 4. Frequencies of 30 to 50 kc were selected for the sets of 10 years ago because they made possible greater gain with stability in an IF amplifier using the low mu triodes then available. With the improvement in tubes and in coil design and shielding, higher frequencies became possible. Frequencies in the order of 175 kc. have been found to give the best all around results with high mu screen grid tubes. Unless very efficient means of preselection are placed ahead of the first detector images will mar the performance of the set. Therefore, in two gang receivers wherein the antenna is coupled directly to the grid of the first

(Continued on page 14)

SEPT 33

REBUILDING WESTON 533 TUBE TESTER FOR MODERN USE.

By A. PAUL, Jr.

The parts used in the Weston Model 533 Tube Checker lend themselves readily to the construction of a modern tube tester which will test over eighty different types of tubes.

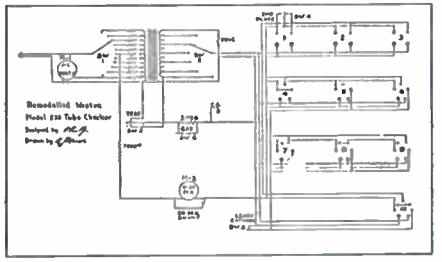
As the writer of this article had an old Readrite analyzer case available, the panel size chosen was determined by the dimensions of this case, however, any small case can be used and the layout of parts may be varied accordingly.

The first step in constructing this tester is to remove the push buttons transformer, meters, switches, etc., from the old Weston Panel

Next obtain a bakelite or hard rubber panel 7x10 inches, or larger, to fit whatever case you have on hand, and arrange the layout of parts.

The trasformer secondary is tapped for the following filament voltages. 1.5, 2.5, 3.3, 5, and 7.5, but it is an easy matter to tap in on the primary to obtain 6.3 Volts as this voltage appears on the outside layer of the primary winding and should be connected to the vacant contact on the Filament Voltage Switch which should be marked 6.3 volts .

It is suggested that the contacts on the push button which switches from the 20 to 80 MA range be re-assembled so that the 80 MA range is had. This is to protect the meter.



The accompanying circuit is self explanatory. Switch (SW-1) is used to compensate for variations in line voltage and should be set so that meter (M-1) coincides with the arrow on the scale.

(Continued on page 16)

POINT TO POINT RESISTANCE TESTING. CROSLEY MODEL 163

(Continued from page 4)

rectifier socket; shorted electrolytic condenser part No. W28068 12 mfd. 200 volts, mounted on underside of chassis.

Approximate capacity measurements may be made without disconnecting any of the electrolytic condensers to determine their respective condition. Connect one test lead of the capacity meter to B negative common (black wire of speaker terminal strip). The other test lead to screen grid terminal of -38 socket measures the 8 mfd. 200 volt section of W25857B. To Cathode of -38 socket for test of 8 mfd. 25 volt section of above condenser. To Cathode of -77 socket indicates W26870A 6 mfd. 25 volt condenser. To yellow wire on speaker terminal measures 12 mfd. 200 volt condenser part No. W28068.

The coupling condenser part No. W28621 .02 mfd. connected between the plate of the -77 detector and control grid of -38 output tube should be tested for any slight leakage. To obtain a satisfactory test it is necessary to unsolder one end of this condenser on the under-

(Continued on page 10)

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World Radio History

BUILDING AND USING A GRID-DIP OSCILLATOR

(Continued from page 3)

microfarads. Now in order to make a coil equal to the oscillator coil come into resonance with the oscillator at half rotation of the condenser, the capacity C4 would have to be 500 plus 150, or 650 micromicrofarads. Since it is not practical to buy condensers of such odd capacities, it is advisable to build them up out of fixed mica condensers and small variable pads. The exact values used are not of very great importance but they must be so selected with relation to each other that the oscillator will cover the intended inductance values. With the values suggested above, a difference of one turn in a solenoid coil of the 220-260 microhenry range will show an appreciable difference in the oscillator dial setting for resonance. In comparing two coils, a rough comparison of RF resistance may be made by observing the depth of the meter dip. All other conditions remaining equal the dip will be obtained when the resistance is lowest.

Position 3 on the switch may be used for another range of inductance, such as super-heterodyn oscillator coils. Here

(Continued on page 15)

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ELEMENTARY OHM'S LAW AND REVIEW

By NORMAN B. NEELY

Part I.

A working knowledge of Ohm's Law and its application is the most necessary and helpful tool that the service man may have at his command. Moreover, it is the simplest and easiest tool to procure of all. This series shall deal with a brief review of the fundamental principals of Ohm's Law and their application to everyday service work and practical design.

In any electrical circuit we are concerned with three fundamental factors. These are electrical pressure (voltage, potential difference, electro-motive force) represented by E in formulae, current flow represented by I, and resistance represented by R. Ohm's Law stated briefly says, "the current flow (I) in any circuit shall be directly proportional to the voltage, or pressure, (E) and inversely proportional to the resistance (R). By analyzing this statement we find it to mean that if in a given circuit we increase the voltage and the resistance remains the same the current flow will increase correspondingly. Also if we increase the resistance and the pressure remains the same the current flow will be reduced. It can be seen from these deductions that given any two of these values in numerical terms we may find the third by the use of the proper formula.

R equals $\frac{E}{I}$, I equals $\frac{E}{R}$ and E equals I x R

(always convert values to ohms, volts, and amperes).

An aid in remembering these formulae may be easily memorized. Draw an isosceles triangle and put a line parrallel to the base and midway to the apex. Below this line write I x R and above the line just underneath the apex write the letter E. By covering the unknown or the factor to be determined we have the formula for finding it.

As a practical example of what we have discussed, let us assume a filament circuit of 3 type 01-A tubes in series with a 32 volt supply for filament voltage. We wish to insert a resistance in series with the circuit to reduce the voltage to the proper amount. We know that 01-A filaments draw .25 ampere at 5 volts. 3 tubes in series would require 15 volts total voltage across the circuit. This is a series circuit so we add the voltage and the total current remains the

(Continued on page 16)

World Radio History

THE AIMS AND PURPOSES OF THE CERTIFIED RADIO TECHNICIAN'S AS'SN.

The radio technician or serviceman, as he is more generally called, has from the very inception of the radio industry, been deemed a necessary evil. It was only after several years of the most intensive demand from technicians in all parts of the country that manufacturers of radio receivers have finally come to realize that it is to their best interests to supply service information to any but dealers in their wares, who more often than not threw what little there was supplied in the waste basket. Because the technician was a docile animal, didn't stop to consider the value of his services or the cost of his training, the cost of keeping his testing and mental equipment up to date or that he might ever grow old or loose his power to bring in the bare necessities of life he has been the prey of this most chaotic or shall I say idiotic industry. Individually we have from time to time endeavored to stem the tide of short-sighted selfishness but the lone wolf however heroic his stand, seldom escapes from his adversaries with a whole skin.

The events of the past few weeks have shown conclusively that The Day Has Arrived when we must exert forceful, well planned and above all, sustained United Effort if we are to maintain for ourselves the right to make an honest living, time for pleasure, study and the necessary functions of a normal and healthful existence. The Certified Radio Technician's Association was organized to provide the facilities for such a movement. It is composed of members of several technical societies of long standing. We invite any radio or electronic technician who will endeavor to maintain for the public and his fellow technicians an ethical standard of proficiency and fair play to join with us in our endeavor to win and maintain working conditions and compensation commeasurate with the service he renders his employer or the public.

In order to effectuate the purposes of the Association for the greatest good of its members and the public at large, we have established connections with forces for the betterment of business conditions generally, such as National and State agencies. We have submitted a Code to the National Industrial Recovery Administrator and we are preparing to take advantage of all state legislation for the benefit of members of our craft. We are working very closely with the Better Business Bureau and the Federal Radio Commission to clean up some of the unethical practices and rackets now prevalent in the radio service field. To protect the ethical and qualified Technician and the public from the inroads of the unscrupulous, the unqualified and those lacking the character to render proper service, we have an Examining Board to determine the qualifications and standing of those who engage in this business. We have established several services for the membership in addition to this magazine. We have a Technical Board composed of competent and recognized radio engineers and service technicians whose duty it is to assemble a library of technical information of interest and value to the members. In addition to this they maintain an inter-consultation service for the members so that difficult questions may be answered by specialists in the particular field involved. We have an employment committee which is actively working to secure for the members of this Association all the available employment in this field. We have in the course of development, a great many other services of like nature which will be of great benefit not only to the members of this organization, but to the radio industry and the public.

All these things and many more are available to the man who supports his organization morally and financially, which would be very difficult if not impossible, for the lone wolf to procure.

JOHN A. ORME,
Secretary.

—o—

THANK YOU!

I wish to take this opportunity to thank everyone who contributed to this magazine, both contributors of articles and news, and the advertisers. Only by your wholehearted cooperation can we hope to make this publication something to be proud of and something which we shall be able to use for our convenience and advancement.

It is only fair that I give particular mention to three persons who gave so generously and unselfishly of their time in making this first issue possible. Miss Marie Saffer donated a great many hours of her time in doing stenographical work for the purpose of getting copy ready for the printer. Mr. Ullberg took the responsibility of selling the advertisements, Mr. Darrow collected the money which paid the printer. Again I thank you all very sincerely.

NORMAN B. NEELY, Editor.

IDEAS

are valuable, but they fail to ring the bell in the cash register or put profits in the cash draw until they are acted upon. Our job is to help you whip your ideas into shape, dress 'em up in ink and paper and start them out to get orders for you.

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RADIO SHOW

The Los Angeles Greater Radio Show at the SHRINE CIVIC AUDITORIUM, October 2-7, 1933, promises to surpass and eclipse any radio show ever held in Southern California. Thirty-seven major cities in the United States are holding radio shows in concurrence with Radio Progress Week.

Be sure to attend and support our show.

POINT TO POINT RESISTANCE TESTING. CROSLEY MODEL 163

(Continued from page 7)

side of chassis at the solder lug where the control grid lead comes through from the -38 tube. Usually if this condenser is defective distortion will result after the set has been playing for about fifteen to thirty minutes. Trouble of this nature can usually be traced to either the coupling condenser or the 8-25 volt electrolytic condenser.

A large number of technicians are not equipped to test the 12Z3 rectifier tube. An approximate condition of the tube can be ascertained while connected in the receiver in operation, by measuring the D. C. output voltage of the rectifier at the speaker terminal. Black wire negative, yellow wire positive. A reading of from 95 to 100 volts D. C. will be obtained with a line voltage of 110 volts.

The above system of servicing receivers has been employed in our service department for some time proving a great saving of labor and time. With receivers becoming more complicated with vast networks of resistors it can be seen that the point to point resistance measurement method is the only way of localizing the trouble.

Due to a limitation of space in this issue we are unable to reproduce the circuit diagram of this receiver. Diagrams of the above receiver may be found in Rider's Service Manual, volume three, or in the August, 1933 issue of Rider's magazine "Service." To non-authorized Crosley dealers and servicemen, copies of the Crosley Service manual may be obtained from the Crosley Radio Corporation, Cincinnatti, Ohio, by addressing a letter on your business letterhead, enclosing fifty cents.

SEPT 33

THE HOW AND WHY OF A CURRENT TRANSFORMER

By JOHN L. VINCENT

Radio Service Laboratory

Not so long ago it became necessary to build a current transformer which dould allow the use of a O-100 MA A. C. meter (Weston model 476) to cover a number of ranges.

Unsatisfactory results trying to make a shunt that would do the work accurately lead to the conclusion that what was needed to accomplish the desired results was a current transformer. However, the well-known text books said not a word about current transformation for test instruments, so with the aid of a Weston model 539 current transformer of 2 volt-amperes and a Jewel 77 0-1 A. C. ammeter, experiments were made.

Using an open core with a few heavy turns for the primary gave no results at all, proving that there must be a very low leakage reactance for practical results. Next a small shell type core from an old audio transformer was tried, with the center leg cut out leaving a closed rectangle. (Shell type is the well-known "E" and "I" shape punchings). This gave promising results and sufficient data to build the final transformer.

The core finally decided upon was 1 inch by one-half inch in cross section, with a window of two inches by one inch, the center leg of these "E" punchings having been removed first. The core was assembled all one way leaving one side open. Bolts secured the laminations including a terminal strip of bakelite. The "I" or straight laminations were taped together so as to be easily removable (they were put in and taken out many times while winding).

The primary consisted of 20 turns of No. 12 enameled wire with a resistance of .0074 ohms. The secondary for a 10 ampere primary current was wound with 26 turns of No. 20 DDC wire having a resistence of .136 ohms. This transformer gave a meter reading of 50 MA with a primary current of 5 amperes and intermediate readings checked.

With a maximum primary current of 2 amperes 325 turns of No. 18 enamel wire in series with the 20 turns of the 10 ampere winding, or a total of 345 turns were required. The size of the wire must be sufficient to prevent appreciable ohmic resistance. After the final assembly of the transformer the

(Continued on page 15)

RCA "HIS MASTER'S VOICE"

R. C. A.
Victor Products

R. C. A. Radiotrons

Norge Rollator
Refrigerators

Leo J. Meyberg
Company, Inc.
1022 Wall Street
Los Angeles

World Radio History

TECHNICAL QUESTION AND ANSWED DEPARTMENT

(Continued from page 6)

detector an IF must be used which will throw the images beyond the broadcast band. An IF of about 460 kc is generally used in this class of set even though the efficiency of the IF amplifier may be somewhat lower than could be obtained with a lower frequency.

Q. 5. How can the characteristics of a band-pass circuit be altered?

—H. A. B.

A. 5. Aside from the special case of the "link circuit" two types are in general use, defined by the kind of common reactance employed for coupling, which may be either inductive or capacitive. Selectivity may be increased by loosening the coupling, by decreasing the common reactance, removing turns if inductively coupled or adding capacitance if capacitively coupled. Closer coupling results from an increase in the common reactance. Always reallign the gang after making any changes in the circuit.

NOTICE TO CONTRIBUTORS

Contributions to all departments are respectfully solicited. In order to avoid unnecessary complications in preparing copy for the printer, contributors are asked to observe the following suggestions:

Please use a separate sheet of paper for each classification of material.

Sign full name--initials are confusing.

Please use only one side of paper.

Type if possible, if not, be sure the handwriting is legible.

Please double-space.

Clearly indicate the nature of each contribution by classification title at the top of each page.

Arrange your diagrams so they conform to a square if possible.

Check your manuscript carefully for technical, grammatical and subject errors.

Strict adherence to the above suggestions will not only simplify transcription of the material submitted but will greatly reduce the possibility of errors and misconceptions of intent.

—The Editor.

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LOS ANGELES, CALIFORNIA

THE HOW AND WHY OF A CURRENT TRANSFORMER

(Continued from page 11)

core was rigidly secured with Metallic X. For calibration a 200 watt lamp and a laboratory heavy duty rheostat and an electric stove were used as loads. Indicated readings were compared with the known values as measured by the Weston Standard.

The above transformer used in conjunction with a O-.1 ampere A. C. meter gave current ranges of O-2 amperes and O-10 amperes with good accuracy.

Further developments or improvements will appear in future issues of The "TECHNICIAN."

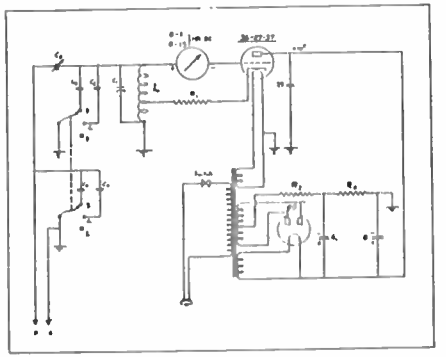
BUILDING AND USING A GRID-DIP OSCILLATOR

(Continued from page 8)

no values will be given, as the builders will undoubtedly have various uses for the third range. The values of capacity may be easily determined by the following rule: The product of L in microhenries and C3 plus one half C1 in microfarads should equal the product of external L and C5.

The range of the instrument may be further extended into the IF bands by using plug in coils. The entire unit may be housed in a small metal box. The leads X--X should be flexible with clips at the ends. These should be color coded so that the lead which is grounded to the case of the oscillator may always be clipped onto the low potential, or ground side of the circuit under test.

If a standard variable inductance is available the scales may be calibrated from it directly. Under ordinary conditions these calibrations should hold within narrow limits over a considerable period of time.



Classified Directory

LU ULLBERG, Adv. Mgr.
Phone REpublic 4711

Wanted—

Stamp collection. Will buy for cash or trade radio test equipment. H. I. O'Brien, 1348 E. Colorado, Glendale.

For Sale—

Late model Readrite Analyzer. A bargain at ten dollars. H. I. O'Brien, 1348 E. Colorado, Glendale.

Western Electric 240 AW Speaker, $3.50. C. W. Nichols, NUiversity 9422.

Television Scanning Discs: 80 hole single spiral for DON-LEE pictures. Complete with hub for $7.50. A-1 Radio Co., 1348 Colorado Blvd., Glendale.

Day Rad portable tube checker with 6 prong adapter. $6.50. Kruger Radio Co., 8630 Melrose.

For Sale or Trade—

Karadio, Auto "B" eliminator 30MA at 150 volts for meters or what have you. Wm. C. Helvey.

Cinderella 5-tube super complete in good shape. Westerner 4-tube rebuilt, exceptional performance. Dwarf 6-tube auto set-Utah remote-Lansing speaker complete in A-1 condition. Want office desk, adding machine, filing cabinet, test oscillator, cash or ?. Norman B. Neely, 1569 Munson Avenue, Los Angeles.

Trade—

Modern mountain cabin completely furnished, at Rim of the World Park. Want public address equipment of any description, new or used. Phone ALbany 1628.

LOST—

Lost from Dodge coupe on the night of August 14, Service notes and Weston Volt-Ohmmeter. Reward for service notes. No questions asked. W. M. Shelton, Platt Music Co.

World Radio History

ELEMENTARY OHM'S LAW AND REVIEW

(Continued from page 8)

same as for one tube. Hence we have a 32 volt source to supply 15 volts at .25 ampere. We must design a resistor of the proper value to drop 17 volts, the difference between 32 and 15, while carrying a quarter of an ampere. We will cover up the R in our triangle and we find the formula to be R equals $\frac{E}{I}$

We substitute 17 volts for E and .25 ampere for I and the second step in our calculation is: R equals $\frac{17.}{.25}$ The result of this operation is the answer, or 68 ohms. We may prove our answer and practice another formula by solving for E.

E equals I x R
E equals .25 x 68.
E equals 17 volts.

The total resistance of resistors in series is the sum of the various resistors in the series circuit.

Try practicing these simple operations in your every day work and in the next issue of The "TECHNICIAN" we shall take up parallel resistance measurements and calculations.

J. L. Mahon

Radiomet
Test Equipment
Sylvania Tubes

1358 So. Grand
PRospect 3681

PERSONAL MENTION

Mr. H. I. O'Brien, of the O'Brien Radio Service Shop, has recently changed the name of his business to the A-1 Radio Company, same address and phone number.

Mr. A. J. Moser, of the Technical Service Laboratories, is now delving into the mysteries of higher mathematics at Hollywood Night School. If you have a couple of spare evenings a week, put them to good use.

The entire technical staff of one of the largest music and radio firms of the entire Southwest are now members of the Certified Radio Technicians Association.

Harold Purkapile has become connected with the Arlington Radio Co., of Hawthorne.

Mr. John A. Orme, prominent radio technician, and Benjamen Platt, well-known radio merchant, have severed business relations.

Mr. A. Paul, Jr., promising young technical laboratory worker, promises to investigate into the correct abreviations of such words as assistants, etc.

REBUILDING WESTON 533 TUBE TESTER FOR MODERN USE

(Continued from page 7)

Switches (SW-2) should then be set for the filament voltage of the tube to be tested.

Switch (SW-3) isolates the Cathode and is used to determine if a short exists between Cathode and filament.

Switch (SW-4) is used to check both plates of full wave rectifiers.

Switch (SW-5) changes the grid bias of the tube under test, and as mutual conductance is the increment change in plate current per increment change in grid voltage, it determines the condition of the tube under test.

Switch (SW-6) introduces a high resistance into the grid circuit and if a change in reading is noted when this button is pushed it indicates gas in the tube.

In next month's issue of The "TECHNICIAN," a complete list of tubes, together with the socket number in which they are placed for test, their filament voltage and the amount of change in plate current for tubes in good condition, will be published.

World Radio History

Servicemen

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USEFUL INFORMATION

The following Victor records are in public domain and may be played in public without interference from the American Society of Composers, Authors and Publishers:

Band

20635 America.
20284 Barnum & Bailey Favorite March
35799 Blue Danube Waltz (Strauss)
35841 Carmen Selections (Bizet)
35842 Carmen Selections (Bizet)
20166 Dixie.
35800 Funeral March (Chopin)
19879 IL Trovatore--Anvil Chorus.
35778 Il Trovatore--Selections.
35850 Il Trovatore--Miserere.
20304 La Brabanconne (Belgium Nat. Air)
20304 La Marseillaise (French Nat. Air)
22053 La Marseillaise (French Nat. Air)
19878 La Paloma
35850 Lucia Sextette
79005 Medley of Hornpipes
19878 Over The Waves—Waltz
20151 Pop Goes The Weasel
35882 Rigoletto Quartet (Verdi)
35827 Semiramide (Rossini)
35804 Soldiers' Chorus from Faust
35799 Southern Roses (Strauss)
35800 Stabat Mater (Cujus)
20319 William Tell Overture (1-2)
20320 William Tell Overture (3-4)
35807 Traviata (Verdi)
35938 Traviata (Verdi)
35780 Triumphal March from Aida

Organ

20129 Abide With Me.
7119 Aria from Orchestral Suite.
35923 Ave Marie (Schubert)
9284 Fantasia in C Minor (Bach.
9284 Fugue in C Minor (Bach)
4086 Fugue A La Gigue (Back
35958 Funeral March (Chopin)
35885 Herd Girl's Sunday
35958 Largo (Handel)
35972 Largo (Handel)
20586 La Paloma (Yradier)
20036 Lohengrin Wedding March (Wagner)
20780 Lead Kindly Light.
35923 Memories of Schubert.
35767 Messiah Hallelujah Chorus.
20129 Nearer My God To Thee.
35972 Prelude in C Minor (Chopin)
21207 Serenade (Schubert)
7119 Sonata No. 1 (Bach)
35885 Three Norwegian Melodies .
35843 Traumerei (Schumann)
20036 Wedding March (Mendelssohn)

Orchestra

21055 Apache Dance.
35794 Ballet Egyptian (1-2)
35795 Ballet Egyptian (3-4)
20011 Barcarolle from Tales of Hoff.
35833 Dance of the Hours.
35774 Danube Waves--Waltz
22728 Dark Eyes.
22013 Hail Columbia.
6652 Hungarian Rhapsody.
79348 Italian Royal March.
35820 Kamennoi-Ostrow.
35830 Kol Nidre.
21055 La Golondrina.
21251 Light Cavalry Overture.
6639 Marche Millitaire.
35764 Merry Wives of Windsor Overture.
20636 Minuet (Boccherini)
19923 Oh Vereland (Old Folk Melody)
9248 Old Black Joe.
9249 Old Folks at Home.
11346 Pique Dame Overture.
35797 Poet and Peasant Overture.
25763 Queen of Sheba Cortege.
20080 Sailing Sailing and Sweet and Low.
21253 Serenade (Schubert)
19992 Silver Threads Among The Gold
21449 Spring Song (Mendelssohn)
20521 Spani[illegible] Serenade.
20635 Star [illegible]gled Banner.
21597 Stradel[illegible]verture.
35879 Sylvia B[illegible]t (Cortege de Bas)
20606 William [illegible]ell Overture (1-2)
20607 William Tell Overture (3-4)

Hawaiian Orchestra

20516 Aloha Oe
20028 Drowsy Waters.
20131 Hawaiian Waltz Medley.
20028 Hilo Intermezzo March.
20027 Honolulu Intermezzo March.

Miscellaneous

20130 Berceuse. Inst. Trio.
79059 Billy Taylor Hornpipe. Hornpipe Band.
19776 Odessa (Polka Mazurka) Russian Orchestra.
79059 Portlaw Reel. Hornpipe Band.
20346 Scarf Dance. Piano.
19960 Shining Moon. Russian Orch.
19960 Volga Boatman Song. Russian Orch.

Note—In some cases only one selection on Record is in public domain.

An additional list of "free" records will be published next month and from time to time as the information is secured. Reports of such records to the editor will be greatly appreciated.—The Editor.

Inasmuch as there seems to be no mention of the corresponding models of RCA Victor models in GE, Westing-

(Continued on page 19)

SEPT 33

USEFUL INFORMATION

(Continued from page 18)

house and Graybar, in most of the service manuals it is often quite difficult to obtain circuit data on some RCA Victor chassis under another trade name. Through the courtesy of Mr. L. C. Lang, of Leo J. Meyberg Company, we are able to print a list of these models giving the much desired information.

1930

RCA Victor Model No.	G. E. Model No.	W. H. Model No.	Graybar Model No.
R 42	None	None	None
R 48	T 41	WR 4	GB 678
R 80	H 31	WR 5	GB 700
R 82	H 51	WR 6	GB 770
R 86	H 71	WR 7	GB 900

1931

T 5	E 52	WR 9	None
R 5	T 12	WR 14	GB 4
R 7	S 22	WR 10	GB 8
R 7A	S 22	WR 10A	GB 8A
R 9	S 42	WR 12	None
R 10	S 132	None	GB 989
R 11	K 62	WR 15	GB 9
R 43	S 42B	None	None
R 50	H 32	None	None
R 55	None	None	GB 100
RAE 59	H 72	None	None
None	S 22X	None	None
None	H 91	None	None
None	K 82	None	None
None	None	WR 8	None

Clock Models

RCA Victor Model	G. E. Model	Graybar Model No.	
R 4	J 70	GT 7	7 tube Table
R 6	J 75	GC 13	7 tube Console
R 8	J 80	GT 8	8 tube Table
R 12	J 85	GC 14	8 tube Console
M 30	A 90	None.	Auto Receiver
P 31	A 81		8 tube Portable Batt.
M 32	A 60		6 tube Auto Rec.
R 70	J 72		7 tube Table
R 71	J 82		8 tube Table
R 72	J 86		8 tube Console
R 73	J 83		8 tube Table
R 74	J 100		10 tube Table
- -	J 109		8 tube Console
R 75	J 87		10 tube Con.
R 76	J 105		(Open Face)
R 77	J 107		10 tube Con (Doors)
R 78	J 125		12 tube Con. (Bi-Ac.)
RE 81	- -		8 tube comb. Acoust.
REA 84	- -		12 tube comb. Acoust.
- -	J 88		8 tube comb. Acoust.
- -	J 109		10 tube comb. Acoust.

A list of 1933 models and corresponding GE models will be printed next month.—Editor.

To All Members:

We have ordered this copy set up-side-down, but trade policies have been up-side-down for some time back without our orders.

We are operating now under Fair-to-Dealer Trade Practices and have been ever since we established our business in 1923. This is particularly hard for us at the present time. But we ask your support of our policies and are hopeful for better conditions in the future.

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Our policy is wholesale prices to radio dealers, service dealers and assemblers only. Of course we must extend the wholesale price to manufacturing assemblers of other than radio industries when such sales do not conflict with our Fair-to Radio-Dealer Trade Practice Ethics. The Radio Dealer is first with us. THEY are the ones we are the most interested in. It is their condition that we want to improve. Come in and we will talk it over.

Yours truly,

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We are located in the Hollywood-Wilshire District near the Paramount and R. K. O. Studios.

World Radio History

SERVICE KINKS AND PET EQUIPMENT

To clean pealings from plates of tuning condensors, disconnect stators and connect to filament of 80 tube. Turn set on and rotate condensor until all sparking stops.

To install aerial back of picture moulding, double up small fold of paper with rubber band around it and jam into moulding above wire.

—George Eckleberry.

Many older screen-grid t. r. f. receivers using control of screen grid voltage for volume control tend to have poor tone quality at low volume. By connecting a fixed resister to furnish screen voltage and using antenna—grid bias volume control, considerable improvement will usually result. The original potentiometer can usually be used if it is in good condition. Connect one end of the control to the antenna input and coil, the other through about 300 ohms to furnish cathode voltage to R. F. tubes. A screen grid bleeder resistance will be found advisable.

Most service men are accustomed to repairing speaker cones, particularly the seams on majestic cones, with paper tape, cement, or adhesive tape. The chief problem is to prevent the tape or cement coming loose and rattling before long. Use adhesive tape and run clean soldering iron over tape, working from inside toward the edges. This will be found to hold indefinitely.

—Norman B. Neely.

To hold thin washers, nuts and small metal parts while filing, lay them on the side of a fresh role of tape and save both fingers and time.

An easy way to drill springs. First soften a spot at the desired location by connecting one pole of a storage battery or a heavy amperage low voltage transformer to the spring and the other pole to an arc carbon and press this to the spot until the spring is white hot at this point, after which the hole may be drilled in the usual manner.

—William C. Helvey.

Have you ever been called to the phone while winding a coil? A snapper cloths-pin will save you the distressing situation you found on your return. Keep one or more handy on the work bench. They save many ticklish situations.

A small bottle of finger-nail polish, which can be found in profusion in any five-and-ten, is one of the handiest things in the tool box. It will hold loose turns on coils, repair cones, voice coils and spiders on speakers. In the absence of a lock washer, it will prevent nuts from loosening, is handy to seal trimmer and IF condensers and prevents insulating fabric from fraying. A little on the threads of a troublesome dial light will assure its staying put.

The most convenient work bench for the radio shop is a large desk with as many draws as possible. The test rack should be mounted on this and the whole assembly should be far enough away from the wall to allow easy access to the rear of the test rack at all times.

Much time can be saved by marking the handles of your socket wrenches and screw drivers with bright colors for easy identification. Keep one screw driver sharpened for the zero adjusters of your meters.

John A. Orme.

(Continued on page 22)

NEW CALIFORNIA LAWS AFFECTING BUSINESS

Assembly Bill 767—A section added to the Fair Trade Act. Declares that advertising, offering for sale or selling any article under a stipulated contract price is unfair competition and is actionable at the suit of anyone aggrieved.

Assembly Bill 769—An act relating to unfair competition and discrimination. Declaring certain contracts to be illegal.

Section 1: The secret payments of rebates or allowances, refunds, commissions or unearned discounts in the form of money or otherwise or extending any special privileges not extended to all purchasers to the injury of a competitor is a misdemeanor with a penalty of $500 fine or one year imprisonment, or both.

Assembly Bill 770—Relates to selling merchandise below cost and makes this punishable as above. Defines for cost etc.

Assembly Bill 2383—Provides for injunctions to prevent or restrain unfair trade practices.

Assembly Bill 2384—Prohibits false advertising and the misleading use of competitive prices.

World Radio History

OPEN FORUM

(This letter was forwarded from the old Association office for publication in this column).

September 5th, 1933.

To Radio Association,
Los Angeles, Calif.
Gentlemen:—

Since coming to Southern California three years ago I have had such trouble trying to get a decent radio program. The station programs are too full of advertising and I am so sick of phonograph records. I don't suppose you could stop this, but if you can, God speed you.

I bought a radio from a concern that disappeared the following week. One of those fly-by-night radio dealers. He sold it to me so cheap--I suppose he took half the insides out--it only worked two weeks fairly good and since then I have had about a dozen chiselers and amateur cranks calling themselves service men try to fix my radio and what they don't know about it is plenty. It seems to me that anybody that has a little nerve, a dirty shirt, a pair of high school corduroys full of grease, knotted hair, dirty fingernails and unshaven face and no culture or refinement, can get a pair of pliers and a screw driver and say he is a radio service man. Aren't there any gentlemen in the radio service business--don't they use soap and water--haven't they any ideas of how a refined person might look and act? Isn't there any law to prevent a man from coming into your home to ruin your property--shouldn't they be licensed and shouldn't the City or the County, or the State, protect the public? I have spent $35.50 to have my radio fixed and they are sending me bills for $28.00 more and after eleven weeks it is worse than it was before. The dealer that sold me the radio seemed to be anxious to get out as soon as he delivered the set. He just threw a wire up over the moulding. When my neighbor turns on a heating pad or the lady next door dials the telephone, or a trolley car three blocks away goes by, I have no radio reception. Is it my fault or is it the industry's fault? Your office recently told me to be sure to get a Certified Radio Technician Who certifies them? I had one boob come here that couldn't have been certified to by anyone in authority, but one smart man came here and he did know the radio business but he wanted so much to repair the set. He told me that these radio stations advertising free service was a racket and that newspaper ads showing 50c and 75c radio calls was dishonest so he charged me over $8.00, but why should I have to pay so much--the only thing I will admit is that it was worth it because my radio for the first time in three months works right and I have it properly installed they tell me.

It seems that your radio business is not properly organized. Of course, it is a young business and I suppose you haven't enough brains or experience to guide you, but we on the listening end haven't much of a complement to say for the industry. Particularly should this service business be put on a practical basis so that people can get real service from capable men without suffering from the rackets that abound or excessive charges. Perhaps your industry will do something to correct this. Let's hope so.

Yours Very Truly,
BARBARA TIRRELL.

We must realize that this letter describes a true condition which we, as members of a highly technical ,though young profession, must combat and eliminate in favor of the truly legitimate class of service engineers. Let us prove that there most certainly are gentlemen and intelligent men in the radio service business. The public should also be made to realize that some of the fault lies with the customer by dint of their demand for "gyp" prices. Intelligent and competent service at a fair price allowing a fair margin of profit is more surely the road to satisfactory radio enjoyment than the detours offered by chiselers and unscrupulous price-cutters.—Editor.

NEWS ITEM

An announcement of extraordinary interest will soon be made at one of the meetings by Mr. Lang, of the Leo J. Meyberg Co., regarding the sensational new RCA-Victor line soon to be released. Mr. Lang will have a great deal of valuable information which he will impart to us as soon as it is available.

The Battem Bill. This bill states that all business must be conducted at a reasonable profit. A reasonable profit is not defined. Definite cost is defined as follows: invoice cost plus rent, light, labor, telephone, postage, advertising expense and depreciation of equipment. To a definite cost a reasonable profit of at least five percent must be added. Conviction for violation of these provisions is punishable by a five hundred dollar fine or six months imprisonment. Any offender is liable to suit for damage he has done to others.

SERVICE KINKS AND PET EQUIPMENT

(Continued from page 20)

If you have a Grebe 3-4 or S. K. that has very abrupt volume control action, replace the 2-8500 ohm bleeder resistors. Don't blame the volume control because you have to turn it on full to get lots of squeels.

An easy way to replace a dial cable on a Majestic 70 is to get a rubber washer that goes under a Philco chassis and slip or force it on the Majestic dial cable shaft up to the chassis and then take a standard dial knob and drill the shaft hole right on through, then slip the knob on the shaft and wedge it and the rubber washer tight against the chassis. Now the shaft will not slip and let all the cable unwind, thereby spoiling a technician's very loveable nature.

—E. H. Darrow.

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— INDEX —

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for feature articles by L. C. Lang, of Leo Meyberg Co.; Cecil Shook, of California Majestic Co., and Mr. Grimes, Chief Engineer, Radio Trades' Association.

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World Radio History